



Jacob L. Steenwyk

Ph.D. Candidate
Evolutionary genomics
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EDUCATION

Present	Ph.D. Candidate, Biological Sciences Advisor: Antonis Rokas GPA: 3.97	Vanderbilt University
2016	M.S. Biochemistry and Molecular Biology Advisor: John G. Gibbons GPA: 3.98	Clark University
2015	B.A. Biochemistry and Molecular Biology Advisor: Denis Larochelle Cumulative GPA: 3.84 Science GPA: 3.84	Clark University

AWARDS

2020	Trainee-of-the-Year, Vanderbilt Institute for Infection, Immunology and Inflammation
2019	Gilliam Predoctoral Fellowship, Howard Hughes Medical Institute
2019	Ann Bernard Martin Award for Excellence in Graduate Research, Vanderbilt University
2019	Ruth L. Kirschstein National Research Service Award, National Institutes of Health
2019	Ford Foundation Predoctoral Fellowship, Ford Foundation
2019	Graduate student travel grant, Vanderbilt University
2019	Curb Center Fellow, ArtLab, Vanderbilt University
2018	<i>GENETICS</i> Peer Review Training Program, Genetics Society of America
2018	Best poster award, Cellular and Molecular Fungal Biology, Gordon Research Seminar
2018	Best poster award, Cellular and Molecular Fungal Biology, Gordon Research Conference
2018	Best poster award, Department of Biological Sciences, Vanderbilt University
2018	T-shirt design contest winner, Department of Biological Sciences, Vanderbilt University
2017	Graduate student travel grant, Vanderbilt University
2016	Graduate student council travel awards, Clark University
2015	Summa cum laude, Clark University
2014	Summer research scholar, Bridging the gaps, University of Southern California Keck School of Medicine
2013	Global environmental microbiology scholar, Center for dark energy biosphere investigations, University of Southern California
2011	Jonas Clark Scholar, Clark University

RESEARCH INTERESTS

- DNA damage and repair
- Gene and genome evolution
- Evolution of technologically and medically significant fungi
- Phylogenetics and phylogenomics

SOCIETIES

Genetics Society of America, American Society for Microbiology, Mycological Society of America, Society for the Advancement of Chicanos/Hispanics and Native Americans in Science

FUNDING

Howard Hughes Medical Institute	Principal co-investigator (shared with Antonis Rokas), 09/19-09/22, Examining the loss of diverse DNA repair genes and long-term hypermutation in a lineage of budding yeasts, Gilliam Fellowship, Individual Predoctoral Fellowship, \$150,000
National Institutes of Health	Principal investigator, 08/19-08/22, Examining the loss of diverse DNA repair genes and long-term hypermutation in a lineage of budding yeasts, Ruth L. Kirschstein National Research Service Award, Individual Predoctoral Fellowship (Parent F31), \$88,128 (declined)
Ford Foundation Predoctoral Fellow	Principal investigator, 08/19-08/22, The consequences of aberrant cell cycle and DNA repair processes in budding yeast, Individual Predoctoral Fellowship, \$72,000 (declined)
Curb Center ArtLab Fellow	Principal investigator, 12/18-04/19, Bridging the gap between artist and scientist, ArtLab, Vanderbilt University, \$300

INVITED TALKS

2020	Graduate trainee-of-the-year talk, Vanderbilt Institute for Infection, Immunology and Inflammation Annual Symposium
2020	Day of Wond'ry, Vanderbilt University, Nashville, TN
2019	Genetics Society of America, Early Career Scientist Seminar Series
2019	Gordon Research Conference, Molecular Mechanisms in Evolution, Easton, MA
2019	Gordon Research Seminar, Molecular Mechanisms in Evolution, Easton, MA (declined)
2019	Focal Point, ArtLab, Vanderbilt University, Nashville, TN
2019	30 th Fungal Genetics Conference at Asilomar, Pacific Grove, CA
2019	Phylogenomics and Evolution Group, North Carolina State University, Raleigh, NC
2018	ArtLab Seminar Series, Vanderbilt University, Nashville, TN
2015	TedXClarkUniversity, Clark University, Worcester, MA

