Philip (Phil) Arevalo

CONTACT INFORMATION

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EDUCATION

Ph.D., MIT 2012 - 2017

Microbiology
Advisor: Martin Polz
Thesis: Horizontal gene transfer as a cohesive force in microbial populations.

Sc.B., Brown University, with honors 2007 - 2011

Applied Mathematics-Biology
Advisor: Jeremy Rich
Thesis: Diversity of anammox bactera in ocean sediments.

RESEARCH EXPERIENCE

University of Chicago, Department of Ecology and Evolution
PI: Sarah Cobey

Ruth L. Kirschstein NRSA Postdoctoral Fellow Starting September 2019
Postdoctoral Scholar 2017 - Present

- Modeling the effects infection history on susceptibility to influenza.
- Developing a computational method to identify influenza epitopes.
- Inferring factors responsible for the specificity of the human antibody response against influenza.

MIT, Microbiology Graduate Program
PI: Martin Polz

NSF Graduate Research Fellow 2012 - 2017

- Developed a method to identify microbial populations in networks of horizontal gene transfer.
- Inferred the history of a polysaccharide degradation pathway in a group of marine bacteria.
- Assembled and analyzed a collection of over 700 marine bacterial isolates.

HONORS AND AWARDS

Ruth L. Kirschstein NRSA Postdoctoral Fellow Starting September 2019

NSF Graduate Research Fellow 2012 - 2017

MIT Energy Initiative BP Energy Fellow 2012 - 2013

Povar Prize in Zoology and Physiology (awarded in recognition for outstanding academic achievements in physiology or zoology at Brown University) 2011

Society of Sigma Xi 2011

PREPRINTS IN REVIEW

1. **Arevalo P.**, McLean H.Q., Belongia E.A., Cobey S. (2019). *Earliest infections predict the age distribution of seasonal influenza A cases.* medRxiv. doi:10.1101/19001875
2. Chase A.B., **Arevalo P.**, Brodie E.L., Polz M.F., Karaoz U., Martiny J.B.H. (2019). *Sympatric and allopatric differentiation delineates population structure in free-living terrestrial bacteria.* bioRxiv. doi:10.1101/644468

Publications

** indicates equal contribution of authors*

1. **Arevalo P.***, VanInsberghe D.*, Elsherbini J., Gore J., Polz M.F. (2019). *A reverse ecology approach based on a biological definition of microbial populations.* Cell, 178(4). doi:10.1016/j.cell.2019.06.033
2. Polzin J., **Arevalo P.**, Nussbaumer T., Polz M.F, Bright M. (2019). *Polyclonal symbiont populations in hydrothermal vent tubeworms and the environment.* Proceedings of the Royal Society B, 286(1896). doi:10.1098/rspb.2018.1281
3. Rich J.J., **Arevalo P.**, Chang B.X., Devol A.H., Ward B.B. (2018). Anaerobic ammonium oxidation (anammox) and denitrification in Peru margin sediments. Journal of Marine Systems. doi:10.1016/j.jmarsys.2018.09.007
4. **Arevalo P.**, VanInsberghe D., Polz M.F. (2018) A Reverse Ecology Framework for Bacteria and Archaea. In: Population Genomics: Microorganisms. Springer, Cham. doi: 10.1007/13836_2018_46.
5. Kauffman K., Hussain F., Yang J., **Arevalo P.**, Brown J., Cutler M., Kelly L., Polz M.F. (2018). *A major lineage of non-tailed dsDNA viruses as unrecognized killers of marine bacteria.* Nature, 554:118-122. doi:10.1038/nature25474
6. Burks D.J., Norris S., Kauffman K.M., Joy A., **Arevalo P.**, Azad R.K., Wildschutte H. (2017). *Environmental vibrios represent a source of antagonistic compounds that inhibit pathogenic Vibrio cholerae and Vibrio parahaemolyticus strains.* MicrobiologyOpen, 6(5). doi:10.1002/mbo3.504.
7. Takemura A., Corzett C., Hussain F., **Arevalo P.**, Datta M,. Yu X., Le Roux F., Polz M.F. (2017). *Natural resource landscapes of a marine bacterium reveal distinct fitness-determining genes across the genome.* Environmental Microbiology, 19:2422–2433. doi:10.1111/1462-2920.13765.
8. Chase A.B., **Arevalo P.**, Polz M.F., Berlemont R., Martiny J.B.H. (2016). *Evidence for ecological flexibility in the cosmopolitan genus Curtobacterium.* Frontiers in Microbiology, 7:1874. doi: 10.3389/fmicb.2016.01874
9. Hehemann J.-H.*, **Arevalo P.***, Datta M.S.*, Yu X., Corzett C., Preheim S.P., Henschel A., Timberlake S., Alm E.J., Polz M.F. (2016). *Adaptive radiation by waves of gene transfer leads to fine-scale resource partitioning in marine microbes.* Nature Communications, 7. doi:10.1038/ncomms12860.

