

Timothy Sackton, PhD
Harvard University, Cambridge MA 02138
phone (mobile): 617-899-9485
email: tsackton@g.harvard.edu
website: <http://scholar.harvard.edu/tsackton>

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.

Preprints (*equal contributions, corresponding author)

Huei-Mei Mei Chen, **Timothy B Sackton**, Beste Mutlu, Jie Wang, Sabine Keppler-Ross, Erel Levine, Tao Liu, Susan E Mango. (2018). A heterochromatic histone methyltransferase lowers nucleosome occupancy at euchromatic promoters. *bioRxiv*. <https://doi.org/10.1101/429191>

Cloutier, Alison, **Timothy B. Sackton**, Phil Grayson, Michele Clamp, Allan J. Baker, and Scott V. Edwards. (2018) Whole-Genome Analyses Resolve the Phylogeny of Flightless Birds (Palaeognathae) in the Presence of an Empirical Anomaly Zone. *bioRxiv*. <https://doi.org/10.1101/262949>.

Cloutier, Alison, **Timothy B. Sackton**, Phil Grayson, Scott V. Edwards, and Allan J. Baker. 2018. "First Nuclear Genome Assembly of an Extinct Moa Species, the Little Bush Moa (*Anomalopteryx Didiformis*)."
bioRxiv. <https://doi.org/10.1101/262816>.

Hu, Zhirui, **Timothy B. Sackton**, Scott V. Edwards, and Jun S. Liu. 2018. "A Hierarchical Bayesian Model for Detecting Convergent Rate Changes of Conserved Noncoding Elements on Phylogenetic Trees."
bioRxiv. <https://doi.org/10.1101/260745>.

Sackton, Timothy B., Phil Grayson, Alison Cloutier, Zhirui Hu, Jun S. Liu, Nicole E. Wheeler, Paul P.

Gardner, et al. 2018. “Convergent Regulatory Evolution and the Origin of Flightlessness in Palaeognathous Birds.” *bioRxiv*. <https://doi.org/10.1101/262584>.

Xu, Luohao, Simon Yung Wa Sin, Phil Grayson, Daniel E. Janes, Scott V. Edwards, and **Timothy B. Sackton**. 2018. “Evolutionary Dynamics of Sex Chromosomes of Palaeognathous Birds.” *bioRxiv*. <https://doi.org/10.1101/295089>.

Publications (*equal contributions, corresponding author)

