

Avery Davis Bell

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EDUCATION

PhD, Harvard University

2012-2019

- Program in Genetics and Genomics, Biological and Biomedical Sciences Program
- Advisor: Steven McCarroll

BA, Swarthmore College

2008-2012

- Major in Biology, Minor in Sociology & Anthropology (Highest Honors)

RESEARCH EXPERIENCE (selected)

Postdoctoral research with Annalise Paaby

May 2020 – Present

Georgia Institute of Technology, School of Biological Sciences

- Computational genetics investigations of evolution using DNA and RNA sequencing data from the model organism nematode *Caenorhabditis elegans*
- Developed and implemented data processing workflows, lab data management documentation, best practices, and procedures

Postdoctoral research with Steven McCarroll

September 2019 – January 2020

Harvard Medical School, Department of Genetics

- Continued investigation of recombination and aneuploidy from sequencing human sperm genomes with Sperm-seq (method developed by me during my PhD)
- Initial application of Sperm-seq to patients with infertility

Dissertation research with Steven McCarroll

March 2013 – August 2019

Harvard Medical School, Department of Genetics

- Insights about recombination and aneuploidy from >30,000 haploid human sperm genomes
- Developed and implemented cellular, molecular, and computational methods to sequence single sperm in droplets, generate completely phased genomes of the sperm donors, identify recombination and aneuploidy events in each single cell, and analyze inter- and intra-individual variation and correlation in and among meiotic phenotypes
- *Dissertation advisory committee:* Mark Daly, Stephen Elledge, Joel Hirschhorn

PREPRINTS, PUBLICATIONS, AND OTHER RESEARCH PRODUCTS

Stabilizing selection and adaptation shape *cis* and *trans* gene expression variation in *C. elegans*. *Preprint in revision at Genetics*.

- **Bell A.D.**, Valencia F, Paaby A.B. (2024). *bioRxiv*
- *DOI: [10.1101/2024.10.15.618466](https://doi.org/10.1101/2024.10.15.618466)*

A web application for gene-based queries of CaeNDR RNA-seq data

- **Bell A.D.**, Paaby A.B. (2024). *microPublication Biology*
- *PMID: 38911436 | DOI: [10.17912/micropub.biology.001194](https://doi.org/10.17912/micropub.biology.001194)*

Diversification of small RNA pathways underlies germline RNA interference incompetence in wild *Caenorhabditis elegans* strains

- Chou H. T., Valencia, F., Alexander J.C., **Bell A.D.**, Deb D., Pollard D.A., Paaby A.B. (2024).
- *PMID: 37865119 | DOI: [10.1093/genetics/iyad191](https://doi.org/10.1093/genetics/iyad191)*

Beyond the reference: gene expression variation and transcriptional response to RNAi in *C. elegans*

- **Bell A.D.**, Chou H.T., Valencia F., Paaby A.B. (2023). G3: Genes|Genomes|Genetics.
- **PMID: 36993640 | DOI: [10.1093/g3journal/jkad112](https://doi.org/10.1093/g3journal/jkad112)**

Interactive websites sharing research data with the community

- Expression and regulatory divergence in wild *C. elegans* and their F1 progeny. Updated 2024. <https://wildworm.biosci.gatech.edu/ase/>
- Gene expression for 208 wild *C. elegans* strains from CaeNDR. Updated 2024. <https://wildworm.biosci.gatech.edu/cendrexp/>
- Gene expression in 5 *C. elegans* strains x 3 RNAi treatments. Updated 2023. <https://wildworm.biosci.gatech.edu/rnai/>

A method for low-coverage single-gamete sequence analysis demonstrates adherence to Mendel's first law across a large sample of human sperm

- Carioscia S.A., Weaver K.J., Bortvin A.N., Pan H., Ariad D., **Bell A.D.**, and McCoy R.C. (2022). *eLife* 11.
- **PMID: 36475543 | DOI: [10.7554/eLife.76383](https://doi.org/10.7554/eLife.76383)**

eP395: Calculating recurrence risk in an individual with an intrachromosomal structural rearrangement

