ISRAT JAHAN

Graduate Fellow
Evolution, Ecology and Population Biology
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Research Interests

I am broadly interested in how cooperation and conflict drive the evolution of complex life. Specifically, my empirical work focuses on the maintenance and transformation of multicellularity in the social amoebae *Dictyostelium discoideum*. The separation of unicellular and multicellular stages in *D. discoideum* life cycle allows me to investigate evolutionary pressures that shape complex social and life-history traits in multicellular development. My research is theoretically grounded in the principles of social evolution with scientific and philosophical implications for the major evolutionary transitions, germline vs somatic evolution, cell type development, and organismality.

Education

Washington University in St. Louis In Progress
Doctor of Philosophy in Evolution, Ecology and Population Biology
Advisor: Joan E. Strassmann, Ph.D. and David C. Queller, Ph.D.

Indian Institute of Technology, Bombay 2018
Master of Science in Biotechnology

University of Delhi 2016
Bachelor of Science in Biochemistry with Honors

Additional Learning

Janelia Evolution of Multicellularity Workshop, HHMI October 2021
- Two-day online workshop focusing on the mechanisms and selective pressures driving the transition from unicellular to multicellular life
- Covered tools like single cell -omics, cell atlas, and conceptual approaches to understand multicellular regulation

Data Carpentry Workshop on Genomics by the American Naturalists Graduate Council July 2020
- Two-day workshop on genomic analysis of Next Generation Sequencing data
- Covered data wrangling and processing, quality control, alignment, variant calling

Interdisciplinary Study of Cooperation Winter School, ASU January 2020
- Lectures, seminars, and tutorials on fundamental processes underlying cooperation across diverse systems and disciplines
- Presented poster on Evolution of multicellularity in *Dictyostelium discoideum*

Publications

Jahan, I. Larsen, T.J., Strassmann, J.E., and Queller, D.C. Group Maintenance in Aggregative Multicellularity, In: The evolution of multicellularity, eds. Herron, M.D., Conlin, P.L. and Ratcliff, W.C. CRC Press, 2021.

Manuscript under preparation:

Larsen, T.J., **Jahan, I.**, Brock, D.A., Strassmann, J.E., and Queller, D.C. Reduced social function in experimentally evolved *Dictyostelium discoideum* implies selection for social conflict in nature. **Submission: November 2022**

Jahan, I., Scott, T.J., Larsen, T.J., Strassmann, J.E., and Queller, D.C. The evolution of a single celled propagule is insufficiently explained by Wolpert-Szathmary incompatibilities in a multicellular group. **Submission: December 2022**

Jahan, I., Inglis, F., Strassmann, J.E., and Queller, D.C. Germline sequestration in experimentally evolved pseudo-organisms under within and between organism selection. **Submission: 2023**

Stephenson, C., **Jahan, I.,** Strassmann, J.E., and Queller, D.C. Life-history tradeoffs in *D. discoideum* under relaxed selection for social interactions. **Submission: 2023**

Awards, Honors, and Fellowships

Guest in the "Paradox of the Organism" Work Group 2022- Present
Invited by Dr. Arvid Ågren and Dr. Manus Patten to participate in a Templeton Foundation funded work group on the "paradox of the organism".

McDonnell International Scholars Academy

- **Funding for Ph.D. for 5 years ($28,000 every year**) 2018 – Present
- Travel Allowance **($2000 every year**)
- Selected as **Bayer Sponsored Fellow** 2021 – Present

Evolution Conference Registration Fee Waiver June 2022
Student Travel Grant, ASU Interdisciplinary Study of Cooperation Winter School January 2020
M.Sc. Fellowship (**INR 80000**) awarded by Department of Biotechnology, Govt. of India 2016 – 2018
All round Best Student of Daulat Ram College, University of Delhi 2015

Seminars and Presentations

- Revisiting the "egg problem" in the evolution of multicellularity November 2022
  Invited Speaker, Paradox of the Organism Conference, Georgetown University
- Seminar course at Georgetown University September 2022
  Invited Panelist
- The Evolution of Multicellularity January 2022
  Invited Speaker, Daulat Ram College, University of Delhi
- Maintaining a cooperative group: Lessons from the social amoeba *D. discoideum.* November 2021
  Guest Lecturer, Harris Stowe State University, St. Louis (Animal Behavior class)
- Research Perspectives (BIO 4935) September 2021
  Guest Lecturer, Washington University in St. Louis

Research Experience

Graduate Research

- **Dissertation**: Multicellularity and group maintenance in *Dictyostelium discoidium*
  Laboratory of Joan Strassmann, Ph.D., and David Queller, Ph.D. 2019 – Present
  Department of Biology, Washington University in St. Louis

