

# Joshua Ladau

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CONTACT INFORMATION	Environmental Genomics and Systems Biology Lawrence Berkeley National Laboratory Berkeley, CA 94720	<i>email:</i> jladau@gmail.com <i>phone:</i> +1-541-359-5758 <i>Twitter:</i> @jladau
RESEARCH INTERESTS	Microbial Ecology, Metagenomics, Macroecology, Biogeography, Community Ecology, Theoretical Ecology, Statistics, Geometric Probability, Computational Biology	
PROFESSIONAL PREPARATION	Project Scientist, Lawrence Berkeley National Laboratory (February 2020 - present) <ul style="list-style-type: none"><li>• Research: Microbial Macroecology for Agriculture and Public Health</li></ul> Project Scientist, Joint Genome Institute (February 2018 - February 2020) <ul style="list-style-type: none"><li>• Research: Macroecology and Historical Biogeography of Microbes</li></ul> Postdoctoral Fellow, Gladstone Institutes, University of California, San Francisco (October 2008 - February 2018) <ul style="list-style-type: none"><li>• Research Project: Spatial Ecology and Biogeography of Free-Living and Host-Associated Microbes</li><li>• Advisor: Katherine S. Pollard</li></ul> Postdoctoral Fellow, Santa Fe Institute (October 2005 - October 2008) <ul style="list-style-type: none"><li>• Research Project: Optimal Statistical Inference in Biology</li></ul> Ph.D., Neurobiology and Behavior, Cornell University (conferred January 18, 2006) <ul style="list-style-type: none"><li>• Dissertation: “Robust Statistical Tests for Detecting the Effects of Interspecific Competition on Ecological Communities”</li><li>• Advisor: Thomas Eisner</li></ul> B.S., Entomology, <i>Summa Cum Laude</i> with Distinction in Research, Cornell University (2000)	
SELECTED HONORS & AWARDS	Wired Magazine Best Scientific Visualization of the Year Gordon and Betty Moore Foundation Poster Award National Science Foundation Graduate Research Fellowship Barry M. Goldwater Scholarship American Wildlife Research Foundation Research Grant Cornell Presidential Research Scholar Explorers Club Research Grants National Merit Scholar Westinghouse Science Talent Search Finalist	2013 2013 2001-2004 1999-2000 1998 1997-2000 1997, 1996 1997 1997
PUBLICATIONS	Ladau, J., E. Elie-Fadrosh. 2019. Spatial, temporal, and phylogenetic scales of microbial ecology. <i>Trends in Microbiology</i> , 27: 662-669. URL: <a href="https://doi.org/10.1016/j.tim.2019.03.003">https://doi.org/10.1016/j.tim.2019.03.003</a>  Roque, B.M., C.G. Brooke, J. Ladau, T. Polley, L.J. Marsh, N. Najafi, P. Pandey, L. Singh, R. Kinley, J.K. Salwen, E. Elie-Fadrosh, E. Kebreab, M. Hess. 2019. Effect of the macroalgae <i>Asparagopsis taxiformis</i> on methane production and rumen microbiome assemblage. <i>Animal Microbiome</i> , 1: 3. URL: <a href="https://doi.org/10.1186/s42523-019-0004-4">https://doi.org/10.1186/s42523-019-0004-4</a>  Hoarfrost, A., S. Nayfach, J. Ladau, S. Yooseph, C. Arnosti, C.L. Dupont, K.S. Pollard. 2019. Global ecotypes in the ubiquitous marine clade SAR86. <i>The ISME Journal</i> , in press. URL: <a href="https://doi.org/10.1101/635185">https://doi.org/10.1101/635185</a>	

PUBLICATIONS  
(CONTINUED)