CONTRIBUTED TALKS

2019	DNA Damage and Response Journal Club, Vanderbilt University, Nashville, TN
2019	Research in Progress Seminar, Vanderbilt University, Nashville, TN
2019	Biological Sciences Annual Retreat, Vanderbilt University, Nashville, TN
2019	Science club at the library, Nashville Public Library, Nashville, TN
2018	Nashville Science Club, Jackalope Brewing Company, Nashville, TN
2017	Mycological Society of America, University of Georgia, Athens, GA
2016	Mycological Society of America, University of California Berkeley, Berkeley, CA
2016	Graduate Student Multidisciplinary Conference, Clark University, Worcester, MA

UNDERGRADUATE ADVISING

2019-Pres.	Olivia Zheng
2018-Pres.	Megan A. Phillips
2018-2019	Benjamin Buckman
2018	Devin G. Arrants

WORKSHOP TEACHING

- 2019** Organizer and instructor, Values-based leadership, Vanderbilt University, Nashville, TN
- 2019** Founder and instructor, 'A beginner's guide to making figures in R', Vanderbilt University, Nashville, TN
- 2019** Instructor, Workshop on Phylogenomics, Evolution and Genomics, Český Krumlov, Czech Republic
- 2019** Instructor, Workshop on Genomics, Evolution and Genomics, Český Krumlov, Czech Republic

TEACHING EXPERIENCE

- 2017-2019** Teaching Assistant, Introductory Biology Lab, Vanderbilt University, Nashville, TN
- 2016** Teaching Assistant, Introduction to Biostatistics, Clark University, Worcester, MA
- 2014-2015** Teaching Assistant, Cell Biology, Clark University, Worcester, MA

POSTER PRESENTATIONS

- 2020** The Allied Genetics Conference, Virtual Conference
- 2019** HHMI Investigators Science Meeting, Howard Hughes Medical Institute, Bethesda, MD
- 2019** Gilliam Fellows Annual Meeting, Howard Hughes Medical Institute, Bethesda, MD
- 2019** Molecular Mechanisms in Evolution, Gordon Research Conference, Easton, MA
- 2019** Molecular Mechanisms in Evolution, Gordon Research Seminar, Easton, MA
- 2019** 30th Fungal Genetics Conference at Asilomar, Pacific Grove, CA
- 2019** Asperfest pre-meeting at 30th Fungal Genetics Conference at Asilomar, Pacific Grove, CA
- 2018** Cellular and Molecular Fungal Biology, Gordon Research Conference, Holderness, NH
- 2018** Cellular and Molecular Fungal Biology, Gordon Research Seminar, Holderness, NH
- 2018** Department of Biological Sciences Annual Retreat, Vanderbilt University, Nashville, TN
- 2015** Bumpus Symposium, Clark University, Worcester, MA
- 2015** Traina Scholars Presentation, Clark University, Worcester, MA
- 2015** Summer Research Presentation, Clark University, Worcester, MA

RESEARCH EXPERIENCE

- 2016-Pres.** Antonis Rokas Lab at Vanderbilt University, Nashville, TN. Doctoral Research. Evolution of medically and technologically significant fungi.
- 2015-2016** John Gibbons Lab at Clark University, Worcester, MA. Undergraduate and Master's Research. Copy number variation in the human pathogen, *Cryptococcus gattii*.
- 2015-2016** Robert Drewell Lab at Clark University, Worcester, MA. Undergraduate and Master's Research. Genome-wide methylation patterns in the social amoeba, *Dictyostelium discoideum*.
- 2014** Ite A. Laird-Offringa Lab at University of Southern California, Los Angeles, CA. Bridging the Gaps Summer Scholar. Mapping the autoimmune triggering epitope of *ELAVL4* in small cell lung cancer.
- 2013** John Heidelberg and Eric Webb Labs at University of Southern California, Los Angeles, CA. Global Environmental Microbiology Summer Scholar. Fresh and marine water microbial diversity.

