

## Jackie Lee “JL” Weissman

**pronouns:** they/them/theirs or she/her/hers  
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### Positions:

**Assistant Professor**, Department of Ecology & Evolution and the Institute for Advanced Computational Science (IACS), Stony Brook University, Fall 2024 - Present

**Director of Proposal Development**, City College of New York, New York, NY, 2023 - 2024  
– *Previously: Assistant Director of Proposal Development*

**Assistant Professor of Computational Biology**, Schmid College of Science and Technology, Chapman University, Orange, CA, Spring 2023 (*tenure track, resigned for family reasons*)

**Postdoctoral Fellow**, Department of Marine and Environmental Biology, University of Southern California, Los Angeles, CA, 2020 - 2022

### Adjunct Appointments:

**Adjunct Assistant Professor of Biology**, the City College of New York, 2023 - Present

**Adjunct Assistant Professor of Biological Sciences**, USC, 2023 - Present

**Adjunct Instructor of Natural Sciences**, School of Art, The Cooper Union, 2023-2024

### Education

**Ph.D., Behavior, Ecology, Evolution, and Systematics** (BEES; Fall 2019), University of Maryland College Park, College Park, MD

**Graduate Certificate, Computation and Mathematics for Biological Networks** (COMBINE; Fall 2019), University of Maryland College Park, College Park, MD

**B.A., Mathematics and Biology** (Spring 2015), Bard College, Annandale-on-Hudson, NY

### External Funding

**Chemical Currencies of a Microbial Planet (C-CoMP) Faculty Fellow** (\$40,000), C-CoMP NSF STC, 2024

*Inferring Microbial Growth in Communities to Understand a Changing Climate*

**NORDP Minority Serving Institution (MSI) Consultants Program (PI)**

(\$150,000, plus 600 hrs research development consulting, \$20,000 stipend, travel fund), National Organization of Research Development Professionals, 2023

*The City College of New York (CCNY) Aims for R1 (CARI)*

**DoEd Research and Development Infrastructure Program (Key Personnel)**

(*Coordinated proposal and wrote significant sections*) (\$5 million),

Department of Education, 2023

*Translational Research Excellence Across Disciplines (TREAD)*

**NSF BRC-BIO (PI)** (*awarded, declined when left Chapman position*) (\$442,368),

National Science Foundation, 2023

*Genomic and Metagenomic Maximum Growth Rate Estimation to Understand and Predict the Trajectories of Warming Permafrost Communities*

**Simons Foundation Postdoctoral Fellowship in Marine Microbial Ecology** (\$246,100),

Simons Foundation, 2020-2023

*Drafting an Atlas of Prokaryotic Immune Strategy in the Global Oceans*

## **Publications** (\*corresponding)

### **Preprints:**

1. Xu L., E. Zakem, J.L. Weissman\*. **Improved maximum growth rate prediction from microbial genomes by integrating phylogenetic information..** *bioRxiv*
2. Laperriere S. M., B. Minch, J.L. Weissman, S. Hou, Y.C. Yeh, J.C.L. Ignacio-Espinoza, N.A. Ahlgren, M. Moniruzzaman, J.A. Fuhrman. **Phylogenetic proximity drives temporal succession of marine giant viruses in a five-year metagenomic time-series.** *bioRxiv*
3. Zakem E.J., J. McNichol<sup>†</sup>, J.L. Weissman<sup>†</sup>, Y. Raut, L. Xu, E.R. Halewood, C.A. Carlson, S. Dutkiewicz, J.A. Fuhrman, N.M. Levine. **Predictable functional biogeography of marine microbial heterotrophs.** *bioRxiv*
4. Buchanan P.J., X. Sun, J.L. Weissman, E. Zakem. **Oxygen intrusions sustain aerobic nitrite oxidation in anoxic marine zones.** *bioRxiv*
5. Weissman\* J.L., E.R.O. Dimbo, A.I. Krinos, C. Neely, Y. Yagües, D. Nolin, S. Hou, S. Laperriere, D.A. Caron, B. Tully, H. Alexander, J.A. Fuhrman. **Estimating the maximal growth rates of eukaryotic microbes from cultures and metagenomes via codon usage patterns.** *bioRxiv*
6. Ignacio-Espinoza J.C., S. Laperriere, Y. Yeh, J.L. Weissman, S. Hou, M. Long, J.A. Fuhrman. **Ribosome-linked mRNA-rRNA chimeras reveal active novel virus host associations.** *bioRxiv*