- Vetrovsky, T., P. Kohout, M. Kopecky, A. Machac, M. Man, B.D. Bahnmann, V. Brabcova, J. Choi, L. Meszarosova, Z.R. Human, C. Lepinay, S. Llado, R. Lopez-Mondejar, T. Martinovic, T. Masinova, D. Morais, D. Navratilova, I. Odriozola, M. Stursova, K. Svec, V. Tlaskal, M. Urbanova, J. Wan, L. Zifcakova, A. Howe, J. Ladau, K.G. Peay, D. Storch, J. Wild, P. Baldrian. 2019. A meta-analysis of global fungal distribution reveals climate-driven patterns. *Nature Communications*, 10: 5142  
URL: <https://doi.org/10.1038/s41467-019-13164-8>
- Ryan, S.J., J. Ladau. 2019. Competition in the savanna: models of species assemblages in Kruger National Park, South Africa. *Ecosphere*, in review.
- Ladau, J., Y. Shi, X. Jing, J. He, L. Chen, X. Lin, N. Fierer, J.A. Gilbert, K.S. Pollard, H. Chu. 2018. Existing Climate Change Will Lead to Pronounced Shifts in the Diversity of Soil Prokaryotes. *mSystems*, 3: e00167-18.  
URL: <https://doi.org/10.1128/mSystems.00167-18>
- Lloyd, K.G., A.D. Steen, J. Ladau, J. Yin, L. Crosby. 2018. Phylogenetically Novel Uncultured Microbial Cells Dominate Earth Microbiomes. *mSystems*, 3: e00055-18.  
URL: <https://doi.org/10.1128/mSystems.00055-18>
- American Gut Consortium (including J. Ladau). 2018. American Gut: an Open Platform for Citizen Science Microbiome Research. *mSystems*, 3: e00031-18.  
URL: <https://doi.org/10.1128/mSystems.00031-18>
- Thompson, L.R., J.G. Sanders, D. McDonald, A. Amir, J. Ladau, et al. 2017. A communal catalogue reveals Earths multiscale microbial diversity. *Nature*, 551: 457-463.  
URL: <https://doi.org/doi:10.1038/nature24621>
- Ladau, J. 2017. The architecture and design of ecological null models. *bioRxiv* doi 10.1101/195131.  
URL: <https://doi.org/10.1101/195131>
- Ladau, J., S.J. Schwager. 2017. Four fundamental processes of community assembly. *bioRxiv* doi 10.1101/188607.  
URL: <https://doi.org/10.1101/188607>
- Ladau, J., J.L. Green, K.S. Pollard. 2017. The geometry of the distance-decay of similarity in ecological communities. *bioRxiv* doi 10.1101/200212.  
URL: <https://doi.org/10.1101/200212>
- Mhuireach, G., B.R. Johnson, A.E. Altrichter, J. Ladau, J.F. Meadow, K.S. Pollard, J.L. Green. 2016. Urban greenness influences airborne bacterial community composition. *Science of The Total Environment*, 571: 680-687.  
URL: <https://doi.org/10.1016/j.scitotenv.2016.07.037>
- Ramirez, K.S., M. Dring, N. Eisenhauer, C. Gardi, J. Ladau, J. W. Leff, G. Lentendu, Z. Lindo, M.C. Rillig, D. Russell, S. Scheu, M.G.S. John, F.T.D. Vries, T. Wubet, W.H.V.D. Putten, D.H. Wall. 2015. Toward a global platform for linking soil biodiversity data. *Frontiers in Ecology and Evolution*, 3: 91.  
URL: <https://doi.org/10.3389/fevo.2015.00091>
- Maurice, C.F., S. Knowles, J. Ladau, K.S. Pollard, A. Fenton, A.B. Pedersen, P.J. Turnbaugh. 2015. Marked seasonal variation in the wild mouse gut microbiota. *The ISME Journal*, 9: 2423-2434.  
URL: <https://doi.org/10.1038/ismej.2015.53>

PUBLICATIONS  
(CONTINUED)