SERVICE

- 2020** Panelist at the Communication and Outreach Workshop, The Allied Genetics Conference, Genetics Society of America
- 2019-Pres.** Co-chair, Communication and Outreach Subcommittee, Genetics Society of America

- 2019-Pres.** Inclusion Coordinator, The Evolutionary Studies Initiative at Vanderbilt, Vanderbilt University, Nashville, TN
- 2019-Pres.** Graphic Illustrator, The Evolutionary Studies Initiative at Vanderbilt, Vanderbilt University, Nashville, TN
- 2019-Pres.** President, Inclusivity in Biosciences Association, Vanderbilt University, Nashville, TN
- 2018-Pres.** Volunteer Deputy, American Society of Microbiology Vanderbilt University Chapter, Nashville, TN
- 2017-Pres.** Educational outreach booth design and execution, MEGAMicrobe, Nashville, TN
- 2017-Pres.** Communications chair, Inclusivity in Biosciences Association, Vanderbilt University, Nashville, TN
- 2017-Pres.** Member of the Dean of Graduate Student's survey quantitative analysis subgroup, Graduate Diversity and Inclusion Committee, Vanderbilt University, Nashville, TN
- 2017-Pres.** Judge, Middle Tennessee Science and Engineering Fair, Belmont University, Nashville, TN
- 2019-2020** Co-chair, MEGAMicrobe, Vanderbilt Institute for Infections, Immunology and Inflammation, Nashville, TN
- 2018-2019** Vice President, Inclusivity in Biosciences Association, Vanderbilt University, Nashville, TN
- 2013-2019** Administrator and Owner, Molecular Biology and Biochemistry for Researchers and Students Group, LinkedIn
- 2019** Peer review workshop leader, 30th Fungal Genetics Conference at Asilomar, Pacific Grove, CA
- 2018-2019** Vice President, Graduate Student Association, Department of Biological Sciences, Vanderbilt University, Nashville, TN
- 2018-2019** Vice co-chair, MEGAMicrobe, Vanderbilt Institute for Infections, Immunology and Inflammation, Nashville, TN
- 2017-2018** Secretary, Graduate Student Association, Department of Biological Sciences, Vanderbilt University, Nashville, TN
- 2017-2018** Scientific consultant, Little Harpeth Brewing, Nashville, TN
- 2017** Vanderbilt Student Volunteers for Science, Volunteer Science Teacher, West End Middle School, Nashville, TN
- 2014-2015** Undergraduate Subcommittee for Department of Chemistry, Biochemistry and Molecular Biology Faculty Search Committee, Clark University, Worcester, MA
- 2014-2015** Science Education Outreach Blogger, C-DEBI Sci-Curious Blog

ART SHOWS

- 2020** Fire-Exhibition, Kefi Collective at Vanderbilt University, Nashville, TN
- 2019** Biomedical Sciences Winter Show, Vanderbilt University, Nashville, TN
- 2019** Focal point, ArtLab, Vanderbilt University, Nashville, TN
- 2019** Connecting the Dots, ArtLab, Vanderbilt University, Nashville, TN
- 2018** ArtLab opening reception, ArtLab, Vanderbilt University, Nashville, TN
- 2018** The Intersection between Art and Science, ArtLab, Vanderbilt University, Nashville, TN

MANUSCRIPT REVIEWER

Systematic Biology; Genome Biology and Evolution; BMC Genomics; Genetics; G3: Genes | Genomes | Genetics; PLoS One; Molecular Genetics and Genomics; Young Scientists Journal; Scholarly Undergraduate Research Journal

POPULAR SCIENCE ARTICLES

- (2) **J.L. Steenwyk & A. Rokas.** A new hybrid fungus is found in hospitals and linked to lung disease, *The Conversation*, June 4, 2019.

- (1) **J.L. Steenwyk** & A. Rokas. An outlaw yeast thrives with genetic chaos – and could provide clues for understanding cancer growth, *The Conversation*, May 21, 2019.