- Rotation Project: Adaptation and bet hedging in yeast under fluctuating selection — Fall 2018
  Performed fitness assays for experimentally evolved yeast populations in the laboratory of Carlos Botero, Ph.D., Department of Biology, Washington University in St. Louis

- Rotation Project: Molecular fossils from Pescadero Basin hydrothermal system — Fall 2018
  Extracted lipids hydrocarbons from carbonate samples to study early life in the laboratory of Alex Bradley, Ph.D., Department of Earth and Planetary Sciences, Washington University in St. Louis

M.Sc. Thesis

Dissertation: Biological and evolutionary study of different pathways taken by the proteins of the relict plastid apicoplast in apicomplexan parasite *Toxoplasma gondii* — 2017 – 2018
Advisor: Swati Patankar, Ph.D., Department of Biosciences and Bioengineering, IIT Bombay
Using techniques of human tissue culture, molecular cloning and confocal microscopy, I showed that the apicoplast membrane protein APT1 does not take an evolutionarily conserved golgi dependent pathway in *Toxoplasma gondii*.

Undergraduate Research

- Hands on training in Drosophila Resource Centre — 2015 –2016
  Project: Elucidation of dosage compensation over generations in *Drosophila melanogaster.*
- Innovation Project on Biomarkers of Heat Stress and Acclimatization — 2014 – 2015
  Project: Biochemical and physiological changes in heat stress and acclimation
  DU Journal of Undergraduate Research, Vol 1, Issue 3, p49-56, 2015

Mentorship

Peer Mentor for Graduate Students — 2021 – 2022
Calum Stephenson and Ellen Urquhart
First-year graduate students in the EEPB program, Washington University

Undergraduate Mentees

- Kayla Wallace, Strassmann-Queller Lab, Washington University — November 2020 – April 2021
- Sara Lichtarge, DBBS Summer Research Program — June – August 2022

Institute Student Mentorship Program, IIT Bombay — 2017- 2018

- Prepared Handbook for the Department of Biosciences
- Mentored five first-year MSc Biotechnology students at IIT Bombay
- As **Department Coordinator**, led a team of six and conducted institute wide post-graduate orientation for 1449 students

Teaching Experience and Training

Mentored Teaching Experience, Washington University in St. Louis
Behavioral Ecology (BIO 472) — Fall 2019

- Assistant to Instructor (Joan Strassmann, Ph.D.) for 34 students
- Leading Discussion section for 13 students

Professional Development in Teaching Program
Centre for Teaching and Learning, Washington University in St. Louis
Foundations in Teaching Workshops — August – October 2019

- Teaching in an American Classroom

- Asking Questions to Improve Learning
- Designing and Delivering a Guest Lecture

STEM Pedagogy workshops — December 2020

- Introduction to Pedagogical Scholarship
- Writing assignments in STEM

Academic Community Service

Center for Diversity and Inclusion (WUSTL) — March 2021 – Present
Graduate Student Member of the Advisory Board

Steering Committee of Evolution, Ecology and Population Biology Program — 2019 – 2021
Graduate Student representative

OUT of the margins: A safe space discussion on sexuality and gender in nature — November 2021

- Organized a workshop with Dr. Anwesha Kundu
- Facilitated a discussion session with **20 International Scholars** across the departments of Biomedical Sciences, Engineering, Law, Social Work, Economics, English, Political Science

Neurodiversity and Allyship Seminar — April 2021

- Panelist for seminar by Neurodiversity at the Workplace
- Organized a training session with the help of **Biology Inclusion Committee** with 60 attendees across the departments of Biology, Chemistry, Physics, Earth & Planetary Sciences, Math & Statistics, and the Academy for Diversity, Equity, & Inclusion

Science Education and Outreach

Science at the Ferguson Farmers Market — September 2019

- Prepared short activities to teach basic evolution and ecology concepts to a general audience at a farmers' market booth
- Collaborated with Dr. Rachel Penczykowski and supervised a Red Queen card game to illustrate host-pathogen interactions

Young Scientist Program

- Director of Finance — 2019
  Served on the executive board and managed funds and grants for YSP finance
- Continuing Mentor — 2018 – 2019
  Mentored two high school students at Soldan International High School, St. Louis

Professional Associations

- American Society of Naturalists (**awarded membership**) — 2022 – Present
- American Association for Advancement of Science (**endorsed membership**) — 2020 – Present
- Society for Study of Evolution — 2018 – Present
- McDonnell International Scholar Academy — 2018 – Present

Programming Languages

R, Python, Bash, C, NetLogo