- Schilit S., **Bell A.**, Rowsey R., Sassaman A., Galinsky A., Studwell C., Mason-Suarez H. (2022). *Genetics in Medicine* 24(3).
- **DOI: [10.1016/j.gim.2022.01.430](https://doi.org/10.1016/j.gim.2022.01.430)**

Single cell analysis of DNA in more than 10,000 individual sperm from men with abnormal reproductive outcomes

- Leung A.Q., **Bell A.D.**, Mello C.J., Penzias A.S., McCarroll S.A., and Sakkas D. (2021). *J Assist Reprod Genet*.
- **PMID: 34417660 | DOI: [10.1007/s10815-021-02300-3](https://doi.org/10.1007/s10815-021-02300-3)**

Insights into variation in meiosis from 31,228 human sperm genomes

- **Bell A.D.**, Mello C.J., Nemesh J., Brumbaugh S.A., Wysoker A., McCarroll S.A. (2020). *Nature*.
- **PMID: 32494014 | DOI: [10.1038/s41586-020-2347-0](https://doi.org/10.1038/s41586-020-2347-0)**

Analyzing Copy Number Variation with Droplet Digital PCR

- **Bell A.D.**, Usher, C.L., McCarroll, S.A. (2018). *Methods Mol Biol* 1768, 143-160.
- **PMID: 29717442 | DOI: [10.1007/978-1-4939-7778-9_9](https://doi.org/10.1007/978-1-4939-7778-9_9)**

A Loss-of-Function Splice Acceptor Variant in IGF2 Is Protective for Type 2 Diabetes

- Mercader, J.M., Liao, R.G., **Bell, A.D.**, Dymek, Z., Estrada, K., Tukiainen, T., Huerta-Chagoya, A., Moreno-Macias, H., Jablonski, K.A., Hanson, R.L., Walford, G.A., Moran, I., Chen, L., Agarwala, V., Ordóñez-Sánchez, M.L., et al. (2017). *Diabetes* 66, 2903-2914.
- **PMID: 28838971 | DOI: [10.2337/db17-0187](https://doi.org/10.2337/db17-0187)**

Schizophrenia risk from complex variation of complement component 4

- Sekar, A., Bialas, A.R., de Rivera, H., **Davis, A.**, Hammond, T.R., Kamitaki, N., Tooley, K., Presumey, J., Baum, M., Van Doren, V., Genovese, G., Rose, S.A., Handsaker, R.E., Schizophrenia Working Group of the Psychiatric Genomics, C., Daly, M.J., McCarroll, S.M. et al. (2016). *Nature* 530, 177-183.
- **PMID: 26814963 | DOI: [10.1038/nature16549](https://doi.org/10.1038/nature16549)**

Impact of natural selection due to malarial disease on human genetic variation

- Gomez F., Ko W.-Y., **Davis A.**, Tishkoff S.A. (2013). Pp. 117-160 in *Primates, Pathogens, and Evolution*. Brinkworth, J.F. and Pechenkina, K., Eds.

PRESENTATIONS

Georgia Institute of Technology Research Talks

various

- *Georgia Tech Postdoc Symposium talk: November 2024*
- *Center for Integrative Genomics Advanced Research Seminar talks: April 2022; May 2023*
- *School of Biological Sciences Seminar talk: April 2022*

24th International *C. elegans* Conference

June 2023

Glasgow, Scotland and online

- *Poster (online): Regulatory mode and genomic context determine natural gene expression variation in *C. elegans**

Evolutionary biology of *Caenorhabditis* and other nematodes

June 2022

Hamilton, ON and online

- *Talk: Allele specific expression suggests that genomic distance amplifies gene regulatory divergence and its compensation*

23rd International *C. elegans* Conference

June 2021

Online

- *Poster: Regulatory differences in wild *C. elegans* strains from investigation of allele-specific expression*

Annual Meeting of the American Society of Human Genetics

October 2019

Houston, TX

- *Talk: Aneuploidy and recombination across chromosomes, gametes, and individuals from large-scale single-sperm sequencing*

Annual Meeting of the American Society of Human Genetics

October 2018

San Diego, CA

- *Talk: Analysis of 33,527 haploid sperm genomes from 20 individuals reveals new relationships underlying meiotic recombination and aneuploidy*

