Timothy Sackton, PhD
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Education

PhD, 2008 in Ecology and Evolution Biology. CORNELL UNIVERSITY, Ithaca NY

Sc. B., 2001 in Biology, *magna cum laude*. BROWN UNIVERSITY, Providence RI

Experience

Director of Bioinformatics 2017-present. Informatics Group, Division of Science, Faculty of Arts and Sciences, Harvard University.

Senior Bioinformatics Scientist, 2015 - 2017. Informatics Group, Division of Science, Faculty of Arts and Sciences, Harvard University. [with PI status from July 2016]

Postdoctoral Research Associate, 2014-2015. Department of Organismic and Evolutionary Biology, Harvard University, with Dr. Scott Edwards.

Postdoctoral fellow, 2008-2014. Department of Organismic and Evolutionary Biology, Harvard University, with Dr. Daniel Hartl.

Graduate Research Fellow, 2002-2008. Department of Molecular Biology and Genetics, Cornell University. Thesis advisor, Dr. Andrew Clark. PhD thesis: "Evolution of the innate immune system in *Drosophila*."

Research Assistant, 2000-2002. Department of Ecology and Evolutionary Biology, Brown University, with Dr. David Rand.

Selected Recent Publications

For a full list of publications and links to papers, see my Google Scholar profile:
https://scholar.google.com/citations?user=u8RfnXoAAAAJ&hl=en

Freund F, Kerdoncuff E, Matuszewski S, Lapierre M, Hildebrandt M, Jensen JD, … **Sackton, T. B.**, Achaz G. (2023) Interpreting the pervasive observation of U-shaped Site Frequency Spectra. PLoS Genet 19(3): e1010677. https://doi.org/10.1371/journal.pgen.1010677

Olafson, P. U., Aksoy, S., Attardo, G. M., Buckmeier, G., Chen, X., Coates, C. J., … **Sackton, T. B.** …Benoit, J. B. (2021). Functional genomics of the stable fly, Stomoxys calcitrans, reveals mechanisms underlying reproduction, host interactions, and novel targets for pest control. *BMC Biology*. 19(1):1-13. doi: 10.1186/s12915-021-00975-9

Toda, Y., Ko, M. C., Liang, Q., Miller, E. T., Rico-Guervara, A., … **Sackton. T. B.,** … Baldwin, M. W. (2021). Early origin of sweet perception in the songbird radiation. *Science* 373 (6551), 226-231.

Cai, L., Arnold, B. J., Xi, Z., Khost, D. E., Patel, N., Hartmann, C. B., Manickam, S., Sasirat, S., Nikolov, L. A., Matthews, S., **Sackton, T. B.**, Davis, C. C. (2021). Deeply altered genome architecture in the endoparasitic flowering plant Sapria himalayana Griff. (Rafflesiaceae). *Current Biology* 31 (5), 1002-1011. e9. doi: 10.1016/j.cub.2020.12.045

Freedman, A. H., Clamp, M., & **Sackton, T. B.** (2021). Error, noise and bias in de novo transcriptome assemblies. *Mol Ecol Resources*. 21(1):1-11. doi: 10.1111/1755-0998.13156

Xu, L., Sin, S. Y. W., Grayson, P., Janes, D. E., Edwards, S. V., & **Sackton, T. B.** (2019). Evolutionary dynamics of sex chromosomes of palaeognathous birds. *Genome Biol. Evol.* 11(8): 2376-2390. doi: 10.1093/gbe/evz154

Cloutier, A., **Sackton, T. B.**, Grayson, P., Clamp, M., Baker, A. J., & Edwards, S. V. (2019). Whole-genome analyses resolve the phylogeny of flightless birds (Palaeognathae) in the presence of an empirical anomaly zone. *Syst. Biol.* 68(6):937-955. doi: 10.1093/sysbio/syz019

Hu, Z., **Sackton, T. B.**, Edwards, S. V., & Liu, J. S. (2019). Bayesian Detection of Convergent Rate Changes of Conserved Noncoding Elements on Phylogenetic Trees. *Molecular Biology and Evolution*, *36*(5), 1086–1100. doi: 10.1093/molbev/msz049