- Shultz, Allison J., and **Sackton, T. B.** (2019) Immune Genes Are Hotspots of Shared Positive Selection across Birds and Mammals. *eLife*. 8, e41815
- Tigano, A., **Sackton, T. B.**, Friesen, V. L. (2018) Assembly and RNA-free annotation of highly heterozygous genomes: The case of the thick-billed murre (*Uria lomvia*) *Molecular ecology resources*. 18:1
- Hirst, C. E., Major, A. T., Ayers, K. L., Brown, R. J., Mariette, M., **Sackton, T. B.**, Smith, C. A. (2017) Sex Reversal and Comparative Data Undermine the W Chromosome and Support Z-linked DMRT1 as the Regulator of Gonadal Sex Differentiation in Birds. *Endocrinology*. 158: 9
- Sackton, T. B.**, Lazzaro, B. P., Clark, A. G. (2017). Rapid expansion of immune-related gene families in the house fly, *Musca domestica*. *Mol. Biol. Evol.* 34:4.
- Rago, A., Gilbert D. G., Choi, J-H., **Sackton, T. B.**, Wang, X., Kelkar, Y. D., Werren, J. H., Colbourne, J. K. (2016). OGS2: genome re-annotation of the jewel wasp *Nasonia vitripennis*. *BMC Genom.* 17:1.
- 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
- Scott, J. G., Warren, W. C, Beukeboom, L. W., Bopp, D., Clark, A. G., ... **Sackton, T. B.**, ... Wilson, R. K, Liu, N. (26 total authors). (2014). Genome of the House Fly (*Musca domestica* L), a Global Vector of Diseases with Adaptations to a Septic Environment. *Genome Biology*. 15:466.
- Adrion, J. R.*, Kousathanas, A.*, Pascual, M., Burrack, H. J, Haddad, N. M., Bergland, A. O., Machado, H., **Sackton, T.B.**, Schlenke, T. A., Watada, M., Wegmann, D.*, Singh, N. D.* (2014). *Drosophila suzukii*: the genetic footprint of a recent, world-wide invasion. *Mol Biol Evol.* 31 (12), 3148-3163 PMID: 25158796.
- Sackton, K. L.*, Dimova, N.*, Zeng, X.*, Tian, W.*, Zhang, M., **Sackton, T. B.**, Meaders, J., Pfaff, K. L., Sigoillot, F., Yu, H., Luo, Z., King, R. W. (2014). Synergistic Blockade of Mitotic Exit by Two Chemical Inhibitors of the Anaphase-Promoting Complex. *Nature*. 514 (7524): 646-649. PMID: 25156254.
- Sackton, T. B.**, Corbett-Detig, R. B., Nagaraju, J., Vaishna, R. L., Arunkumar, K. P., Hartl, D. L. (2014). Positive selection drives faster-Z evolution in silkmoths. *Evolution*. 68(8): 2331-2342. PMID: 2482690.
- Sackton, T. B.**, Werren, J. H., Clark, A. G. (2013). Characterizing the infection-induced transcriptome of *Nasonia vitripennis* reveals a preponderance of taxonomically-restricted immune genes. *PLoS ONE*. 8(12): e83984. PMID: 24386321.
- Sackton T. B.** and Hartl, D. L. (2013). Meta-analysis reveals that genes regulated by the Y chromosome in *Drosophila melanogaster* are preferentially localized to repressive chromatin. *Genome Biol Evol.* 5(1):255-66. PMID: 23315381.
- Whiteman, N. K., Gloss, A. D.*, **Sackton, T. B.***, Groen, S. C., Humphrey, P. T., Lapoint, R. T., Sønderby, I. E., Halkier, B. A., Kocks, C., Ausubel, F. M., Pierce, N. E. (2012). Genes involved in the evolution of herbivory by a leaf-mining, Drosophilid Fly. *Genome Biol Evol.* 4:788-804. PMID: 22813779.
- Zhou, J., **Sackton, T. B.**, Martinsen, L., Lemos, B., Eickbush, T. H., Hartl, D. L. (2012). Y chromosome mediates ribosomal DNA silencing and modulates the chromatin state in *Drosophila*. *Proc Natl Acad Sci.* 109(25):9941-46. PMID: 22665801.
- Sackton, T. B.**, Montenegro, H., Hartl, D. L., Lemos, B. (2011). Disruption of testis-specific gene expression and male reproductive phenotypes in heterospecific Y chromosome introgressions in *Drosophila*. *Proc Natl Acad Sci.* 108(41):17046-51. PMID: 21969588.
- Werren, J. H., Richards, S., Desjardins, C. A., Niehuis, O., Gadau, J., Colbourne, J. K., Nasonia Genome Working Group (2010). Functional and evolutionary insights from the genomes of three

parasitoid *Nasonia* species. *Science*. 327(5963):343–348. PMID: 20075255.

Sackton, T. B., Lazzaro, B. P., Clark, A. G. (2010). Association of genotype and gene expression in the *Drosophila melanogaster* immune response. *PLoS Genet*. 6(1): e1000797. PMID: 20066029.

Sackton, T. B.*, Kulathinal, R. J.*, Bergman, C. M., Quinlan, A. R., Dopman, E. B., Carneiro, M., Marth, G. T., Hartl, D. L., Clark, A. G. (2009). Population genomic inferences from sparse high-throughput sequencing of two populations of *Drosophila melanogaster*. *Genome Biol Evol*. 1:449-465. PMID: 20333214.

Sackton, T. B. and Clark, A. G. (2009) Comparative profiling of the transcriptional response to bacterial infection in two species of *Drosophila* by short-read cDNA sequencing. *BMC Genomics*. 10:259. PMID: 19500410.

