

# Abhilesh Dhawanjewar

BIOINFORMATICIAN · MRC MITOCHONDRIAL BIOLOGY UNIT · UNIVERSITY OF CAMBRIDGE

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## Education

### Ph.D. in Evolutionary Biology

UNIVERSITY OF NEBRASKA-LINCOLN, USA

Advisors: Dr. Kristi Montooth & Dr. Colin Meiklejohn

Aug 2015 - Jul 2022

### Integrated B.S.-M.S. Dual Degree

INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH, PUNE, INDIA

Advisor: Dr. M.S. Madhusudhan

Aug 2010 - May 2015

## Summary

I am an Evolutionary Biologist passionate about uncovering the mechanistic processes behind the diversity of life on Earth. By integrating empirical and computational approaches, I aim to achieve a holistic understanding of evolutionary dynamics. My interests center on interactions between mitochondrial and nuclear genomes and their roles in cellular function, especially in the context of mitochondrial diseases in humans. I also explore evolutionary processes shaping genetic conflicts, such as mitochondrial-nuclear incompatibilities, and the evolution of sex-specific traits. My expertise spans experimental evolution, genomics, statistical modeling, and bioinformatics. I have developed statistical methods to analyze protein-protein interaction stability and applied bioinformatics tools to dissect complex biological data. Currently, I integrate large, multimodal datasets—such as genomics and single-cell analyses—to reveal underlying biological patterns and their evolutionary significance. I am dedicated to translating these insights into a deeper understanding of human health and evolution.

## Publications

### JOURNAL ARTICLES

Burr S., Auckland K., Glynos A.\* **Dhawanjewar A.S.\***, Wei W., Ryall C., Hynes-Allen A.M., Prater M., Sczaniecka-Clift M., Prudent J., Chinnery P.F., & van den Amelee J. (2025). MitoPerturb-Seq identifies common and gene-specific single-cell responses to mitochondrial DNA depletion and heteroplasmy (*Under Review*)

Chandrasegaram R., Hynes-Allen A.M., Gao B., **Dhawanjewar A.S.**, Frison M., Petridi S., Chinnery P.F., Ma H. & van den Amelee J.(2025). Single-molecule mitochondrial DNA imaging reveals heteroplasmy dynamics shaped by developmental bottlenecks and selection in different organs in vivo *bioRxiv*, 2025.01.24.634671v1

**Dhawanjewar, A.S.**, Montooth K.L., & Meiklejohn, C.D. Mitochondrial OXPHOS genes exhibit higher levels of molecular compensation of human disease associated mutations relative to nuclear OXPHOS genes in mammals. *In preparation, manuscript available on request*

M. Florencia Camus & **Dhawanjewar, A.S.** (2023). Multilevel selection on mitochondrial genomes. *Current Opinion in Genetics & Development*, 80, 102050.

**Dhawanjewar A.S.\***, Roy A.A.\*, & Madhusudhan M.S. (2020). A knowledge-based scoring function to assess the stability of quaternary protein assemblies. *Oxford Bioinformatics*, 36(12), 3739-3748.

Roy, A.A.\*, **Dhawanjewar, A.S.\***, Sharma, P., Singh, G., & Madhusudhan, M.S. (2019). Protein Interaction Z Score Assessment (PIZSA): an empirical scoring scheme for evaluation of protein-protein interactions. *Nucleic acids research*, 47(W1), W331-W337.

Montooth, K.L., **Dhawanjewar, A.S.**, & Meiklejohn, C.D. (2019). Temperature-sensitive reproduction and the physiological and evolutionary potential for Mother's Curse. *Integrative and comparative biology*, 59(4), 890-899.

Nelson, T.C., Jones, M.R., Vellotta, J.P., **Dhawanjewar, A.S.**, & Schweizer, R.M. (2019). UNVEILING connections between genotype, phenotype, and fitness in natural populations. *Molecular ecology*, 28(8), 1866-1876.

