

## Claire Duvallet

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I am a PhD in computational biology using data science to impact society.

EDUCATION	<b>Massachusetts Institute of Technology</b> , <i>Cambridge, MA</i> Ph.D., Biological Engineering, January 2019	2014 – 2019
	<b>Columbia University</b> , <i>New York, NY</i> B.S., Biomedical Engineering	2009 – 2013
EXPERIENCE	<b>Biobot Analytics</b> <i>Data Scientist</i>  Biobot Analytics measures opioids in sewage to estimate consumption in cities. As Biobot's first data scientist, I lead our data analytics and visualization efforts, communicate the value of our novel opioid data, and serve as the main point of contact for our customers, public health and city officials.	2019 – present
RESEARCH	<b>Massachusetts Institute of Technology</b> Supervisor: Eric J. Alm, Ph.D. Ph.D., <i>Department of Biological Engineering</i> (2015 – Jan. 2019) Postdoc (Feb. 2019 – Apr. 2019)  I studied the relationship between the microbiome and health and disease, mining large clinical and biological datasets to extract scientific insight.	2015 – 2019
	<b>Columbia University</b> Supervisor: Samuel L. Sia, Ph.D. <i>Molecular and Microscale Bioengineering Laboratory</i>  As an undergraduate researcher, I worked on developing a point-of-care microfluidic device to diagnose multi-drug resistant tuberculosis in resource-limited settings.	2011 – 2013
	<b>Ecole Polytechnique</b> Supervisor: Cedric Norais, Ph.D. <i>Laboratoire de Biochimie</i>  As an international undergraduate research intern, I studied the acquired-immunity CRISPR system in <i>E. coli</i> .	Summer 2012
TEACHING	<b>Teaching Assistant</b>	Fall 2015
EXPERIENCE	20.106 Systems Microbiology, <i>Massachusetts Institute of Technology</i>  I was a TA for seven advanced undergraduate students in a new course on the human microbiome, emerging disease, phylogenetics, and host-microbe interactions.	
	<b>Lecturer</b> Biomedical Equipment Technology Department, <i>University of Puthisastra</i> Engineering World Health, <i>Phnom Penh, Cambodia</i>  As a Luce Scholar, I was one of the first lecturers for Engineering World Health's new Associate Bachelors program in Biomedical Equipment Technology at the University of Puthisastra, a private university in Phnom Penh.	2013 – 2014
	<b>Teaching Assistant</b> The Art of Engineering, <i>Columbia University</i>	2012 – 2013

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

## PUBLICATIONS

1. Noriko Endo, Newsha Ghaeli, **Claire Duvallet**, Katelyn Foppe, Tim Erickson, Mariana Matus, and Peter Chai. (2020)  
“Rapid assessment of opioid exposure and treatment in cities through robotic collection and chemical analysis of wastewater.”  
*Journal of Medical Toxicology*, doi: [10.1007/s13181-019-00756-5](https://doi.org/10.1007/s13181-019-00756-5).
2. **Claire Duvallet**. (2020)  
“Data detectives, self-love, and humility: a research parasite’s perspective.”  
*GigaScience*, doi: [10.1093/gigascience/giz148](https://doi.org/10.1093/gigascience/giz148).
3. Mariana Matus, **Claire Duvallet**, Newsha Ghaeli, Melissa Kido Soule, Krista Longnecker, Ilana Brito, Carlo Ratti, Elizabeth B. Kujawinski, and Eric Alm. (2019)  
“24-hour multi-omics analysis of residential sewage reflects human activity and informs public health.”  
*bioRxiv*, doi: [10.1101/728022](https://doi.org/10.1101/728022).
4. **Claire Duvallet**, Kara Larson, Scott Snapper, Sonia Iosim, Ann Lee, Katherine Freer, Kara May, Eric Alm, and Rachel Rosen. (2019)  
“Framework for rational donor selection in fecal microbiota transplant clinical trials.”  
*PLoS ONE*, doi: [10.1371/journal.pone.0222881](https://doi.org/10.1371/journal.pone.0222881).
5. Evan Bolyen, Jai Ram Rideout, Matthew R. Dillon, Nicholas A. Bokulich ... **Claire Duvallet** ... Rob Knight, Greg Caporaso. (2019)  
“Reproducible, interactive, scalable and extensible microbiome data science using QIIME 2.”  
*Nature Biotechnology*, doi: [10.1038/s41587-019-0209-9](https://doi.org/10.1038/s41587-019-0209-9).
6. Chengzhen Dai, **Claire Duvallet**, An Ni Zhang, Mariana Matus, Newsha Ghaeli, Shinkyu Park, Noriko Endo, Siavash Isazadeh, Tong Zhang, Kazi Jamil, Carlo Ratti, and Eric Alm. (2019)  
“Multi-site sampling and risk prioritization reveals the public health relevance of antibiotic resistance genes found in sewage environments.”  
*bioRxiv*, doi: [10.1101/562496v1](https://doi.org/10.1101/562496v1).
7. **Claire Duvallet**, Caroline Zellmer, Pratik Panchal, Shrish Budree, Madji Osman, and Eric Alm. (2019)  
“Aerodigestive sampling reveals altered microbial exchange between lung, oropharyngeal, and gastric microbiomes in children with impaired swallow function.”  
*PLoS ONE*, doi: [10.1371/journal.pone.0216453](https://doi.org/10.1371/journal.pone.0216453).
8. Keegan Korthauer\*, Patrick Kimes\*, **Claire Duvallet**<sup>†</sup>, Alejandro Reyes<sup>†</sup>, Ayshwarya Subramanian<sup>†</sup>, Mingxiang Teng, Chinmay Shukla, Eric Alm, and Stephanie Hicks. (2019)  
“A practical guide to methods controlling false discoveries in computational biology.”  
*Genome Biology*, doi: [10.1186/s13059-019-1716-1](https://doi.org/10.1186/s13059-019-1716-1).
9. Thomas Gurry, HST Microbiome Consortium, Sean M Gibbons, Sean M Kearney, Ashwin Ananthakrishnan, Xiaofang Jiang, **Claire Duvallet**, Zain Kassam, and Eric J Alm. (2018)  
“Predictability and persistence of prebiotic dietary supplementation in a healthy human cohort.”  
*Scientific Reports*. doi: [10.1038/s41598-018-30783-1](https://doi.org/10.1038/s41598-018-30783-1).