- Barberan, A., J. Ladau, J.W. Leff, K.S. Pollard, H.L. Menninger, R.R. Dunn, N. Fierer. 2015. Continental-scale distributions of dust-associated bacteria and fungi. *Proceedings of the National Academy of Sciences USA*, 112: 57565761.  
URL: <https://doi.org/10.1073/pnas.1420815112>
- Fierer, N., J. Ladau, J.C. Clemente, J.W. Leff, S.M. Owens, K.S. Pollard, R. Knight, J.A. Gilbert, R.L. McCulley. 2013. Reconstructing the Microbial Diversity and Function of Pre-Agricultural Tallgrass Prairie Soils in the United States. *Science*, 342: 621-624.  
URL: <https://doi.org/10.1126/science.1243768>
- Ladau, J., T.J. Sharpton, M.M. Finucane, G. Jospin, S.W. Kembel, J. O'Dwyer, A.F. Koeppl, J.L. Green, K.S. Pollard. 2013. Global marine bacterial diversity peaks at high latitudes in winter. *The ISME Journal*, 7: 1669-1677.  
URL: <https://doi.org/10.1038/ismej.2013.37>
- Fierer, N. and J. Ladau. 2012. Predicting microbial distributions in space and time. *Nature Methods*, 9: 549-551.  
URL: <https://doi.org/10.1038/nmeth.2041>
- Sharpton, T.J., S.J. Riesenfeld, S.W. Kembel, J. Ladau, J.P. O'Dwyer, J.L. Green, J.A. Eisen, K.S. Pollard. 2010. PhylOTU: A High-throughput Procedure Quantifies Microbial Community Diversity and Resolves Novel Taxa from Metagenomic Data. *PLoS Computational Biology*, 7: e1001061.  
URL: <https://doi.org/10.1371/journal.pcbi.1001061>
- Ladau, J. and S.J. Ryan. 2010. MPowering ecologists: community assembly tools for community assembly rules. *Oikos*, 119: 1064-1069.  
URL: <https://doi.org/10.1111/j.1600-0706.2009.17574.x>
- Crandall, J.H., R. Ensafi, S. Forrest, J. Ladau, B. Shebaro. 2008. The Ecology of Malware. *Proceedings of the 2008 New Security Paradigms Workshop*, 99-106.  
URL: <https://doi.org/10.1145/1595676.1595692>
- Ladau, J. 2008. Validation of null model tests using Neyman-Pearson hypothesis testing theory. *Theoretical Ecology*, 1: 241-248.  
URL: <https://doi.org/10.1007/s12080-008-0024-2>
- Ladau, J. and S.J. Schwager. 2008. Robust Hypothesis Tests for Independence in Community Assembly. *Journal of Mathematical Biology*, 57: 537-555.  
URL: <https://doi.org/10.1007/s00285-008-0176-0>
- Knapp, R., C. Hawkins, J. Ladau, and J. McClory. 2005. Fauna of Yosemite National Park lakes has low resistance but high resilience to fish introductions. *Ecological Applications*, 15(3): 835-847.  
URL: <https://doi.org/10.1890/04-0619>
- Bezzerides, A., T. Yong, J. Bezzerides, J. Husseini, J. Ladau, M. Eisner, and T. Eisner. 2004. Plant-derived pyrrolizidine alkaloid protects eggs of a moth (*Utetheisa ornatrix*) against a parasitoid wasp (*Trichogramma ostriniae*). *Proceedings of the National Academy of Sciences USA*, 101(24): 9029-9032.  
URL: <https://doi.org/10.1073/pnas.0402480101>

- PUBLICATIONS  
(CONTINUED)
- Ladau, J. 2003. Prey capture in a mantid (*Gonatista grisea*): does geotropy promote success? *Canadian Journal of Zoology*, 81(2): 354-356.  
URL: <https://doi.org/10.1139/z03-005>
- Ladau, J. 2004. Territoriality and singing-site preferences in the cricket, *Cyphoderris monstrosa* (Orthoptera : Haglidae) in Western North America. *Entomological News*, 114(4): 197-204.  
URL: [biostor.org/reference/76446](http://biostor.org/reference/76446)
- MANUSCRIPTS IN PREPARATION
- Ladau, J., D. Storch, J.L. Green, K.S. Pollard. 2018. Beta-diversity is determined almost exclusively by the area and perimeter of species ranges.
- Ladau, J., J. O'Dwyer, K.S. Pollard, S. Cornell. 2018. Linking the species area relationship to the shapes of species ranges using geometric probability.
- SOFTWARE
- GitHub: <https://github.com/jladau>
  - Software for detecting non-random spatial structure in the distributions of microbes.  
URL: <https://github.com/jladau/SpatialAutocorrelation>
  - Software for predicting temporal and spatial distributions of microbes using environmental niche models.  
URL: <https://github.com/jladau/SpeciesDistributionModeling>
  - Software for assessing the nestedness of microbial communities.  
URL: <https://github.com/jladau/Nestedness>
  - Lightweight, portable library for working with HDF5 BIOM files using Java.  
URL: <https://github.com/jladau/BiomIO>
  - *MPower*, software for assessing the reliability of null model tests in ecology.  
URL: <http://nullmodels.weebly.com/mpower.html>
  - *CoOccur*, software for implementing robust null model tests in ecology.  
URL: <http://nullmodels.weebly.com/cooccur.html>
  - *FixIt*, software for implementing null model tests that use unbiased algorithms.  
URL: <http://nullmodels.weebly.com/fixit.html>
- TECHNICAL SKILLS
- Programming and scripting languages: Java, Bash, R, SQL, LaTeX (proficient); Gnuplot, Mathematica, Maple, HTML, Visual Basic, Sun Grid Engine (working knowledge).
  - Geographic information systems: QGIS, NetCDF, GDAL, Panoply (proficient); KML, GPplates (working knowledge).
- INVITED TALKS
- Microbial Macroecology: The Ecology of Microbes at Large Scales. ASM Microbe 2019, American Society of Microbiology, San Francisco, 2019.
  - Microbial Ecology at the Macroscale. Advanced Seminar in Microbial Molecular Biology, Stanford University, 2019.
  - Spatial, Temporal, and Phylogenetic Scales of Microbiology. Aquatic Park Lunchtime Seminar, Lawrence Berkeley National Laboratory, 2019.
  - Scale and sampling in microbial ecology: the lenses through which we view microbial communities. NeLLi Symposium, The Joint Genome Institute, 2019.
  - Are there marsupial microbes? Plate tectonics and the geographic distributions of bacteria and archaea. Inaugural Symposium, The International Center for Deep Life Investigation, Shanghai Jiao Tong University, 2018.
  - Global and continental biogeography of bacteria. Department of Biology Seminar Series, University of San Francisco, 2017.
  - Mapping the current, historic, and future geographic distributions of bacteria. MinT Seminar Series, Pacific Northwest National Laboratory, 2017.
  - Differentiation of subsurface microbial communities. Deep Life Community Meeting. Edinburgh, Scotland, 2017.