\* Equal contribution

### WEB-SERVERS

Prediction of Stable Quaternary Protein Assemblies -

PIZSA (Protein Interaction Z-score Assessment) - <http://cospi.iiserpune.ac.in/pizsa/>

## Research Experience

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### Cell- and Tissue-specificity of Mitochondrial Disease Mutations

MRC MITOCHONDRIAL BIOLOGY UNIT · UNIVERSITY OF CAMBRIDGE

2024-Present

UK

- Analyse multimodal single-cell data to identify cell- and tissue-specific effects of mitochondrial disease mutations
- Identify nuclear modifiers of mitochondrial disease mutations using CRISPR-based screens
- Develop data processing pipelines for DamID-seq analysis

### The Evolution of Sexually Antagonistic Variation in Fruit Flies

UNIVERSITY COLLEGE LONDON

2022-Present

UK

- Designed experiments implementing sex-limited selection in *Drosophila melanogaster* for experimental evolution
- Developed analytical and statistical tools using Approximate Bayesian Computation (ABC) to identify and characterize sexually antagonistic variation from genomic data

### Mitochondrial-Nuclear Coevolution in Mammalian Genomes

UNIVERSITY OF NEBRASKA-LINCOLN

2021-2022

USA

- Compiled datasets and computed evolutionary rate correlations between mitochondrial genes and nuclear genes with different degrees of interaction for mammalian species.
- Nuclear genes interacting with mitochondrial genes exhibit stronger correlations in evolutionary rates, supporting the hypothesis of mito-nuclear coevolution.

### Molecular Compensation in the Oxidative Phosphorylation System (OXPHOS)

UNIVERSITY OF NEBRASKA-LINCOLN

2019-2021

USA

- Curated and analyzed mitochondrial and nuclear protein sequences from 1200 mammalian species to identify potential compensating residues for disease-causing mutations using sequence, structural and phylogenetic analysis
- Mitochondrial genes exhibit a higher degree of compensatory evolution compared to nuclear genes, suggesting a higher degree of functional redundancy in the mitochondrial genome

### Mitochondrial-Nuclear Interactions and the Thermal Sensitivity of Male Reproduction

UNIVERSITY OF NEBRASKA-LINCOLN

2016-2019

USA

- Performed G×G×E×E×E phenotypic assays to characterize the effects of a mitochondrial-nuclear incompatibility between *Drosophila melanogaster* and *Drosophila simulans* hybrid on thermal male sterility.
- Mitochondrial-nuclear incompatibility exacerbates thermal sensitivity of spermatogenesis that is further modulated by environmental cues such as temperature, diet and age of exposure.

### Prediction of Stable Quaternary Assemblies Protein Interaction Z Score Assessment (PIZSA)

INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH, PUNE

2013-2015

India

- Constructed knowledge-based statistical potentials trained over 4900 native three-dimensional protein structures to predict the stability of protein-protein interactions
- Extensively bench-marked across multiple test sets and is among the top 6 methods, outperforming 31 other statistical, physics, based and machine learning scoring schemes and deployed the algorithm as a web-server

## Honors & Awards

Registration Waiver and Travel Support , <b>EMBO Population genomics: Background and tools (€400)</b>	2024
Blair Paxton Udale Fund for Life Sciences, <b>The University of Nebraska Foundation (\$1900)</b>	2021
Milton E. Mohr Fellowship, <b>UNL Center for Biotechnology (\$1000)</b>	2021
Blair Paxton Udale Fund for Life Sciences, <b>The University of Nebraska Foundation (\$500)</b>	2020
Milton E. Mohr Fellowship, <b>UNL Center for Biotechnology (\$1000)</b>	2019
Suzanne O. Prather Memorial Fund, <b>University of Nebraska Foundation (\$1500)</b>	2019
Runner-Up Best Poster Award, <b>School of Biological Sciences, UNL (\$50)</b>	2019
AAAS/Science Program for Excellence in Science, <b>American Association for the Advancement of Science</b>	2019
Jessie A. Lee Fund, <b>School of Biological Sciences, UNL (\$2000)</b>	2018
Best Poster Award, <b>School of Biological Sciences, UNL (\$100)</b>	2018
Conference Registration Award, <b>Society for Molecular Biology and Evolution (\$450)</b>	2018
Travel Grant, <b>Society for Molecular Biology and Evolution (\$250)</b>	2017
Runner-Up Best Poster Award, <b>School of Biological Sciences, UNL (\$50)</b>	2017
Mary D. Rogick Memorial Fund, <b>School of Biological Sciences, UNL (\$1300)</b>	2017
Travel Grant, <b>Society for the Study of Evolution (\$500)</b>	2016
Blair Paxton Udale Fund for Life Sciences, <b>The University of Nebraska Foundation (\$1500)</b>	2016
Rosemary Grant Award, <b>Society for the Study of Evolution (\$2500)</b>	2016
Travel Grant, <b>The Indian Institute of Science Education and Research, Pune (\$1300)</b>	2014
Travel Grant, <b>The American Society of Naturalists (\$250)</b>	2014
Working Internship, <b>Max Planck Institute for Evolutionary Biology (\$3500)</b>	2013
INSPIRE Scholarship, <b>Department of Science and Technology, India (\$8000)</b>	2010
National Talent Search Examination (NTSE) Scholar, <b>NCERT, India (\$250)</b>	2006