### **Peer Reviewed:**

1. Gleich S., L. Mesrop, J. Cram, J.L. Weissman, S. Hu, Y. Yeh, J. Fuhrman, D. Caron. 2025. **With a little help from my friends: Importance of protist-protist interactions in structuring marine protistan communities in the San Pedro Channel.** *mSystems* e01045-24.
2. Weissman\* J.L., C.R. Chappell, B.F.R. de Oliveira, N. Evans, A.C. Fagre, D. Forsythe, S.A. Frese, R. Gregor, S.L. Ishaq, J. Johnston, Bittu K.R., S.B. Matsuda, S. McCarren, M.O.A. de la Campa, T.A. Roepke, N. Sinnott-Armstrong, C.S. Stobie, L. Talluto, J. Vargas-Muñiz, The Advancing Queer and Trans Equity in Science (AQTES) Consortium. 2024. **Queer- and trans-inclusive faculty hiring—A call for change.** *PLOS Biology* 22(11), e3002919.
3. Merchant S., J.L. Weissman, E. MacLachlan. 2024. **Creating a Broader Impacts Culture.** *Journal of Community Engagement and Scholarship* 17(2), 13.
4. Xiao W., J.L. Weissman, P.L.F. Johnson. 2024. **Ecological drivers of CRISPR immune systems.** *mSystems* e00568-24
5. Connors E., A. Dutta, R. Trinh, N. Erazo, S. Dasarathy, H. Ducklow, J.L. Weissman, Y.C. Yeh, O. Schofield, D. Steinberg, J. Fuhrman, J.S. Bowman. 2024. **Microbial community composition predicts bacterial production across ocean ecosystems.** *The ISME Journal*, p.wrae158.
6. McDonald M.D., C. Owusu-Ansah, J.B. Ellenbogen, Z.D. Malone, M.P. Ricketts, S. Frolking, J.G. Ernakovich, M. Ibba, S.C. Bagby, J.L. Weissman\*. 2024. **What is Microbial Dormancy?.** *Trends in Microbiology*
7. Gregor R., J. Johnston, L. Shu Yang Coe, T. Evans, D. Forsythe, R. Jones, D. Muratore, B.F. Rodrigues de Oliveira, R. Szabo, Y. Wan, J. Williams, Queer and Trans in Microbiology Consortium, J.L. Weissman\*. 2023. **Building a Queer- and Trans-Inclusive Microbiology Conference.** *mSystems* 8(5), e00433-23.
8. Fletcher-Hoppe C., Y.C. Yeh, Y. Raut, J.L. Weissman, J.A. Fuhrman. 2023. **Symbiotic diazotrophic UCYN-A strains co-occurred with El Niño, relaxed upwelling, and varied eukaryotes over 10 years off Southern California Bight.** *ISME Communications* 3(1), 63
9. Weissman\* J.L., M. Peras, T.P. Barnum, J.A. Fuhrman. 2022. **Benchmarking community-wide estimates of growth potential from metagenomes using codon usage statistics.** *mSystems* 7(5), e00745-22.
10. Tao J., W. Wang, J.L. Weissman, Y. Zhang, S. Chen, Y. Zhu, C. Zhang, and S. Hou. 2022. **Size-fractionated microbiome observed during an eight-month long sampling in Jiaozhou Bay and the Yellow Sea.** *Scientific Data* 9(1), 1-8.
11. Gleich S.J., J.A. Cram, J.L. Weissman, D.A. Caron. 2022. **NetGAM: Using generalized ad-**