INVITED TALKS  
(CONTINUED)

- Distributions of soil bacteria lag up to 50 years behind climate change: ramifications for the present and the future. 3rd International Symposium on Soil Metagenomics. Braunschweig, Germany, 2016.
- Estimating the Global Diversity of Bacteria Using Metagenomics. Department of Statistics, Statistics and Genomics Seminar, University of California Berkeley, 2016.
- Mapping the current and future geographic distributions of bacteria. Department of Microbiology Seminar, Oregon State University, 2015.
- Mapping historic, current, and future soil biodiversity. German Centre for Integrative Biodiversity Research. Leipzig, Germany, 2014.
- Predicting Microbial Distributions on a Global Scale using Niche Models. General Meeting of the American Society for Microbiology, Denver, Colorado, 2013.
- Predicting microbial distributions in space and time: niche modeling of global marine bacterial diversity. Cooperative Institute for Research in Environmental Sciences Seminar, University of Colorado Boulder, 2012.
- Horse racing and the assembly of ecological communities: a tale of three models and a novel application of the Plackett-Luce model to biology. The International Environmentrics Society Society North America Regional Meeting, La Crosse, Wisconsin, 2011.
- Linking beta diversity to the shapes of species ranges and niches using geometric probability. Ecology and Evolution Department Seminar, Stony Brook University, 2010.
- Inferring large-scale effects of interspecific interactions. Colloquium for the Ecology and Evolutionary Biologists, San Francisco State University, 2009.
- Null Model Tests of Community Assembly. Center for Complex Systems Research Seminar, University of Illinois at Urbana-Champaign, 2007.

COLLOQUIA &  
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- Non-universality of species area relationships and the geometry of species ranges. Ecological Society of America 103rd Annual Meeting, New Orleans, Louisiana, 2018.
- Universal nestedness of microbial communities: Are there global cauldrons of microbial diversity? Ecological Society of America 102nd Annual Meeting, Portland, Oregon, 2017.
- The human gut microbiome is geographically unstructured across the United States. 16th International Symposium on Microbial Ecology, Montreal, Canada, 2016.
- Global beta-diversity is more sensitive to loss of species with small versus large ranges. Ecological Society of America 100th Annual Meeting, Baltimore, Maryland, 2015.
- Stuck in the 1960s: Distributions of Soil Bacteria Lag up to 50 Years Behind Anthropogenic Climate Change. Ecological Society of America 99th Annual Meeting, Sacramento, California, 2014.
- Universal scaling of beta-diversity across taxa and terrestrial and marine ecosystems. Ecological Society of America 98th Annual Meeting, Minneapolis, Minnesota, 2013.
- Global hotspots of marine bacterial diversity are highly affected by human impacts. Ecological Society of America 97th Annual Meeting, Portland, Oregon, 2012.
- Global biodiversity and biogeography of marine bacteria. Ecological Society of America 96th Annual Meeting, Austin, Texas, 2011.
- Inferring the shapes of species ranges from distance-decay relationships. Ecological Society of America 95th Annual Meeting, Pittsburgh, Pennsylvania, 2010.
- Inferring the spatial distributions of microbes from metagenomic data. 13th International Symposium on Microbial Ecology, Seattle, Washington, 2010.
- Null Model Software for Informing Conservation Policy. Society for Conservation Biology Annual Meeting, Chattanooga, Tennessee, 2008
- Robustness and Bias of Null Model Tests. Bay Area Conservation Biology Symposium, University of California, Berkeley, California, 2007.
- Should theoretical biology be formalized? Santa Fe Institute Researcher Meeting, Santa Fe, New Mexico, 2007.
- “Fractional” categories and the assembly of ecological communities. Santa Fe Institute Researcher Meeting, Santa Fe, New Mexico, 2007