The Biology of Genomes Meeting

May 2018

Cold Spring Harbor, NY

- *Poster: 33,527 haploid sperm genomes from 20 individuals ascertained by a droplet-based single-sperm sequencing technology*

Harvard University Program in Genetics and Genomics

April 2018

Annual Symposium

Boston, MA

- *One of two selected student talks: Insights from 33,527 haploid sperm genomes*

Annual Meeting of the American Society of Human Genetics,

October 2014

San Diego, CA

- *Poster: Population genetics and mutation analysis of an exceptionally copy-number-variable sperm gene*

HONORS AND AWARDS

National Science Foundation

September 2021-August 2023

Postdoctoral Research Fellowship in Biology

- Two-year fellowship, “Maximizing power to uncover the molecular mechanisms between genotype and phenotype: allele-specific expression and protein regulation in *C. elegans*”

**Semi-finalist for Charles J. Epstein Trainee Awards
for Excellence in Human Genetics Research**

Summer 2018

- Selection based on abstract submitted to the 68th American Society of Human Genetics Meeting
- One of 60 / 670 trainee applicants selected as semi-finalists

Bok Center Certificate of Distinction in Teaching

for Genetics 201 Fall 2013;
for LS1b Spring 2015

- Reflects an average student evaluation score of 4.5 / 5 or higher

Phi Beta Kappa, Swarthmore College

May 2012

MENTORSHIP AND EDUCATION OUTREACH

**Co-founder and lead organizer, Mentorship program
Supporting Women+ in Computational Biology, Georgia Institute of Technology**

February 2023-present

- Group aims to support and connect early-career women (PhD students and postdocs) and gender minorities in computational biology and related field. Any Georgia Tech PhD student or postdoc sharing this goal and doing research connected in any way to computational biology is eligible to apply.
- Recruited over 20 mentors from academia and industry and 10 trainee mentees from Georgia Tech each year; matched mentors and mentees
- Organized and facilitated monthly events,
- First cohort reported that their mentoring interactions were incredibly useful and that the sense of the community developed among the cohort is “favorite part of graduate school”

Research mentorship of students and early career scientists

- Introduce young scientists to bioinformatics research in R programming language, guide them through developing projects using RNA-seq data
- *Specific individuals:* Two undergraduates at the Georgia Institute of Technology, one semester each; Lab technician at the Georgia Institute of Technology, ongoing

Outreach and career journey talks and panels

- Interviewed by undergraduate for essay contest, biographies of contemporary women mathematicians and statisticians, *Association for Women in Mathematics and Math for America* January 2024
- Research and career journey speaker and academic career panel panelist, *Southeast Center for Mathematics and Biology Undergraduate Workshop (hosted at Georgia Tech)* August 2023
- Keynote speaker, *Southeast Node Genetics Education Project Student Research Symposium*. April 2023
- Panelist, *Awesome Girls in Coding career panel, 100 Girls of Code (Conyers, GA chapter). Sole life scientist panelist.* August 2022
- Professional development career path speaker, *Project ENGAGES, ‘group mentoring’ of high school researchers from marginalized groups, Georgia Institute of Technology* February 2022

Guest lecturer in undergraduate courses

- Research lecture on Sperm-seq, *Prof. Fran Norflus’ upper-level reading course, Clayton State University* March 2021

- Research lecture on Sperm-seq, *Prof. Elinne Becket's upper-level genomics course, California State University San Marcos* March 2021

High school cancer research outreach program weekly journal club co-facilitator June – July 2017 and 2018

- *Dana-Farber / Harvard Cancer Center Continuing Umbrella of Research Experience*

Judge for genetics-related high school competitions

- First round essay judge, *American Society of Human Genetics DNA Day essay competition* March 2018
- Second round essay judge, *American Society of Human Genetics DNA Day essay competition* March 2014
- Proposal judge, *Barcoding Burlington high school project* November 2013

Program in Genetics and Genomics journal club co-organizer 2014-2017

Invited speaker for undergraduate student research club February 2016

- Spoke about my path to research and thesis research, *Massachusetts College of Pharmacy and Health Sciences Student and Professor Academic Research Kollaboration (SPARK)*