- ditive models to improve the predictive power of ecological network analyses constructed using time-series data. *ISME Communications* 2(1), 23
12. Weissman\* J.L., S. Hou, J.A. Fuhrman. 2021. **Estimating maximal microbial growth rates from cultures, metagenomes, and single cells via codon usage patterns.** *Proceedings of the National Academy of Sciences* 118(12), e2016810118.
  13. Weissman\* J.L., E.O. Alseth, S. Meaden, E.R. Westra, J.A. Fuhrman. 2021. **Immune Lag Is a Major Cost of Prokaryotic Adaptive Immunity During Viral Outbreaks.** *Proceedings of the Royal Society B* 288, 20211555.
  14. Weissman J.L., ..., P.L.F. Johnson, D. Karig, W.F. Fagan, S. Bewick. 2021. **Exploring the functional composition of the human microbiome using a hand-curated microbial trait database.** *BMC Bioinformatics* 22(1), 1471-2105.
  15. Tully B.J, J. Buongiorno, ..., L.E. Valentin-Alvarado, J.L. Weissman, BVCN Instructor Consortium. 2021. **The Bioinformatics Virtual Coordination Network: an open-source and interactive learning environment.** *Frontiers in Education* 6, 394.
  16. Weissman J.L., A. Stoltzfus, E.R. Westra, P.L.F. Johnson. 2020. **Avoidance of Self During CRISPR Immunization.** *Trends in Microbiology* 28(7), 543-553.
  17. Weissman J.L. & P.L.F. Johnson. 2020. **Network-Based Prediction of Novel CRISPR-Associated Genes in Metagenomes.** *mSystems* 5(1), e00752-19.
  18. Martí-Carreras J., ..., J.L. Weissman, V. Zalunin, A. Efremov, B. Busby. 2020. **NCBI's Virus Discovery Codeathon: Building the "FIVE" – Federated Index of Viral Experiments API index.** *Viruses* 12(12), 1424.
  19. Weissman J.L., W.F. Fagan, P.L.F. Johnson. 2019. **Linking high GC content to the repair of double strand breaks in prokaryotic genomes.** *PLOS Genetics* 15(11), e1008493.
  20. Weissman J.L., R. Laljani, W.F. Fagan, P.L.F. Johnson. 2019. **Visualization and prediction of CRISPR incidence in microbial trait-space to identify drivers of antiviral immune strategy.** *The ISME Journal* 13(10), 2589-2602.
  21. Bewick S., E. Gurarie, J.L. Weissman, J. Beattie, C. Davati, R. Flint, P. Thielen, F. Breitwieser, D. Karig, W.F. Fagan. 2019. **Trait-Based Analysis of the Human Skin Microbiome.** *Microbiome* 7(1), 101.
  22. Weissman J.L., W.F. Fagan, P.L.F. Johnson. 2018. **Selective maintenance of multiple CRISPR arrays across prokaryotes.** *The CRISPR Journal* 1(6), 405-413.
  23. Weissman J.L., R. Holmes, R. Barrangou, S. Moineau, W.F. Fagan, B. Levin, P.L.F. Johnson. 2018. **Immune Loss as a Driver of Coexistence During Host-Phage Coevolution.** *The ISME Journal* 12(2), 585-597.

#### Whitepapers:

1. Weissman\* J.L., C.R. Chappell, B.F.R. de Oliveira, N. Evans, A.C. Fagre, D. Forsythe, S.A. Frese, R. Gregor, S.L. Ishaq, J. Johnston, Bittu K.R., S.B. Matsuda, S. McCarren, M.O.A. de la Campa, T.A. Roepke, N. Sinnott-Armstrong, C.S. Stobie, L. Talluto, J. Vargas-Muñiz, The Advancing Queer and Trans Equity in Science (AQTES) Consortium. 2024. **Running a queer- and trans-inclusive faculty hiring process.** <https://doi.org/10.32942/X2J310>

#### Outreach Publications:

1. Weissman J. L., S. Hou, J.A. Fuhrman. 2022. **Using DNA to Predict How Fast Bacteria Can Grow.** *Frontiers Young Minds*.
2. Weissman J. L., H.H. Yiu, P.L.F. Johnson. 2019. **What Bacteria Do When They Get Sick.** *Frontiers Young Minds*.

#### Teaching

##### Teaching at Stony Brook University,

- BEE 552: Biometry (core graduate statistics course; S25)
- SBU102: Genomes & Society (freshman seminar; S25)

**Teaching at City College (Proposal Development),**

- Early Career Faculty Writing Club (F23-S24)
- Broader Impacts Writing Workshop (January 2024)
- Writing an Effective DOE Promoting Inclusive and Equitable Research (PIER) Plan Workshop (October 24)

**Teaching at The Cooper Union,**

- RS-201-I: Genomes & Society (*interdisciplinary non-major course examining the science and the social implications of genomics*; F23, S24)

