

Jonathan Friedman

Hebrew University of Jerusalem
Dept. of Plant Pathology & Microbiology
Faculty of Agriculture, Food, and Environment
P.O. Box 12, Rehovot 7610001, Israel

Office: +972-8-9489161
Cell: +972-54-2842467
E-mail: yonatan.friedman@mail.huji.ac.il
url: friedmanlab.net

Education

Massachusetts Institute of Technology 2013
Ph.D., Computational and Systems Biology

Tel Aviv University 2007
B.S., Physics and Biology (Double Major), with distinction

Professional Experience

Senior Lecturer, Hebrew University of Jerusalem 2017-present

Postdoctoral Associate, Massachusetts Institute of Technology 2013-2017
advisor: Jeff Gore

Experimental tests of the principles that shape ecological communities using synthetic microbial communities as a simple and tractable model system:

- Predictability of microbial community structure.
- Ecological interaction networks and community properties.
- The role of facilitation in promoting species coexistence.

Ph.D. student, Massachusetts Institute of Technology 2008-2013
advisors: Eric Alm & Daniel Rothman

Leveraging high-throughput genomic surveys to study the structure of natural microbial communities, as well as to investigate the role of horizontal gene transfer in speciation and adaptation:

- Correlation inference in genomic surveys.
- Genetic diversity in the presence of selective sweeps and horizontal gene transfer.
- Shape and evolution of the temperature and salinity niche of marine *Vibrio*.

Undergraduate research assistant, Tel Aviv University 2006-2007
PI: Eshel Ben-Jacob

- Detection of functional gene groups from microarray data in *B. subtilis*.

Fellowships & Awards

2016 Ilanit (FISEB) travel award.

2010-2012 The Merck-MIT Fellowship (covering full tuition and scholarship).

2007 Dean's list in Physics and Biology, Tel-Aviv University.

2006 Weizmann Institute Amos de-Shalit Ulpana for Physics Fellowship.

Invited Presentations

- Dec 2017** *Plant Sciences Institute seminar, Hebre University* (organizer: Dr. Idan Efroni).
"Synthetic Ecology: Building Microbial Communities from the Bottom Up"
- Oct 2017** *116th International Titisee Conference* (organizers: Dr. Roy Kishony & Dr. David Relman).
"High-throughput measurements of microbial interactions using nanodroplets"
- Dec 2016** *Channing Division of Network Medicine, Harvard Medical School* (invited by Dr. Yang-Yu Liu).
"Synthetic Ecology: Building Microbial Communities from the Bottom Up"
- Mar 2016** *Microbiome Club, MIT*
"Understanding microbial communities"
- Feb 2016** *Non-Equilibrium Statistical Mechanics Group, MIT*
"Using game theory to model individual behavior and species evolution"
- Apr 2014** *Channing Division of Network Medicine, Harvard Medical School* (invited by Dr. Yang-Yu Liu).
"The structure of microbial species and communities"
- Apr 2013** *Biophysics student seminar, MIT*
"Modelling the Human microbiome"
- Mar 2013** *Kyoto University* (invited by Dr. Ziya Kalay)
"Horizontal gene transfer, ecological differentiation, and microbial speciation"
- Apr 2012** *ETH Zurich* (invited by Dr. Martin Ackerman)
"Microbial ecology of strains and communities"

Contributed Presentations

- Feb 2017** *Ilanit (FISEB) conference*
Contributed talk: "Community Structure Follows Simple Assembly Rules in Microbial Microcosms".
- Mar 2016** *American Physical Society meeting*
Contributed talk: "Assembly rules for microbial communities".
- Aug 2015** *Ecological Society of America meeting*
Contributed talk: "Predicting community composition from pairwise interactions in a model microbial ecosystem".
- Aug 2015** *GRS: Microbial population biology*
Contributed poster: "Predicting community composition from pairwise interactions in a model microbial ecosystem".
- Jun 2015** *Boston Bacterial Meeting*
Contributed poster: "Inferring higher-order interactions among bacterial species".
- Jul 2013** *ENIGMA annual meeting*
Contributed poster: "Inferring correlation networks from genomic survey data".
- Jul 2012** *qBio Conference*
Contributed poster: "Classifying 2D niche shapes – pairwise interactions between environmental stresses".

Manuscripts in preparation [* denotes equal contribution]

- C. Abreu, **J. Friedman**, B. Woltz, and J. Gore. Effect of Environmental Deterioration on Interspecies Competition. *In preparation*.
- L. Higgins, **J. Friedman**, H Shen, and J. Gore. Extreme hierarchy of interactions among co-occurring soil bacteria. *In Revision, Nature Communications*.