Sackton, T. B., Grayson, P., Cloutier, A., Hu, Z., Liu, J. S., Wheeler, N. E., … Edwards, S. V. (2019). Convergent regulatory evolution and loss of flight in paleognathous birds. *Science*, *364*(6435), 74–78. doi: 10.1126/science.aat7244

Shultz, A. J., & **Sackton, T. B.** (2019). Immune genes are hotspots of shared positive selection across birds and mammals. *eLife*, *8*, 398362. doi: 10.7554/eLife.41815

Corbett-Detig, R. B., Hartl, D. L., & **Sackton, T. B.** (2015). Natural selection constrains neutral diversity across a wide range of species. *PLoS Biology*, *13*(4), e1002112. doi: 10.1371/journal.pbio.1002112

Invited Reviews

Sackton, T. B. (2020). Studying natural selection in the era of ubiquitous genomes. *Trends in Genetics*. 36(10): 792-803. doi: 10.1016/j.tig.2020.07.008

Waterhouse, R. M., Lazzaro, B. P., **Sackton, T. B.** (2020). Characterization of Insect Immune Systems from Genomic Data. Immunity in Insects, p. 3-34. Humana, NY

Näpflin, K., Becks, L., Bensch, S., Ellis, V. A., Hafer-Hahmann, N., Harding, K. C., … **Sackton, T. B.**, … Edwards, S. V. (2019). Genomics of hosts-pathogen interactions: challenges and opportunities across ecological and spatiotemporal scales. *PeerJ*. doi: 10.7287/peerj.8013

Sackton, T. B., & Clark, N. (2019). Convergent evolution in the genomics era: new insights and directions. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, *374*(1777), 20190102. doi: 10.1098/rstb.2019.0102

Lamichhaney, S., Card, D. C., Grayson, P., Tonini, J. F. R., Bravo, G. A., Näpflin, K., … **Sackton, T. B.**, Edwards, S. V. (2019). Integrating natural history collections and comparative genomics to study the genetic architecture of convergent evolution. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, *374*(1777), 20180248. doi: 10.1098/rstb.2018.0248

Sackton, T. B. (2019). Comparative genomics and transcriptomics of host-pathogen interactions in insects: evolutionary insights and future directions. *Current Opinion in Insect Science*, *31*, 106–113. doi: 10.1016/j.cois.2018.12.007

Sackton, T. B., & Hartl, D. L. (2016). Genotypic Context and Epistasis in Individuals and Populations. *Cell*, *166*(2), 279–287. doi: 10.1016/j.cell.2016.06.047

Singh, N. D., Larracuente, A. M., **Sackton, T. B.**, & Clark, A. G. (2009). Comparative Genomics on the Drosophila Phylogenetic Tree. *Annual Review of Ecology, Evolution, and Systematics*, *40*(1), 459–480. doi: 10.1146/annurev.ecolsys.110308.120214

Grants, Fellowships, and Awards

Grants

Boehringer Ingelheim GMBH Collaborative Research Agreement, "Data Analysis, Modelling and Integration Related to the Study of Brain Circuitry" (2016-2024). $1,196,512. Investigators: **Timothy Sackton (PI).**

NIH/NHGRI, "Statistical and high-throughput models of enhancer function and evolution" (2021-2025). $2,246,451 (total award, including subcontract; shared among 5 PIs). Investigators: Scott Edwards (lead PI), **Timothy Sackton (MPI)**, Cliff Tabin (MPI), Emma Farley (MPI), Jun Liu (MPI).

NSF DEB, "Collaborative Research: Comparative Genomics of Host-specific Adaptation and Life History Evolution in Brood Parasitic Birds" (2018-2024). $149,574 (Harvard). Investigators: Michael Sorenson (lead PI), **Timothy Sackton (co-PI)**, Christopher Balakrishnan (co-PI), Jeffrey DaCosta (co-PI), Wesley Warren (co-PI)

NIH Ruth L. Kirschstein National Research Service Award: "Interspecific divergence of Y chromosome effects on gene expression in *Drosophila*." (2009-2011)

NSF Doctoral Dissertation Improvement Grant: "Quantitative Genetics of Innate Immunity in *Drosophila melanogaster*." (2006-2008)