**Teaching at Chapman University,**

- BIOL317: General Microbiology (S23)
- Designed interdisciplinary upper-level elective **BIOL460: Genomes & Society** examining both the science and the social, ethical, and historical context of human genomics research

**Instructor**, Qlife Quantitative Biology Winter School: Quantitative Viral Dynamics Across Scales, Département de Biologie, École normale supérieure, Paris, France, March 2022

**Facilitator**, Microbial Ecology Reading Group, SBU, 2024-

**Facilitator**, Marine and Environmental Biology Statistics Reading Group, USC, 2020-2022

**Instructor**, Bioinformatics Virtual Coordination Network, 2020-2021

<https://biovcnet.github.io/>

**Guest Lecturer**

*Stony Brook University*

- BEE556: Research Areas in Ecology & Evolution, Fall 2024
- GRD500: Responsible Conduct of Research, Fall 2024
- IACS PDP: Proposal Development, Fall 2024

*The City College of New York*

- BIO483: Biotechnology Laboratory, Winter 2025

*Reed College*

- BIO331: Computational Systems Biology, Fall 2024

*University of Maryland College Park*

- BIOL709F: Statistics and Modeling for Biologists, Spring 2018
- BSCI464: Microbial Ecology, Spring 2018
- BSCI405: Population and Evolutionary Genetics, Spring 2017

**Teaching Assistant, Calculus for the Life Sciences**, Department of Biology, University of Maryland College Park, Fall 2015

**Teaching Assistant, Bridge to Enter Advanced Mathematics (BEAM)**, The Art of Problem Solving Foundation, Cambridge, MA, Summer 2012 and 2015

**Project Head, Bard Math Circle**, Bard College, Annandale-on-Hudson, NY, 2011-2015

**Mentoring**

**Mentorship Training, CIMER Training**, Stony Brook University, 2024

**Scientific “Thought-Partner”, Artist in Residency Program**, GenSpace, 2024

**Faculty Adviser, oSTEM at Chapman**, Chapman University, 2023

**Panelist, Path of Professorship Workshop**, MIT, 2022, 2023, 2024

**Panelist, Effective Time Management for New Graduate Students (Orientation)**, USC, 2022

**Workshop Organizer, Mentoring Undergraduate Researchers: A Practical Guide for Graduate Student Mentors**, University of Maryland College Park, 2019

**Undergraduate Researchers Mentored** (\**coauthor*, †*presented at symposium or conference*)

*Stony Brook University:*

Jesse Natarajan (Fall 2024 - Spring 2025; Senior Honors Thesis)

*Chapman University:*

Athena Gonzalez (Spring 2023)

*University of Southern California:*

Edward-Robert Dimbo\* (Winter 2021 - Summer 2022; GGURE)

James Rosas† (Summer 2021; National Summer Undergraduate Research Project, nsurp.org)

Yuniba Yagües\*† (Summer 2020; National Summer Undergraduate Research Project, nsurp.org)

Oscar Escobedo† (Summer 2020; National Summer Undergraduate Research Project, nsurp.org)

*University of Maryland College Park:*

Rohan Laljani\*<sup>†</sup> (Fall 2017 - Summer 2019)  
Vinay Veluvolu<sup>†</sup> (Summer 2018 - Summer 2019)  
Julia Gall<sup>†</sup> (Fall 2018 - Spring 2019; College Park Scholars)  
Cori Butkiewicz (Summer 2017 - Spring 2018)  
Nicholas Penn (Spring 2017 - Summer 2017)