Publications [* denotes equal contribution]

18. Y. Xiao, M. T. Angulo, **J. Friedman**, M. K. Waldor, S. T. Weiss, and Y. Y. Liu. Mapping the ecological networks of microbial communities. *Nature communications*. *Nature Communications*, 2017.
17. **J. Friedman**, L. Higgins, and J. Gore. Community structure follows simple assembly rules in microbial microcosms. *Nature Ecology & Evolution*, 2017.
16. **J. Friedman** and J. Gore. Ecological Systems Biology: The Dynamics of Interacting Populations. *Current Opinion in Systems Biology*, 2017. (Invited review)
15. A. Prez-Escudero*, **J. Friedman***, and J. Gore. Preferential interactions promote blind cooperation and informed defection. *PNAS*, 2016.
14. S. P. Preheim*, S. W. Olesen*, A. Materna, C. Varadharajan, M. Blackburn, **J. Friedman**, J. Rodriguez, H. Hemond, E. J. Alm. Surveys, simulations, and single-cell assays relate function and phylogeny in a lake ecosystem. *Nature Microbiology*, 2016.
13. A. Bashan, T. E. Gibbson, **J. Friedman**, S. T. Weiss, E. L. Hohmann and Y. Y. Liu. Universality of human microbial dynamics. *Nature*, 2016.
12. S. Weiss, W. Van Treuren, C. Lozupone, K. Faust, **J. Friedman**, Y. Deng, L. C. Xia, Z. Z. Xu, L. Ursell, E. J. Alm, A. Birmingham, J. A. Cram, J. A. Fuhrman, J. Raes, F. Sun, J. Zhou, and R. Knight. Correlation detection strategies in microbial datasets vary widely in sensitivity and precision. *ISME J*, 2016.
11. L. A. David, A. C. Materna, **J. Friedman**, M. I. Campos-Baptista, M. C. Blackburn, A. Perrotta, S. E. Erdman, and E. J. Alm. Host lifestyle affects human microbiota on daily timescales. *Genome Biol*, 2014.
10. **J. Friedman**, E. J. Alm, and B. J. Shapiro. Sympatric speciation: when is it possible in bacteria? *PLoS One*, 2013.
9. S. P. Preheim, A. R. Perrotta, **J. Friedman**, C. Smilie, I. Brito, M. B. Smith, and E. J. Alm. Computational methods for high-throughput comparative analyses of natural microbial communities. *Methods Enzymol*, 2013.
8. **J. Friedman**, E. J. Alm. Inferring correlation networks from genomic survey data. *PLoS Comp Bio*, 2012.
7. A. C. Materna*, **J. Friedman***, C. Bauer, C. David, S. Chen, I. B. Huang, A. Gillens, S. A. Clarke, M. F. Polz, and E. J. Alm. Shape and evolution of the fundamental niche in marine *Vibrio*. *ISME J*, 2012.
6. The Human Microbiome Project Consortium. Structure, function and diversity of the healthy human microbiome. *Nature*, 2012.
5. The Human Microbiome Project Consortium. A framework for human microbiome research. *Nature*, 2012.

4. B. J. Shapiro, **J. Friedman**, O. X. Cordero, S. P. Preheim, S. C. Timberlake, G. Szab, M. F. Polz, and E. J. Alm. Population genomics of early events in the ecological differentiation of bacteria. *Science*, 2012.
3. C. S. Smillie*, M. B. Smith*, **J. Friedman**, O. X. Cordero, L. A. David, and E. J. Alm. Ecology drives a global network of gene exchange connecting the human microbiome. *Nature*, 2011.
2. B. J. Shapiro, L. A. David, **J. Friedman**, and E. J. Alm. Looking for darwins footprints in the microbial world. *Trends in Microbiology*, 2009.
1. A. Madi*, **Y. Friedman***, D. Roth, T. Regev, S. Bransburg-Zabary, and E. Ben-Jacob. Genome holography: Deciphering Function-Form motifs from gene expression data. *PLoS One*, 2008.

Teaching Experience

- Teaching assistant: “Modeling Environmental Complexity”, taught by Daniel Rothman, MIT, 2009. Average overall rating of 6.0/7.0.
- Teaching assistant: “Foundations of Computational & Systems Biology”, taught by Christopher Burge and Amy Keating, MIT, 2009. Average overall rating of 6.0/7.0.
- Course Instructor: “Introductory Physics for Biologists” offered by the student council, Tel Aviv University, 2006-2007. Average overall rating of 6.5/7.0.