Fellowships and Awards

Arthropod Genomics Symposium Travel Award (2013)
Genetics Society of America DeLill Nasser Award for Professional Development in Genetics (2009)
Society for Molecular Biology and Evolution Graduate Student Travel Award (2008)
Howard Hughes Medical Institute Predoctoral Fellowship (2003-2008)

Teaching and Mentoring

Mentoring

Postdoctoral Associates:
Ekaterina Osipova (Nov 2022 – current)
Subir Shakya (April 2022 – current)
Alejandro Llanos-Garrido (September 2019 – September 2021)
Veronika Laine (January 2019 - July 2019)
Sara JS Wuitchik (June 2019 – August 2021)

Graduate students:
Luohao Xu (MEME Master's student, co-advised with Scott Edwards; Sept 2015 – March 2016)

Undergraduate students:
Dymon Blango (REU student; summer 2020)
Khaleb Enoch (REU student; summer 2020)
Xukang Shen (undergraduate intern from Zhejiang University; Sept 2016 – April 2017)
Julia Yu (Harvard undergraduate; July 2015 – April 2016)

Teaching Experience

Bioinformatics Summer Mini-Course (Harvard University, summer 2018, summer 2019)
Week-long intensive (full day) introduction to bioinformatics, covering R, basic Unix, single-cell RNA-seq, differential expression testing, population genetics, read mapping, variant calling, and other common bioinformatics techniques.
Role: Lead instructor

Bioinformatics and Genomics Workshop (IMIBIO, Puerto Iguazú, Argentina, August 2017)
Three-day intensive (full day) introduction to bioinformatics and genomics, covering a wide range of topics. Targeted at beginning students.
Role: Lead instructor

Bioinformatics Workshops (Harvard University, 2014-current)
Design and run workshops sponsored by Harvard Informatics covering topics in bioinformatics and biological computing. Topics have included: genome and transcriptome assembly, introduction to R, intermediate R, differential expression with RNA-seq data, genomic analysis with bedtools, phylogenetics.
Role: Instructor

R Workshop (Harvard University, Summer 2011)
Informal workshop for graduate students and postdocs in the department. Seven weeks of meetings with attendance of 6-10 people per week. Developed exercises, lesson plans, and weekly lectures.
Role: Instructor

Speciation (Cornell University, Spring 2005)
Upper level course for undergraduates and graduate students (Instructor: Richard Harrison). Graded essays and exams, led discussion section, gave guest lecture.
Role: Teaching assistant.

Population Genetics (Cornell University, Fall 2004)
Upper level course for undergraduates and graduate students (Instructor: Charles Aquadro). Graded problem sets and exams, led discussion section, gave guest lecture.
Role: Teaching assistant.

Guest Lectures

Evolutionary Genomics (Harvard University, Spring 2016, Fall 2021)
Upper level course for undergraduates and graduate students (Instructor: Jim Mallet).
Gave a guest lecture on population genomics (2016), genome assembly (2021).

Big Data for Biologists (University of Florida, Fall 2020)
Introductory course on data analysis for biologists (Instructor: Lauren McIntyre).
Gave a guest lecture on transcriptomes and transcriptome assembly.

Evolutionary Biology (Princeton University, Fall 2020)
Introductory course for undergraduates (Instructor: Julien Ayroles).
Gave a guest lecture on convergent evolution and genomics.

Molecular Ecology and Evolution (Harvard University, Fall 2016, Fall 2019, Spring 2021)
Upper level course for undergraduates and graduate students (Instructor: Scott Edwards).
Gave a guest lectures on varying topics in molecular evolution and population genetics.

Seminar in Molecular Evolution (Tufts University, Fall 2014)
Upper level course for undergraduates and graduate students (Instructor: Erik Dopman). Gave a guest lecture on sex chromosome evolution.