**Service**

**Turner Advisory Committee**, SBU Graduate School, 2025-2027  
**Co-Founder/Facilitator**, Advancing Queer and Trans Equity in Science, 2024-  
**New Recruit Award Committee**, SBU IACS, 2025  
**Affiliate Committee**, SBU IACS, 2025  
**Faculty Search Committee**, SBU IACS, 2024-2025  
**Student Excellence Award Guest Reviewer**, SBU Ecology & Evolution, 2025  
**Graduate Admissions Committee**, SBU Ecology & Evolution, 2024-2025  
**Living World Lecture Series Committee**, SBU Ecology & Evolution, 2024-2025  
**Department Self-Study (Financials & Faculty Development)**, SBU Ecology & Evolution, 2024-2025  
**Judge**, CUNY Summer Research Program Poster Session, 2024  
**Conference Chair**, NYC Future Energy Conference, CCNY, 2024  
**Search Committee**, Grant Writer, CCNY, 2024  
**Search Committee**, Associate Provost for Research, CCNY, 2024  
**Panelist**, Pride in Microbiology Network, 2023  
**Member**, Committee on Inclusive Excellence, National Organization of Research Development Professionals, NORDP, 2023-2024  
**Co-Founder**, Working Group on Trans- and Queer-Inclusive Conferences in Microbiology, 2022-2023  
**Organizer**, Inclusive Teaching Workshop, Chapman University, 2023  
**DEI Taskforce Member**, Schmid College, Chapman University, 2022-2023  
**Facilitator**, DEI Journal Club on Ableism in Evolutionary Biology, USC, 2022  
**Reviewer**, CAREER Awards, NSF, 2022  
**Session Co-Chair**, Ocean Sciences Meeting, 2022  
**DEI Committee Member**, Dept. of Marine and Environmental Biology (MEB), USC, 2021-2022  
**DEI Subcommittee on Reporting Member**, MEB, USC, 2021-2022  
**Judge**, ASM Early Career Flash Talks, October 2021  
**Conference Organizing Committee**, Holistic Bioinformatics Approaches Used in Microbiome Research, Bioinformatics Virtual Coordination Network, Summer 2020-Summer 2021  
**Facilitator**, Pride Month Workshop on Queering Professionalism, USC, June 2021  
**Co-Organizer**, Pride Month Programming for MEB, USC, June 2021  
**Poster Judge**, CRISPR 2021 Meeting, June 2021  
**Secretary-Treasurer**, BEES Student Taskforce (BEESst), UMD-CP, Fall 2018-Spring 2019  
**Co-President**, BEES Student Taskforce (BEESst), UMD-CP, Fall 2017-Spring 2018  
**Graduate Mentor**, Biological Sciences Graduate Program, UMD-CP, Fall 2016, 2017  
**Journal Reviewer**: ISME J, PNAS, Current Biology, Trends in Microbiology, Nature Communications, mSystems, Microbiome, Proceedings B, PLoS Comp Bio, Marine Genomics, npj Biofilms and Microbiomes, BMC Bioinformatics, J Theor Biol

**Community Engagement**

**Collaborator/Bioinformatics Facilitator**, Microbial Reef Project, GenSpace, 2024-  
**Participant**, SciArt Workshop, BrainNY & Genspace, 2023  
**Co-Founder**, Postdoc Outreach Project with LA Public Library, USC, 2020-2022

**Project Mentor**, Terps in Space, 2017, 2018, 2022  
**Tutor & Mentor**, Joint Educational Project, USC, Spring 2020  
**Lead Organizer**, Frontiers Young Minds Writing Group, USC, Winter-Spring 2020  
**Panel Reviewer**, Student Spaceflight Experiments Program (SSEP) 2016-2019  
**Maryland Day Organizer**, Biological Sciences, UMD-CP, 2016-2018  
**Project Leader**, Bard Math Circle, Annandale-on-Hudson, NY, 2013-2015  
**Public Talk**, GradTerps Exchange, University of Maryland, Spring 2019  
**Public Talk**, Skype a Scientist, Summer 2020

#### **Other Fellowships and Awards**

COMBINE Network Science Fellowship (\$35,859, UMD/NSF DGE-1632976, 2018)  
 Devra Kleiman Memorial Scholarship (\$2,500, UMD, 2018)  
 GAANN Mathematical Biology Fellowship (\$74,598, UMD/U.S. Department of Education, 2015)  
 The Flagship Fellowship (\$50,000, UMD, 2015)  
 The Dean's Fellowship (\$10,000, UMD, 2015)  
 The Harry J. Carman Scholarship (Bard College, 2014)  
 The John Bard Scholarship (Division of Science, Math and Computing, Bard College, 2013)  
 George I. Alden Scholar (George I. Alden Trust, 2012)  
 The Excellence and Equal Cost Scholarship (Bard College, 2011)  
 The Bishop Scholarship (The Bishop Scholarship Foundation, 2011)

