

## Jonathan Friedman

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## 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

- **Postdoctoral Associate, Massachusetts Institute of Technology** 2013-Present  
*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

- 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

- 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".
- Jul 2012** *qBio Summer School: Stochastic Gene Regulation*  
Contributed talk: "Community assembly of the Human microbiome".

## Manuscripts in preparation [\* denotes equal contribution]

- L. Higgins, **J. Friedman**, and J. Gore. Extreme hierarchy of interactions among co-occurring soil bacteria. *In preparation.*

## Publications [\* denotes equal contribution]

- **J. Friedman**, L. Higgins, and J. Gore. Community structure follows simple assembly rules in microbial microcosms. *Nature Ecology & Evolution*, *accepted*. (Preprint available at: [bioRxiv \(2016\): 067926](https://doi.org/10.1101/067926))
- **J. Friedman** and J. Gore. Ecological Systems Biology: The Dynamics of Interacting Populations. *Current Opinion in Systems Biology*, *accepted*. (Invited review)
- A. Prez-Escudero\*, **J. Friedman\***, and J. Gore. Preferential interactions promote blind cooperation and informed defection. *PNAS*, 2016.
- 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.
- A. Bashan, T. E. Gibbson, **J. Friedman**, S. T. Weiss, E. L. Hohmann and Y. Y. Liu. Universality of human microbial dynamics. *Nature*, 2016.
- 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.
- 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.
- **J. Friedman**, E. J. Alm, and B. J. Shapiro. Sympatric speciation: when is it possible in bacteria? *PLoS One*, 2013.
- 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.
- **J. Friedman**, E. J. Alm. Inferring correlation networks from genomic survey data. *PLoS Comp Bio*, 2012.
- 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.
- The Human Microbiome Project Consortium. Structure, function and diversity of the healthy human microbiome. *Nature*, 2012.
- The Human Microbiome Project Consortium. A framework for human microbiome research. *Nature*, 2012.
- 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.
- 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.
- B. J. Shapiro, L. A. David, **J. Friedman**, and E. J. Alm. Looking for darwins footprints in the microbial world. *Trends in Microbiology*, 2009.
- 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.