PUBLICATIONS

Preprints

- (4) **Steenwyk, J.L.**[^], T.J. Buida III, Y. Li, X.-X. Shen, & A. Rokas[^] (2020). ClipKIT: a multiple sequence alignment-trimming algorithm for phylogenomic inference. ([^]Senior authors). bioRxiv. doi: xxyyzz
- (3) Shen, X.-X.[^], **J.L. Steenwyk**, A.L. LaBella, D.A. Opulente, X. Zhou, J. Kominek, Y. Li, M. Groenewald, C.T. Hittinger, & A. Rokas (2020). Genome-scale phylogeny and contrasting modes of genome evolution in the fungal phylum Ascomycota. ([^]Senior authors). bioRxiv. doi: 10.1101/2020.05.11.088658.
- (2) **Steenwyk, J.L.**, M.E. Mead*, S.L. Knowles*, H.A. Raja, C.D. Roberts, O. Bader, J. houbraken, G.H. Goldman, N.H. Oberlies, & A. Rokas (2020). Biosynthetic gene clusters, secondary metabolite profiles, and cards of virulence in the closest nonpathogenic relatives of *Aspergillus fumigatus*. (*Equal contributors). bioRxiv. doi: 10.1101/2020.04.09.033902.
- (1) **Steenwyk, J.**, J. St. Denis, J. Dresch, D. Larochelle, & R. Drewell (2017). Whole genome bisulfite sequencing reveals a sparse, but robust pattern of DNA methylation in the *Dictyostelium discoideum* genome. bioRxiv. doi: 10.1101/166033

Peer Review Published

- (24) Ries, L.N.A., L. Pardeshi, Z. Dong, K. Tan, **J.L. Steenwyk**, A.C. Colabardini, J.A.F. Filho, P.A. de Castro, L.P. Silva, N.W. Preite, F. Almeida, L.J. de Assis, R.A.C. dos Santos, P. Bowyer, M. Bromley, R.A. Owens, S. Doyle, M. Demasi, D.C.R. Hernández, L.E.S. Netto, M.T. Pupo, A. Rokas, F.V. Loures, K.H. Wong, & G.H. Goldman (2020). The *Aspergillus fumigatus* transcription factor RglT is important for gliotoxin biosynthesis and self-protection, and virulence. PLoS Pathogens: *in press*
- (23) **Steenwyk, J.L.**^{*}, A.L. Lind^{*}, L.N.A. Ries, T.F. dos Reis, L.P. Silva, F. Almeida, R.W. Bastos, T.F. de Campos Fraga da Silva, V.L.D. Bonato, A.M. Pessoni, F. Rodrigues, H.A. Raja, S.L. Knowles, N.H. Oberlies, K. Lagrou, G.H. Goldman[^], A. Rokas[^] (2020). Pathogenic allodiploid hybrids of *Aspergillus* fungi. (*Equal contributors; [^]Senior authors). Current Biology. doi: 10.1016/j.cub.2020.04.071
- (22) Mead, M.E.^{*}, A.T. Borowsky^{*}, B. Joehnk, **J.L. Steenwyk**, X.-X. Shen, A. Sil, & A. Rokas (2020). Recurrent loss of *abaA*, a master regulator of asexual development in filamentous fungi, correlates with changes in genomic and morphological traits. (*Equal contributors). Genome Biology and Evolution. doi: 10.1093/gbe/evaa107
- (21) Santos, R.A.C., **J.L. Steenwyk**, O. Rivero-Menendez, M.E. Mead, L.P. Silva, R.W. Bastos, A. Alastruey-Izquierdo, G.H. Goldman[^], & A. Rokas[^] (2020). Genomic and phenotypic heterogeneity of clinical isolates of the human pathogens *Aspergillus fumigatus*, *Aspergillus lentulus* and *Aspergillus fumigati*affinis. ([^]Senior contributors). Frontiers in Genetics. doi: 10.3389/fgene.2020.00459.
- (20) Bastos, R.W., C. Valero, L.P. Silva, T. Schoen, M. Drott, V. Brauer, R. Silva-Rocha, A. Lind, **J.L. Steenwyk**, A. Rokas, F. Rodrigues, A. Resendiz-Sharpe, K. Lagrou, M. Marcet-Houben, T. Gabaldon, E. McDonnell, I. Reid, A. Tsang, B.R. Oakley, F. Loures, F. Almeida, A. Huttenlocher, N.P. Keller, L. Ries, G.H. Goldman (2020). Functional characterization of

clinical isolates of the opportunistic fungal pathogen *Aspergillus nidulans*. mSphere. doi: 10.1128/mSphere.00153-20.