Talks and Presentations

Invited Seminars

University of Rochester, Ecology and Evolutionary Biology (invited seminar). "Genomic signatures of convergent evolution and adaptation in birds" (6 Dec 2018)

Max Planck Institute for Ornithology, Seewiesen (invited seminar), "Genomic signatures of convergent evolution and adaptation in birds" (17 Sept 2018)

Tufts University, Department of Biology (invited seminar) "Genome signatures of adaptation and convergent evolution in birds" (27 Oct 2017)

The Rowland Institute at Harvard (invited seminar), "Evolutionary diversification of innate immune systems in insects." (8 April 2016)

Boston College, Department of Biology (invited seminar), "The pervasive impact of natural selection on genome evolution" (10 Feb 2015)

Clark University, Department of Biology (invited seminar), "Dynamic genomes: what comparative genomics tells us about evolutionary process" (29 Jan 2014)

Invited Conference Talks

Ecological and Evolutionary Genomics Gordon Conference, "Comparative Population Genomics Reveals Shared Patterns of Positive Selection in Birds" (Aug 2023)

ABRF Annual Meeting, panel presentation on bioinformatics training (April 2023)

RCN for Evolution in Changing Seas (invited workshop talk), "Standards and best practices for non-model population genomics." (Aug 2020, canceled due to COVID)

Cod Genomics Kickoff Meeting (invited conference talk), "Building a comparative population genomics database for cod and beyond" (21 Sept 2018)

5th Annual Immunogenomics Conference, HudsonAlpha Institute for Biotechnology (invited conference talk), "Comparative genomics of innate immunity in birds and flies." (October 2017)

Symposium on Host-pathogen Co-evolution in the Genomic Era, University of Gothenburg, Sweden (invited conference talk). "Comparative genomics of innate immunity in birds and flies." (May 2017)

Principals in Population Genomics Conference, Cornell University (invited conference talk), "Natural selection helps explain the unexpectedly small range of neutral diversity among species" (11 Jul 2014)

Other Talks

RCN-ECS MarineOmics Panel Seminar, "Genotyping with whole-genome sequencing." (21 May 2021)

Boston Evolutionary Supergroup Meeting, "Comparative population genomics in the era of cheap

sequencing." (25 Oct 2019)

Harvard University, Cellular Dynamics Seminar Series, "Facilitating large scale data analysis in biology." (29 April 2019)

Harvard University, Cellular Dynamics Seminar Series, "Bioinformatics at Harvard FAS: who we are and what we do." (30 Oct 2018)

Harvard University, Museum of Comparative Zoology, "The functional consequences of Y chromosome divergence in *Drosophila*" (02 May 2011)

Harvard University, Museum of Comparative Zoology, "The promise of short-read sequencing technology for evolutionary transcriptomics" (27 Jan 2010)

University of Rochester, Department of Biology, "Genomics and *Drosophila* immunity" (4 Dec 2008)

Cornell University, Department of Ecology and Evolutionary Biology, Dissertation Defense Seminar. "Evolutionary genetics of the innate immune response in the genus *Drosophila*" (22 May 2008)

Professional Service

Co-organizer, Harvard Science Operations Diversity Discussion Series (2020-2021).

Guest editor, "Convergent evolution in the genomics era: new insights and directions", special issue of *Philosophical Transactions B*. (2018-2019)

Guest editor, "Comparative Population Genomics", special issue of *Genome Biology and Evolution*. (2020-2021)

Symposium co-organizer, Convergent Evolution symposium (2017) and Comparative Population Genomics symposium (2020; meeting canceled due to coronavirus), Society for Molecular Biology and Evolution annual meeting

Co-organizer, EEB Graduate Student Symposium, Cornell University (2003-2006)

Ad hoc reviewer for: French National Research Agency, Canada Foundation for Innovation, Austrian National Research Agency, National Science Foundation GRFP, National Science Foundation, Czech National Science Foundation.

Peer review for: Animal Conservation; Biology Letters; BMC Biology; BMC Genomics; BMC Evolutionary Biology; Communications Biology; Developmental and Comparative Immunology; eLife; Evolution; Evolution Letters; Frontiers in Genetics; Genetics; Genome Biology and Evolution; Genome Research; G3: Genes, Genomes, Genetics; Infection, Genetics and Evolution; Integrative and Comparative Biology; Microbes and Infection; Molecular Biology and Evolution; Molecular Ecology; Molecular Phylogenetics and Evolution; Nature Reviews Genetics; Nature Ecology and Evolution; Parasites and Vectors; PCI Evolutionary Biology; PLOS Genetics; PLOS ONE; PLOS Biology; Proceedings of Royal Society B; Proceedings of the National Academy of Sciences; Science; Science Advances.