Larracuente, A. M.*, **Sackton, T. B.***, Greenberg, A. J., Wong, A., Singh, N. D., Sturgill, D., Zhang, Y., Oliver, B., Clark, A. G. (2008) Evolution of protein coding genes in *Drosophila*. *Trends Genet*. 24(3):114-23. PMID: 18249460.

Drosophila 12 Genomes Consortium: **Clark, A. G.**, **Eisen, M. B.**, **Smith, D. R.**, **Bergman, C. M.**, **Oliver, B.**, **Markow, T. A.**, **Kaufman, T. C.**, **Kellis, M.**, **Gelbart, W.**, **Iyer, V. N.**, **Pollard, D. A.**, **Sackton, T. B.**, **Larracuente, A. M.**, **Singh, N. D.**, *et al.* (>100 additional coauthors). (2007) Evolution of genes and genomes on the *Drosophila* phylogeny. *Nature*. 450(7167):203-18. PMID: 17994087.

Sackton, T. B., Lazzaro B. P., Schlenke, T. A., Evans, J. D., Hultmark, D., Clark, A. G. (2007) The evolution of the innate immune system in *Drosophila*. *Nat Genet*. 39(12):1461-8. PMID: 17987029.

Lazzaro, B. P., **Sackton, T. B.**, Clark, A. G. (2006). Genetic variation in *Drosophila melanogaster* resistance to infection: a comparison across bacteria. *Genetics*. 174(3):1539-54. PMID: 16888344.

Nielsen, R., Bustamante, C., Clark, A. G., Gnanapavan, S., **Sackton, T. B.**, Hubisz, M. J., Fledel-Alon, A., Tanenbaum, D. M., Civello, D., White, T. J., Sninsky, J., Adams, M. D., Cargill, M. (2005). A Scan for Positively Selected Genes in the Genomes of Humans and Chimpanzees. *PLoS Biol* 3(6): e170. PMID: 15869325.

Palmer, M. R. and **Sackton, T. B.** (2003) The effects of dietary coenzyme Q on *Drosophila* life span. *Aging Cell* 2(6):335-339. PMID: 14677636.

Sackton, T. B., Haney, R. A., **Rand, D. M.** (2003) Cytonuclear coadaptation in *Drosophila*: disruption of cytochrome c oxidase activity in backcross genotypes. *Evolution* 57(10): 2315-2325. PMID: 14628919.

Rand, D. M., Spaeth, P. S., **Sackton, T. B.**, Schmidt, P. S. (2002) Ecological genetics of Mpi and Gpi polymorphisms in the acorn barnacle and the spatial scale of neutral and non-neutral variation. *Integr Comp Biol* 42(4): 825-836. PMID: 21708781.

Invited Reviews

Sackton, T. B. (2018) Comparative genomics and transcriptomics of host-pathogen interactions in insects: evolutionary insights and future directions. *Current Opinion in Insect Science*. [Epub ahead of print 2018/12/28]

Sackton, T. B. and Hartl, D. L. (2016). Genotypic context and epistasis in individuals and populations. *Cell*. 166:2.

Singh, N. D., Larracuente, A. M., **Sackton, T. B.**, **Clark, A. G.** (2009). Comparative genomics on the *Drosophila* phylogenetic tree. *Annu. Rev. Ecol. Evol. Syst*. 40:459-480

Fellowships, Grants, and Awards

NSF DEB, “Collaborative Research: Comparative Genomics of Host-specific Adaptation and Life History Evolution in Brood Parasitic Birds” (2018-2022). Harvard Budget: \$149,574.

Investigators: Michael Sorenson (lead PI), **Timothy Sackton (co-PI)**, Christopher Balakrishnan (co-PI), Jeffrey DaCosta (co-PI), Wesley Warren (co-PI)

Arthropod Genomics Symposium Travel Award (2013)

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

Genetics Society of America DeLill Nasser Award for Professional Development in Genetics (2009)
Society for Molecular Biology and Evolution Graduate Student Travel Award (2008)
NSF Doctoral Dissertation Improvement Grant: “Quantitative Genetics of Innate Immunity in
Drosophila melanogaster.” (2006-2008)
Howard Hughes Medical Institute Predoctoral Fellowship (2003-2008)

Teaching Experience

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.