- (19) Rokas, A., M.E. Mead, **J.L. Steenwyk**, N.H. Oberlies, & G.H. Goldman (2020). Evolving moldy murderers: *Aspergillus* section *Fumigati* as a model for studying the repeated evolution of fungal pathogenicity. PLoS Pathogens. doi: 10.1371/journal.ppat.1008315.
- (18) Knowles, S.L., M.E. Mead, L.P. Silva, H.A. Raja, **J.L. Steenwyk**, G.H. Gustavo, A. Rokas, & N.H. Oberlies (2020). Gliotoxin, a known virulence factor in the major human pathogen *Aspergillus fumigatus*, is also biosynthesized by the non-pathogenic relative *A. fischeri*. mBio. doi: 10.1128/mBio.03361-19.
- (17) Libkind, D., D. Peris, F.A. Cubillos, **J.L. Steenwyk**, D.A. Opulente, Q.K. Langdon, N. Bellora, A. Rokas, & C.T. Hittinger (2020). Into the wild: new yeast genomes from natural environments and new tools for their analysis. FEMS Yeast Research. doi: 10.1093/femsyr/foaa008.
- (16) Rokas, A., M.E. Mead, **J.L. Steenwyk**, H.A. Raja, & N.H., Oberlies (2020). Biosynthetic gene clusters and the evolution of fungal chemodiversity. Natural Product Reports. doi: 10.1039/C9NP00045C.
- (15) Bodinakku, I., J. Shaffer, A.B. Connors, **J.L. Steenwyk**, E. Kastman, A. Rokas, A. Robbat, B. Wolfe (2019). Rapid phenotypic and metabolomics domestication of wild *Penicillium* molds on cheese. mBio. doi: 10.1128/mBio.02445-19.
- (14) Mead, M.E.*, H.A. Raja*, **J.L. Steenwyk**, S.L. Knowles, N.H. Oberlies^, & A. Rokas^ (2019). Draft genome sequence of the griseofulvin-producing fungus *Xylaria flabelliformis* strain G536. (*Equal contributors; ^Senior authors) Microbiology Resource Announcements. doi: 10.1128/MRA.00890-19.
- (13) **Steenwyk, J.L.** & A. Rokas (2019). treehouse: a user-friendly application to obtain subtrees from large phylogenies. BMC Research Notes. doi: 10.1186/s13104-019-4577-5
- (12) Labella, A.L., D.A. Opulente, **J.L. Steenwyk**, C.T. Hittinger, & A. Rokas (2019). Variation and selection on codon usage bias across an entire subphylum. PLoS Genetics. doi: 10.1371/journal.pgen.1008304
- (11) **Steenwyk, J.L.**, X.-X. Shen, A.L. Lind, G.H. Goldman, & A. Rokas (2019). A robust phylogenomic timetree for biotechnologically and medically important fungi in the genera *Aspergillus* and *Penicillium*. mBio. doi: 10.1128/mBio.00925-19
- (10) **Steenwyk, J.L.**, D. Opulente, J. Kominick, X.-X. Shen, X. Zhou, A.L. LaBella, N.P. Bradley, B.F. Eichman, N. Čadež, D. Libkind, J. DeVirgilio, A.B. Hulfachor, C.P. Kurtzman, C.T. Hittinger^, & A. Rokas^ (2019). Extensive loss of cell cycle and DNA repair genes in an ancient lineage of bipolar budding yeasts. (^Senior authors) PLoS Biology. doi: 10.1371/journal.pbio.3000255
- (9) Ries, L.N.A., **J.L. Steenwyk**, P.A. de Castro, P.B.A. de Lima, F. Almeida, L.J. de Assis, A.O. Manfiolli, A. Takahashi-Nakaguchi, Y. Kusuya, D. Hagiwara, H. Takahashi, X. Wang, J. Obar, A. Rokas, & G.H. Goldman (2019). Nutritional heterogeneity among *Aspergillus fumigatus* strains has consequences for virulence in a strain- and host-dependent manner. Frontiers in Microbiology. doi: 10.3389/fmicb.2019.00854
- (8) Mead M.E., S.L. Knowles, H.A. Raja, S.R. Beattie, C.H. Kowalski, **J.L. Steenwyk**, L.P. Silva, J. Chiaratto, L.N.A. Ries, G.G. Goldman, R.A. Cramer, N.H. Oberlies, & A. Rokas (2019). Characterizing the pathogenic, genomic, and chemical traits of *Aspergillus fischeri*,