10. Sean Gibbons, **Claire Duvallet**, and Eric Alm. (2018)  
“Correcting for batch effects in case-control microbiome studies.”  
*PLoS Computational Biology*. doi: [10.1371/journal.pone.0176335](https://doi.org/10.1371/journal.pone.0176335).
11. **Claire Duvallet**. (2018)  
“Meta-analysis generates and prioritizes hypotheses for translational microbiome research.”  
*Microbial Biotechnology*. doi: [10.1111/1751-7915.13047](https://doi.org/10.1111/1751-7915.13047).
12. **Claire Duvallet**, Sean Gibbons, Thomas Gurry, Rafael Irizarry, and Eric Alm. (2017)  
“Meta-analysis of gut microbiome studies identifies disease-specific and shared responses.”  
*Nature Communications*. doi: [10.1038/s41467-017-01973-8](https://doi.org/10.1038/s41467-017-01973-8).

- Received PSB Award for Rigorous Secondary Data Analysis

13. Scott Olesen, **Claire Duvallet**, and Eric Alm. (2017)  
“dbOTU3: A new implementation of distribution-based OTU calling.”  
*PloS ONE*. doi: [10.1371/journal.pone.0176335](https://doi.org/10.1371/journal.pone.0176335).

#### Non-peer reviewed

14. [Tutorial] Claire Duvallet. “Updating your QIIME 2 plugin.” (2019) *QIIME 2 developer documentation*.
15. [Blog post] Claire Duvallet. “Scientific discovery from a clinical study: surprises from the lung and stomach microbiomes.” (2019) *Nature Microbiology Community Forum*. [go.nature.com/30rx4VZ](https://go.nature.com/30rx4VZ).
16. [Tutorial] Claire Duvallet and Mehrbod Estaki. “QIIME 2 for Experienced Microbiome Researchers.” (2018) *QIIME 2 documentation*.
17. [Tutorial] Claire Duvallet. “Developing a plugin for dummies.” (2018) *QIIME 2 developer documentation*.
18. [Tutorial] Claire Duvallet. “Publishing your plugin on conda.” (2018) *QIIME 2 developer documentation*.
19. [Blog post] Claire Duvallet. “Fuzzy zeros in percentile normalization method to correct for batch effects.” (2018) *microBEnet: the microbiology of the Built Environment network*.
20. [Blog post] Claire Duvallet. “Beyond dysbiosis: disease-specific and shared microbiome responses to disease.” (2017) *Nature Microbiology Community Forum*. [go.nature.com/2As9meL](https://go.nature.com/2As9meL).
21. [Dataset] Claire Duvallet, Sean Gibbons, Thomas Gurry, Rafael Irizarry, and Eric Alm. “MicrobiomeHD: the human gut microbiome in health and disease.” (2017) *Zenodo*. doi: [10.5281/zenodo.1146764](https://doi.org/10.5281/zenodo.1146764)

#### Other

22. [Blog post] “A well-kept secret for finding a job post-PhD.” (*in press*) *MIT Graduate Admissions Blog*.
23. [Blog post] “Learning to Engage in Deep Conversations.” (2018) *MIT Graduate Admissions Blog*.
24. [Resource] “Graduate student support resources flowchart.” (2018) *MIT Division of Student Life*.