## Conference Presentations

### INVITED TALKS

#### The Ethics of Using Genetic Tools for Conservation

UNVEIL SYMPOSIUM 2018

Jun 2018

Missoula, Montana, USA

#### Population Genomics of the Range-Expanding Populations of *Argiope bruennichi*

20<sup>TH</sup> INTERNATIONAL CONGRESS OF ARACHNOLOGY

Jul 2016

Golden, Colorado, USA

### ORAL PRESENTATIONS

#### Faster Mitochondrial Evolution Drives Mitochondrial-Nuclear Coevolution

CELLS WITHIN CELLS SYMPOSIUM

Jan 2025

Cambridge, UK

#### Compensatory Evolution of Disease Associated Residues in the Oxidative Phosphorylation (OXPHOS) pathway \*

SOCIETY FOR MOLECULAR BIOLOGY AND EVOLUTION MEETING

Jun 2020

Québec City, Canada

#### Environmental Modification of Mitochondrial-Nuclear Epistasis in Shaping Thermal Male Sterility in *Drosophila*

UNVEIL SYMPOSIUM 2018

Jun 2018

Missoula, Montana, USA

#### Mitochondrial-Nuclear Interactions and the Thermal Sensitivity of Male Reproduction

MITOCHONDRIAL GENOMICS AND EVOLUTION, AN SMBE SATELLITE MEETING

Sep 2017

Ein Gedi, Israel

### POSTER PRESENTATIONS

#### The Evolution of Sexual Antagonism in Fruit Flies

EMBO POPGEN - POPULATION GENOMICS: BACKGROUND AND TOOLS

Jul 2024

Naples, Italy

#### Compensatory Evolution of Disease Associated Residues in the Mitochondrial Genome

2<sup>ND</sup> UNVEIL SYMPOSIUM 2019

Oct 2019

Lincoln, Nebraska, USA

#### Structural Compensation of Disease Associated Residues in the Mitochondrial Genome

EUROPEAN SOCIETY FOR EVOLUTIONARY BIOLOGY MEETING

Aug 2019

Turku, Finland

#### Mitochondrial Diseases and Compensated Pathogenic Deviations

SOCIETY FOR INTEGRATIVE AND COMPARATIVE BIOLOGY MEETING

Jan 2019

Tampa, Florida, USA

## Genetic and Environmental Factors Underlying the Thermal Sensitivity of Male Reproduction

SOCIETY FOR MOLECULAR BIOLOGY AND EVOLUTION MEETING

Jul 2018

Yokohama, Japan

## Mitochondrial-Nuclear Interactions and the Thermal Sensitivity of Male Reproduction

UNIVERSITY OF NEBRASKA-LINCOLN SPRING RESEARCH FAIR

Apr 2017

Lincoln, Nebraska, USA

## Mitochondrial-Nuclear Interactions and the Thermal Sensitivity of Male Reproduction

58<sup>TH</sup> ANNUAL DROSOPHILA RESEARCH CONFERENCE

Mar 2017

San Diego, California, USA

## Prediction of Protein-Protein Interactions through the use of Statistical Potentials

BIOPHYSICS PASCHIM MEETING

Mar 2015

Mumbai, India

## Comparative Mitogenomic Analysis in the Range-Expanding Populations of *Argiope bruennichi*

QEVOLUTION2014, WORKSHOP ON QUANTITATIVE EVOLUTIONARY BIOLOGY

Sep 2014

Şirince, Turkey

\* Conference cancelled due to COVID-19 concerns

## Outreach

Panel Member at Imperial Lates: Future Cities, <b>Imperial College London</b>	2025
Technology Lead and Ecology Surveyor, <b>The Ealing Beaver Project</b>	2022-Present
BioBlitz Organiser and Surveyor, <b>Ascott Allotments, Ealing, London</b>	2023