SERVICE AND COMMITTEES

Contributer, Postdoc Visibility Project Fall 2023-Spring 2024
Georgia Institute of Technology

- Gave impactful interviews and participated in photo opportunities to help build community among and raise the profile of postdocs at Georgia Tech
- Example publicized quote: “If you have interest in science, you can make it work for you. You do not have to adapt to the prevailing model. Science is better for having you in it.”
- Links: Essential Facts to Know about Postdocs; Postdocs Share Lessons Learned; Celebrating the Postdoc Community

Member, Conference Childcare Committee, November 2023
Genetics Society of America

- Fundraising for conference childcare to enable parents to fully participate in their society's conferences

Founding member, College of Sciences Research Faculty Advisory Council, Georgia Institute of Technology February 2021-July 2022

- Founding Biological Sciences member of postdoctoral fellow and research scientist advisory council to Dean for improving community and opportunity for postdocs and research scientists
- Synthesized data from questionnaire we distributed and presented data and concrete recommendations from same to Deans, department chairs, and Office of Postdoctoral Services
- Council accomplishments include implementing regular townhalls with dozens of attendees, implementing the first-ever College of Sciences awards for postdoctoral fellows and research scientists, working with the Office of Postdoctoral Services to overhaul and improve resource webpages as well as generating our own research webpage

Member, Inaugural College of Sciences Research Faculty Awards Committee, Georgia Institute of Technology March 2022

- Shaped awards scoring
- Helped select inaugural winners, who had impressive achievements previously overlooked

- Wrote language for publicization of awards

TEACHING EXPERIENCE

Instructor: Brief introduction to data analysis in R workshop November 2022, September 2024

Two hour workshop for students in undergraduate introductory course BIOS 4401 Experimental Design & Statistical Methods

- Developed and taught a workshop bridging in-course use of R to using R to analyze data, including formatting real RNA-seq data and data visualizations
- 89% of students agreed that workshop would be helpful to future students in the class; 82% of students reported increased confidence with one or more aspects of data analysis in R; 79% agreed the workshop was a good use of time

Co-instructor, 6-hour course: Algorithmic Thinking: February 2019

How you should be thinking about your data

Graduate and post-doc "nanocourse," Department of Genetics, Harvard Medical School

- Co-developed and co-taught material introducing algorithmic thinking (modular problem breakdown) and introductory R programming to implement algorithmic thinking
- Successful course will be offered again by multiple departments; students gave feedback that this course filled the gap between having a problem and being able to solve it with code

Assistant lead teaching associate for quantitative curriculum development: Fall 2017

BBS230 Analysis of the Biological Literature

Graduate introductory course, Biological and Biomedical Sciences, Harvard Medical School

- Developed curriculum for R programming and statistical analysis for the first year where quantitative curriculum was included in this course
- Developed, tested, and helped teach formative assessments implemented via an online platform and done in in-class groups
- Students reported increased familiarity and ability with performing analyses in R

Guest lecturer: Bio260.A: Molecular Biology Fall 2015

Undergraduate introductory course, Department of Biology, Massachusetts College of Pharmacy and Health Sciences

- Taught two lectures covering meiosis to two sections of 200 students, using clicker questions and activities for student engagement

Teaching Fellow: LS1b Genetics, Genomics, & Evolution Spring 2015

Undergraduate introductory course, Department of Life Sciences, Harvard University

- Led one three-hour section each week comprising problem session and instruction as well as laboratory experiments; graded 2-4 assignments per week
- Received 4.55 out of 5 on course evaluations (11 of 13 students responding) and unsolicited positive feedback verbally and via email from students

Teaching Assistant: Genetics 201 Principles of Genetics Fall 2013

Graduate introductory course, Department of Genetics, Harvard Medical School

- Prepared and taught original problems and demonstrations for section of 13 students in yeast, bacterial, fruit fly, nematode, and human genetics
- Received 5 out of 5 on course evaluations from all students (12 out of 13 students responding)

PEER REVIEW

Reviewer for: *Nature Communications*, *G3: Genes|Genomes|Genetics*, *Molecular Biology and Evolution*, *Nucleic Acid Research (Online Methods)*, *Communications Biology*, *Genome Biology and Evolution*