#### **Summer Schools:**

EMergent Ecosystem Responses to ChanGE Summer Program, EMERGE, NH, 2022  
 Microbial Diversity Course, Marine Biological Laboratory, Woods Hole, MA, 2018  
 The Search for Selection, NIMBioS, Knoxville, TN, 2018  
 Complex Systems Summer School, Santa Fe Institute, Santa Fe, NM, 2017  
 Quantitative Laws II, Lake Como School of Advanced Studies, Italy, 2016

#### **Invited Talks**

1. Chemical Currencies of a Microbial Planet (C-CoMP) Seminar Series, 2025
2. Microbiomes and Social Equity Seminar Series, 2024
3. Invited Abstract, American Geosciences Union, 2024
4. Department of Natural Resources, University of New Hampshire, NY, 2024
5. Department of Biology, Hofstra University, NY, 2024, 2024
6. ECR Viromics Seminar, Ohio State University/European Virus Bioinformatics Center, 2024
7. Department of Ecology and Evolution, Stony Brook University, 2024
8. Institute for Advanced Computational Science (IACS), Stony Brook University, 2024
9. Track Hub, American Society for Microbiology, TX, 2023 (Declined)
10. Physics of Life Sciences, Massachusetts Institute of Technology, MA, 2022
11. Department of Biology, California State University Los Angeles, CA, 2022
12. Department of Biology, University of Minnesota Duluth, MN, 2022
13. Simons Collab. on Comp. Biogeochem. Modeling of Marine Ecosystems (CBIOMES), 2021
14. Center for Dark Energy Biosphere Investigations (C-DEBI), 2021
15. Department of Biology, University of Pittsburgh, PA, 2021
16. Center for Advanced Biotechnology and Medicine, Rutgers University, NJ, 2021
17. Department of Biology, Chapman University, CA, 2021
18. Department of Biology, Westchester University, PA, 2021
19. Department of Biology, Lake Forest College, IL, 2021
20. Department of Biology, San Diego State University, CA, 2021
21. Computation and Mathematics for Biological Networks (COMBINE), UMD, MD, 2020
22. Department of Marine and Environmental Biology, USC, CA, 2020
23. Environment and Sustainability Institute, University of Exeter, Penryn, UK, 2019
24. Clemson University, Clemson, SC, Dec 2018

## **Conference Presentations (\**poster*, <sup>†</sup>*talk*)**

### **Inferring microbial growth in communities—Opportunities for model-data synthesis with genomics and metagenomics**

- Cold Spring Harbor Laboratory Microbiomes Conference, October 2024\*
- American Geophysical Union, December 2024<sup>†</sup>

### **Running a queer-and trans-inclusive faculty hiring process**

- American Geophysical Union, December 2024<sup>†</sup>

### **Demonstrating commitment with limited resources**

- National Organization of Research Development Professionals Conference, May 2024<sup>†</sup>

### **Building a Community of Practice and Engagement (COPE) - A CUNY Broader Impacts Framework**

- Advancing Research Impacts in Society (ARIS) Summit, April 2024\*

### **Predicting maximal microbial growth rates from genomes and metagenomes for prokaryotes and eukaryotes**

- Marine Microbes, Gordon Research Conference and Seminar, Switzerland, May 2022<sup>†\*</sup>
- Fifth Workshop On Trait-Based Approaches to Ocean Life, Knoxville, TN, January 2022\*
- Microbial Ecology & Evolution Virtual (MEEVirtual), online, August 2020\*
- CBIOMES Annual Meeting, online, June 2020\*

### **Linking selection for high GC content to repair of double strand breaks in prokaryotic genomes**

- Microbial Population Biology, Gordon Research Conference and Seminar, NH, July 2019\*

### **Ecology Shapes Microbial Immune Strategy: Temperature and Oxygen as Determinants of the Incidence of CRISPR Adaptive Immunity**

- CRISPR Ecology and Evolution, the Royal Society, London, UK, February 2019\*
- Microbial Eco-Evolutionary Dynamics, Instituto Gulbenkian De Ciência, Oeiras, Portugal, October 2018\*

### **Is Having more than one CRISPR array adaptive?**

- Microbial Population Biology, Gordon Research Conference and Seminar, NH, July 2017\*

### **Immune Loss as a Driver of Coexistence During Host-Phage Coevolution**

- Evolution in Philadelphia Conference (EPiC), UPenn, April 2017<sup>†</sup>
- Molecular Coevolution Workshop, Princeton Center for Theoretical Science, April 2016\*