the closest sequenced relative of the major human fungal pathogen *Aspergillus fumigatus*. mSphere. doi: 10.1128/mSphere.00018-19

- (7) Knowles, S.L., H.A. Raja, A.J. Wright, A.M.L. Lee, L.K. Caesar, N.B. Cech, M.E. Mead, **J.L. Steenwyk**, L.N.A. Ries, G.H. Goldman, A. Rokas, & N.H. Oberlies (2019). Mapping the Fungal Battlefield: Using *in situ* Chemistry and Deletion Mutants to Monitor Interspecific Chemical Interactions between Fungi. *Frontiers in Microbiology*: doi: 10.3389/fmicb.2019.00285
- (6) Eidem, H.R., **J.L. Steenwyk**, J. Wisecaver, J.A. Capra, P. Abbot, & A. Rokas (2018). integRATE: a desirability-based data integration framework for the prioritization of candidate genes across heterogeneous 'omics and its application to preterm birth. *BMC Medical Genomics*. doi: 10.1186/s12920-018-0426-y
- (5) Shen, X.-X.*, D.A. Opulente*, J. Kominek*, X. Zhou*, **J.L. Steenwyk**, K.V. Buh, M.A.B. Haase, J.H. Wisecaver, M. Wang, D.T. Doering, J.T. Boudouris, R.M. Schneider, Q.K. Langdon, M. Ohkuma, R. Endoh, M. Takashima, R. Manabe, N. Čadež, D. Libkind, C.A. Rosa, J. DeVirgilio, A.B. Hulfachor, M. Groenewald, C.P. Kurtzman^, C.T. Hittinger^ & A. Rokas^ (2018). (*Equal contributors; ^Senior authors). Tempo and mode of genome evolution in the budding yeast subphylum. *Cell*. doi: 10.1016/j.cell.2018.10.023
- (4) Segal, E.S., V. Gritsenko, A. Levitan, B. Yadav, N. Dror, **J.L. Steenwyk**, Y. Silberberg, K. Mielich, A. Rokas, N.A.R. Gow, R. Kunze, R. Sharan, & J. Berman (2018). Gene Essentiality Analyzed by In Vivo Transposon Mutagenesis and Machine Learning in a Stable Haploid Isolate of *Candida albicans*. *mBio*. doi: 10.1128/mBio.02048-18
- (3) **Steenwyk, J.L.** & A. Rokas (2018). Copy number variation in fungi and its implications for wine yeast genetic diversity and adaptation. *Frontiers in Microbiology*. doi: 10.3389/fmicb.2018.00288
- (2) **Steenwyk, J.** & A. Rokas (2017). Extensive Copy number variation in fermentation-related genes among *Saccharomyces cerevisiae* wine strains. *G3: Genes | Genomes | Genetics*. doi: 10.1534/g3.117.040105
- (1) **Steenwyk J.L.**, J.S. Soghigian, J.R. Perfect, & J.G. Gibbons (2016). Copy number variation contributes to cryptic genetic variation in outbreak lineages of *Cryptococcus gattii* from the North American Pacific Northwest. *BMC Genomics*. doi: 10.1186/s12864-016-3044-0