Bioinformatics Summer Nanocourse (Harvard University, summer 2018)

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.

Molecular Ecology and Evolution (Harvard University, Fall 2016)

Upper level course for undergraduates and graduate students (Instructor: Scott Edwards). Gave a guest lecture on signatures of natural selection in population genetic data.

Role: Guest lecturer.

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.

Role: Guest lecturer.

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.

Seminars

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

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

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)

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

Ecological and Evolutionary Genomics Gordon Conference (talk selected for Young Investigator's Symposium), “The genomic basis of flight loss in ratites.” (July 2015)

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

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)

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

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, “Evolutionary genetics of the innate immune response in the genus *Drosophila*” (22 May 2008)

Professional Service

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

Symposium co-organizer, Convergent evolution symposium, Society for Molecular Biology and Evolution annual meeting (2017)

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

Ad hoc reviewer for: French National Research Agency, Canada Foundation for Innovation

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

Selected Meeting Presentations

- Sackton, T. B.** “The genomic basis of convergent flight loss in ratites.” (The Allied Genetics Conference 2016, oral presentation)
- Sackton, T. B.**, Corbett-Detig, R. B., Hartl, D. L. Natural selection helps explain the unexpectedly small range of genetic variation within species. (Evolution 2014, oral presentation)
- Sackton, T. B.** Characterizing the infection-induced transcriptome of *Nasonia vitripennis*. (Arthropod Genomics Symposium 2013, poster presentation)
- Sackton, T. B.**, Hartl D. L. Genes regulated by the Y chromosome are preferentially localized to repressive chromatin. (Drosophila Research Conference 2013, poster presentation)
- Sackton, T. B.**, Hartl, D. L. The how of the Y: a meta-analysis of Y-linked regulatory variation in *Drosophila*. (Society for Molecular Biology and Evolution 2012, poster presentation)
- Sackton, T. B.**, Montenegro, H., Hartl, D. L., Lemos, B. Contribution of the Y chromosome to gene expression divergence between *Drosophila simulans* and *Drosophila sechellia*. (Drosophila Research Conference 2011, poster presentation)
- Sackton, T. B.**, Kulathinal, R. J., Bergman, C. M., Quinlan, A. R., Dopman, E. B., Carneiro, M., Marth, G. T., Hartl, D. L., Clark, A. G. Population genomic inferences from sparse high-throughput sequencing of two populations of *Drosophila melanogaster*. (Drosophila Research Conference 2009, oral presentation)
- Sackton, T. B.**, Clark, A. G. Comparative profiling of the transcriptional response to infection by short read cDNA sequencing. (Society for Molecular Biology and Evolution 2008, oral presentation)
- Sackton, T. B.**, Lazzaro, B. P., Schlenke, T. A., Evans, J. D., Hultmark, D., Clark, A. G. Comparative genomics of innate immunity in *Drosophila*. (Drosophila Research Conference 2007, oral presentation)
- Sackton, T. B.** Comparative genomics of innate immunity in *Drosophila*. (Howard Hughes Medical Institute Meeting of Predoctoral and Physician Postdoctoral Fellows, 2006, oral presentation)
- Sackton, T. B.**, Lazzaro, B. P., Clark, A. G. Gene expression determinants of immunocompetence in *Drosophila melanogaster*. (Drosophila Research Conference 2006, workshop talk and poster)
- Sackton, T. B.**, Clark, A. G. Comparative genomics of innate immunity in *Drosophila*. (Society for the Study of Evolution 2005, oral presentation)
- Sackton, T. B.**, Lazzaro, B. P., Clark, A. G. Specificity in innate immunity? Association mapping of resistance to diverse pathogens in *Drosophila*. (ESF conference, 2004, on 'Innate immunity: bridging the gap between ecology and molecules', poster)
- Sackton, T. B.**, Clark, A. G. Molecular evolution of the *Drosophila* transferrin gene family. (Society for the Study of Evolution 2003, oral presentation)
- Sackton, T. B.**, Rand, D. M. Cytonuclear coadaptation in *Drosophila*: disruption of cytochrome oxidase activity in backcross genotypes. (Society for the Study of Evolution 2003, oral presentation)