Presentations and posters

1. **Arevalo P.**, VanInsberghe D., Elsherbini J., Gore J., Polz M.F. *A reverse ecology approach based on a biological definition of microbial populations.* July 2019. Microbiome. Cold Spring Harbor Laboratory. Oral presentation.
2. **Arevalo P.**, McLean H.Q., Belongia E.A., Cobey S. *Earliest infections predict the age distribution of seasonal influenza A cases.* May 2019. Models of Infectious Disease Agent Study (MIDAS) Annual Meeting. Oral presentation.
3. **Arevalo P.**, Vieira M., Cobey S. *Original antigenic sin and antigenic maps.* April 2019. Santa Fe Institute Working Group on Aging and Adaptation in Infectious Diseases. Oral presentation.
4. **Arevalo P.**, McLean H.Q., Belongia E.A., Cobey S. *The role of immune history in population-level influenza dynamics.* July 2018. Centers of Excellence for Influenza Research and Surveillance (CEIRS) Annual Network Meeting. Oral presentation.
5. **Arevalo P**. *The role of immune history in population-level influenza dynamics.* April 2018. University of Chicago Ecology & Evolution Darwin's Weekly. Oral presentation.
6. **Arevalo P**. *Horizontal gene transfer as a cohesive force in microbial populations.* April 2017. University of Chicago Ecology & Evolution Darwin's Weekly. Oral presentation.

7. **Arevalo P**. & Polz M.F. *A biolgical definition for microbial populations and its application to a reverse ecology approach.* August 2016. 16th International Symposium for Microbial Ecology. Evolution. Oral presentation.
8. **Arevalo P**. *A biolgical definition for microbial populations and its application to a reverse ecology approach.* Center for Microbiome Informatics and Therapeutics. June 2016. Work-in-progress meeting. Oral presentation.
9. **Arevalo P.**, Wuchter C., Yang T-H., Coolen M., Sievert S. *Stratified bacterial and archaeal communities across the oxygen minimum zone of the Eastern Tropical North Pacific.* August 2012 . 14th International Symposium for Microbial Ecology. Microbes in a changing ocean. Oral presentation.
10. **Arevalo P.**, Sylva S., Toney C., Le Bris N., Seewald J., & Sievert S. *Bacterial and archaeal community structure along a geochemical gradient in hydrothermally influenced sediments of Guaymas Basin, Gulf of California.* August 2012. 14th International Symposium for Microbial Ecology. Microbial life in extreme environments. Poster session.
11. **Arevalo P.** & Rich J. *Diversity and abundance of anammox bacteria along environmental gradients in the Peru margin.* February 2011. American Society for Limnology and Oceanography Aquatic Sciences Meeting. Poster session.

Teaching and Mentorship Experience

University of Chicago

Guest lecturer, Evolutionary and Genomic Medicine — Winter 2018 and Winter 2019

MIT

Kaufman Teaching Certificate Program — Summer 2017
Rotation student advisor, Jai Padmakumar — Spring 2017
Teaching assistant, Microbial Population Genomics — Fall 2016
Rotation student advisor, Joseph Elsherbini — Winter 2015
Teaching assistant, Microbial Genetics and Evolution — Fall 2014

Centro de Biología Molecular, Managua, Nicaragua

Lecturer, bioinformatics workshop — March 2014

Service

University of Chicago

Organizer, Ecology and Evolution Theory Group — Fall 2018 and Winter 2019

MIT

Graduate Resident Tutor — 2014 - 2017
Ran regular study breaks, assisted in conflict resolution, and insured general well-being of undergraduate students in a residential setting.

Co-organizer, Microbial Engineering and Science Seminar — 2014 - 2015

SPLASH instructor — 2013 and 2015
Taught high school students at annual event organized by members of the MIT community.

Cambridge Rindge and Latin School, a local public high school

Guest lecturer, Biotechnology III — November 2016

Brown University

Writing Fellow 2008 - 2011
Provided writing support for ten students per semester focused on argumentation, style, and clarity.

Other research experience

Woods Hole Oceanographic Institution
PI: Stefan Sievert

Research assistant 2011 - 2012

- Analyzed microbial community composition in oxygen minimum zones and hydrothermal vents.

Brown University, Department of Ecology and Evolutionary Biology
PI: Jeremy Rich

Research assistant 2009 - 2011

- Assessed the diversity of anammox bacteria in ocean sediments.