

# 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 understanding the mechanistic processes behind the diversity of life on Earth. My research integrates empirical and computational approaches to gain a holistic understanding of evolutionary processes. My research interests focus on the interactions between mitochondrial and nuclear genomes, and how these contribute to cellular functions, particularly in the context of mitochondrial diseases in humans. In addition, I also investigate the evolutionary processes shaping genetic conflicts such as mitochondrial-nuclear incompatibilities and the evolution of sex-specific traits. My expertise includes experimental evolution, genomics, statistical modeling, and bioinformatics. I have developed statistical methods to analyze protein-protein interaction stability and used bioinformatics tools for the analysis of complex biological data. My current work involves integrating large datasets from different modalities, such as genomics and single-cell analyses, to uncover underlying biological patterns and their evolutionary significance.

## Publications

### JOURNAL ARTICLES

Chandrasegaram R., Hynes-Allen A.M., Gao B., **Dhawanjewar A.S.**, Frison M., Petridi S., Chinnery P.F., Ma H. & van den Ameel J. 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