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- Application of a robust null model test for detecting effects of interspecific competition. Bay Area Conservation Biology Symposium, San Francisco State University, San Francisco, California, 2006.
- Robust null model tests for detecting effects of competition on communities. Ecological Society of America 91st Annual Meeting, Memphis, Tennessee, 2006.

SYNERGISTIC  
ACTIVITIES

- Symposium organizer, Microbial Ecology at Macro Scales. ASM Microbe 2019, American Society of Microbiology, San Francisco, 2019.
- Guest teacher, Statistical Methods for Bioinformatics, University of California San Francisco, 2016, 2014, 2013.
- Mentored and supervised undergraduate student, Promoting Underrepresented Minorities Advancing in the Sciences Program, 2015.
- Mentored and supervised undergraduate student, Student Research Training Program, 2014. Student won two awards for her project.
- sOILDiv workshop on soil biodiversity at German Centre for Integrative Biodiversity Research, 2014.
- Mentored and supervised graduate students, University of California San Francisco, 2012 and 2013.
- Working Group Organizer, National Institute for Mathematical and Biological Synthesis, 2008-2010.
- Seminar Series Organizer, Santa Fe Institute, 2008.
- Postdoctoral Representative, Santa Fe Institute, 2006 - 2008.
- Teaching Assistant for Introductory Biology Laboratories, Cornell University BI0104, 2003.
- Teaching Assistant for Introductory Biology Laboratories, Cornell University BI0103, 2002.

REFeree/  
REVIEWER

- *Proceedings of the National Academy of Sciences U.S.A.*
- National Science Foundation
- *Nature Ecology and Evolution*
- *Nature Methods*
- *Ecology Letters*
- *The ISME Journal*
- *Ecography*
- *Scientific Reports*
- *FEMS Microbiology Ecology*
- *Ecology*
- German Centre for Integrative Biodiversity Research
- *Molecular Ecology*
- *Journal of Biogeography*
- *Oikos*
- *Theoretical Ecology*
- *PeerJ*
- *Hydrobiologia*
- *Journal of the Royal Society of New Zealand*
- *Environmental Microbiology and Environmental Microbiology Reports*
- *Applied Soil Ecology*
- *Oecologia*
- *Microbial Ecology*
- *Journal of Theoretical Biology*
- *Frontiers in Ecology and the Environment*
- *Acta Oecologia*
- *Limnology and Oceanography Letters*

APPOINTMENTS	Research Intern <i>Archbold Biological Station</i> , Lake Placid, Florida Antlion allomones and trench geometry	July 2001 – October 2001
	Supervisor of Invertebrate Research <i>Sierra Nevada Aquatic Research Lab.</i> , Mammoth Lakes, California Ecological effects of fish introductions	June 2000 – June 2001
	Research Intern <i>Archbold Biological Station</i> , Lake Placid, Florida Prey capture in praying mantids	June 1999 – August 1999
	Research Intern <i>Cornell University</i> , Ithaca, New York Ambidextrous singing in crickets	August 1998 – June 2000
	Research Intern <i>Archbold Biological Station</i> , Lake Placid, Florida Singing behavior of pygmy mole crickets	July 1998 – August 1998

#### REFERENCES

- Katherine S. Pollard (Gladstone Institutes)  
Email: katherine.pollard@gladstone.ucsf.edu  
Phone: (415) 734-2768
- Rob Knight (University of California, San Diego)  
Email: robknight@ucsd.edu  
Phone: (858) 822-2379
- Emiley Eloë-Fadrosh (Joint Genome Institute)  
Email: eaeloefadrosh@lbl.gov  
Phone: (925) 296-5704
- Jonathan Eisen (University of California, Davis)  
Email: jaeisen@ucdavis.edu  
Phone: (530) 752-3498
- Jack Gilbert (University of Chicago)  
Email: gilbertjack@uchicago.edu  
Phone: (773) 834-5283
- Rick Colwell (Oregon State University)  
Email: rcolwell@coas.oregonstate.edu  
Phone: (541) 737-5220
- Steven J. Schwager (Cornell University)  
Email: steven.schwager@cornell.edu  
Phone: (607) 255-1646