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 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

Interactive websites sharing research data with the community
- Gene expression in 5 *C. elegans* strains x 3 RNAi treatments. Updated 2023. https://wildworm.biosci.gatech.edu/rnai/
- Expression and regulatory divergence in wild *C. elegans* and their F1 progeny. Updated 2022. https://wildworm.biosci.gatech.edu/ase/

Diversification of small RNA pathways underlies germline RNAi incompetence in wild *C. elegans* strains. *Preprint.*
- Chou, H. T., Valencia, F., Alexander, J.C., **Bell, A.D.**, Deb, D., Pollard, D.A., Paaby, A.B. (2022). *bioRxiv*
- *DOI: 10.1101/2021.08.21.457212*

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*

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*

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*

AnalyzingCopy 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*

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., Ordonez-Sanchez, M.L., et al. (2017). Diabetes 66, 2903-2914.
- *PMID: 28838971 | DOI: 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*

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

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   Summer 2018
for Excellence in Human Genetics Research
- 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

TEACHING EXPERIENCE

Instructor: Brief introduction to data analysis in R workshop   November 2022
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)

MENTORSHIP AND EDUCATION OUTREACH

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
- Panelist, *Awesome Girls in Coding career panel*,   August 2022
  100 Girls of Code (Conyers, GA chapter). Sole life scientist panelist.
- Professional development career path speaker, *Project ENGAGES,*   February 2022
  'group mentoring' of high school researchers from marginalized groups,
  Georgia Institute of Technology

Guest lecturer in undergraduate courses
- Research lecture on Sperm-seq, *Prof. Fran Norflus'*   March 2021
  upper-level reading course, Clayton State University
- Research lecture on Sperm-seq, *Prof. Elinne Becket's*   March 2021
  upper-level genomics course, California State University San Marcos

High school cancer research outreach program   June – July 2017 and 2018
weekly journal club co-facilitator
- *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*   March 2018
  DNA Day essay competition
- Second round essay judge, *American Society of Human Genetics*   March 2014
  DNA Day essay competition
- 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

Founding member, College of Sciences Research Faculty   February 2021-July 2022
Advisory Council, *Georgia Institute of Technology*
- 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   March 2022
Awards Committee, *Georgia Institute of Technology*
- Shaped awards scoring
- Helped select inaugural winners, who had impressive achievements previously overlooked
- Wrote language for publicization of awards

PEER REVIEW
Reviewer for: *Nature Communications, Nucleic Acid Research (Online Methods), Genes|Genomes|Genetics*