## ORAL

### PRESENTATIONS

1. “24-hour multi-omics analysis of residential sewage reflects human activity and informs public health.” American Chemical Society National Meeting. Wastewater-Based Epidemiology: Opportunities, Challenges & Applications to Public Health & Safety. San Diego, CA. Aug. 2019. *Invited*.
2. “Intro to microbiome data visualization.” Cornell University 2019 Microbiome Hackathon: Microbiome Hack. Ithaca, NY. Apr. 2019. *Invited*.
3. “Framework for rational donor selection in fecal microbiota transplant clinical trials.” International Conference on Microbiome Engineering (ICME 2018). Boston, MA. Nov. 2018. *Invited*.
4. “Predictive power of the microbiome.” Science on Tap! Boston College Department of Biology seminar series. Boston, MA. Aug. 2018. *Invited*.
5. “Distribution-based methods to increase power and reduce redundancy in microbiome data.” Teaching and Developing QIIME 2 Workshop. San Diego, CA. May 2018. *Selected*.
6. “Meta-analysis to identify consistent disease-associated microbiome shifts.” MIT-Harvard Microbiome Symposium. Cambridge, MA. March 2018. *Selected*.

### SOFTWARE

#### **Percentile normalization**

Correcting batch effects in case-control microbiome studies.

Python implementation (*contributor*) and QIIME 2 plugin (*developer*).

#### **Distribution-based OTU calling**

New implementation of Preheim *et al.*’s distribution-based OTU clustering algorithm.

Python implementation (*contributor*) and QIIME 2 plugin (*developer*).

#### **Amplicon sequencing pipeline**

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

Python implementation (*co-developer*).

### SKILLS

**Technical:** Python (pandas, seaborn, matplotlib, scikit-learn, etc); git and GitHub; AWS (S3, EC2, Glacier, IAM); bash; LaTeX; R (proficient); data wrangling and exploration; machine learning; NGS analysis (16S, metagenomics); untargeted metabolomics analysis.

**Non-technical:** conflict management; student advocacy; project management; oral and written communication; diversity, equity, and inclusion.

**Languages:** English (native), French (fluent), Spanish (conversational), Khmer (beginner)

### FELLOWSHIPS & AWARDS

#### **Fellowships**

Siebel Scholars Foundation <i>Siebel Scholar Class of 2019</i>	2018
National Defense Science and Engineering Graduate Fellowship <i>NDSEG Recipient</i>	2015 – 2018
National Science Foundation Graduate Research Fellowship <i>Honorable Mention</i>	2015
Henry Luce Foundation <i>Luce Scholar, Engineering World Health Cambodia</i>	2013 – 2014

## Awards

PSB Award for Rigorous Secondary Data Analysis <i>Junior Research Parasite</i>	2019
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

## LEADERSHIP & SERVICE

### Academic and professional

Bluebonnet Data Volunteer data analytics for state and local campaigns <i>Team lead and data scientist</i>	2019 – present
MIT Microbiome Club <i>Co-founder, president, and executive board member</i>	2015 – 2018
MIT-Harvard Microbiome Symposium <i>Co-founder and organizing committee</i>	2016 and 2017
MIT Biotech Group <i>Beyond the Bench Initiative board member</i>	2017 – 2018

### Departmental and MIT

Biological Engineering Department Visiting Committee <i>Graduate student representative</i>	2018
Graduate Student Advisory Group for Engineering (GradSAGE) Advisory group to the Dean of the School of Engineering <i>Advisor/Advisee Relations Subcommittee</i>	2017 – 2018
MIT Graduate Student Council Diversity and Inclusion Subcommittee <i>Vice Chair, Department and Classroom Inclusion co-coordinator</i>	2017 – 2019
BE Resources for Easing Friction and Stress (BE REFS) <i>Confidential conflict management coach and graduate student advocate</i>	2016 – 2019
BE Graduate Student Board <i>Diversity Chair</i> <i>Co-founder, BE Application Assistance Program</i> <i>Lead author, BE Departmental Values Statement</i> <i>Co-lead, 2016 BE Diversity Survey</i>	2015 – 2018

## Outreach & Mentorship

MIT Microbiome superUROP	2016 – 2017
<i>Mentor, supervised one undergraduate researcher</i>	
Science Club for Girls, Young Leaders in STEM	2016 and 2017
<i>Volunteer, developed and taught three-day course on microbiology and the human microbiome</i>	
MIT SPLASH	2015
<i>Volunteer, “Microbiome 101: What’s in your poop?”</i>	
E3: Empowering, Encouraging, and Eliminating Barriers for Women in STEM	2015
<i>Mentor (2015), guest presenter (2016)</i>	
ESL Program for MIT Service Employees	2015 – 2018
<i>Math GED tutor</i>	

## Reviewer

MIT Summer Research Program (MSRP) Reviewer	2018 and 2019
MIT Committed to Caring Selection Committee	2017
MIT IDEAS Global Challenge Reviewer	2015 – 2018

## EXTRA-CURRICULARS

MIT Interfaith Dialogue Program	2017 – 2018
<i>Addir fellow</i>	
sMITe, MIT Women’s Ultimate Frisbee Team	2014 – 2019
<i>B-team captain (2014 – 2015)</i>	