Organiser & Lightning Talks and Film Festival Master of Ceremonies, <b>SciComm 2020</b>	2020
My Captain Discover Mentor, <b>The Climber</b>	2018
Scientists in Cars Getting Coffee, <b>Film Festival, SciComm 2018</b>	2018
Master of Ceremonies, Lightning Talks and Film Festival, <b>SciComm 2018</b>	2018
Boys and Girls Science Club, Park Middle School, <b>Lincoln Community Learning Centers</b>	2016-2017
Junior Sunday with a Scientist, <b>Nebraska State Museum</b>	2017
Sunday with a Scientist: Diversity of Life in Nebraska, <b>Nebraska State Museum</b>	2017
Sunday with a Scientist: Darwin Day, <b>Nebraska State Museum</b>	2017
Science Night Live Moderator, <b>SciComm 2016</b>	2016
Sunday with a Scientist: Evolution on the Wing, <b>Nebraska State Museum</b>	2016
Junior Sunday with a Scientist, <b>Nebraska State Museum</b>	2016
Investigate: Show-and-tell Amblypygi, <b>Nebraska State Museum</b>	2016
Science Tutoring for less-privileged high school students, <b>Pune, India</b>	2013-2015

## Teaching

Guest Lecture, <b>BIOL0011 - Evolutionary Genetics</b>	Spring 2023
Teaching Assistant, <b>LIFE 120L - Fundamental Biology Lab I</b>	Fall 2021 - Spring 2022
Guest Lecture, <b>BIOS 897- Communicating Science Through Outreach</b>	Spring 2017, 2018
Teaching Assistant, <b>LIFE 121L - Fundamental Biology Lab II</b>	Fall 2020
Teaching Assistant, <b>LIFE 120L - Fundamental Biology Lab I</b>	Spring 2019
Teaching Assistant, <b>LIFE 120L - Fundamental Biology Lab I</b>	Fall 2016 - Fall 2017
Teaching Assistant, <b>BIOS 101L - General Biology Lab</b>	Fall 2015 - Spring 2016

## Professional Service

Postdoctoral Representative, <b>Genetics, Evolution and Environment, UCL</b>	2022-Present
Organizing Committee, <b>SciComm 2020: A Conference on Effective Science Communication</b>	2020
Graduate Student Representative, <b>UNL oSTEM Conference 2020</b>	2020
Workshop co-organizer: Ethics of Biotechnology Applications to Conservation Biology, <b>UNVEIL Symposium 2018</b>	2018
Grad Student Volunteer, Strategic Vision Committee, <b>School of Biological Sciences, UNL</b>	2018
Vice President, <b>Biology Graduate Students Association, UNL</b>	2017-2019
Undergraduate Poster Judge, <b>UNL Spring Research Fair</b>	2018-2021

## Peer Review

Ecology and Evolution	Genetics
Journal of Evolutionary Biology	G3: Genes Genomes Genetics

## Memberships

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Society for Molecular Biology and Evolution (SMBE)	2018-2025
European Society for Evolutionary Biology (ESEB)	2019-2020
The Society for Integrative and Comparative Biology (SICB)	2019-2020
American Association for the Advancement of Science (AAAS)	2019-2020
Genetics Society of America (GSA)	2017-2019
Society for the Study of Evolution (SSE)	2016-2019
International Society of Arachnologists (ISA)	2016-2017
American Society of Naturalists (ASN)	2014-2015