

YAMINI JANGIR

Microbial Electrochemistry | Astrobiology | Anaerobic Microbiology | Bioinformatics | Geomicrobiology

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I am an early career researcher (visiting assistant professor) in the department of **Space, Planetary, Astronomical Sciences and Engineering (SPASE)** at **Indian Institute of Technology (IIT) Kanpur**.

The focus on fundamental and translational research into the impact of spaceflight on biological systems is of paramount importance for advancing human space exploration and ensuring the sustainability of long-term habitation in both low-Earth orbit and beyond. As a dedicated researcher with a profound passion for **microbes that thrive in extreme environments**, I am eager to deepen my understanding of the physiological and biological challenges posed by space environments and contribute to the development of innovative solutions that will support future sustainable space missions around the world. I have used various microbiological, electrochemical and molecular biological tools including DNA / RNA sequencing, fluorescent in situ hybridization imaging (FISH) coupled with stable isotopic probing (SIP), fluorescent in situ hybridization imaging (FISH) coupled with bioorthogonal non-canonical amino acid labeling (BONCAT), and metabolic modeling to obtain a **deeper understanding of microbe-microbe and microbe-environment interactions**.

I continue to investigate the fundamental underpinnings of electron transfer within synthetic syntrophic microbial communities. Moreover, I am **developing an astrobiology and space biology research program** to undertake : 1) laboratory- and field-based experiments to study lifeforms in extreme and space-like environments, 2) CubeSat- and LEO-payload-based experiments to study the effect of space environment on Earth-based lifeforms, and 3) lab-based experiments to analyze prebiotic compounds that may be present in extraterrestrial rock samples (e.g. asteroid, Moon, Mars).

PUBLICATIONS

- 2025 Redox conduction facilitates direct interspecies electron transport in anaerobic methanotrophic consortia | SCIENCE ADVANCES, ACCEPTED
- 2025 Deep sea anaerobic microbial community couples the degradation of insoluble chitin to extracellular electron transfer | NATURE MICROBIOLOGY, IN REVIEW
- 2025 Planetary analog sites in the Indian subcontinent and the Indian ocean are underexplored environments suited for astrobiological and space research | FRONTIERS IN ASTRONOMY AND SPACE SCIENCES, TO BE SUBMITTED
- 2019 In situ Electrochemical Studies of the Terrestrial Deep Subsurface Biosphere at the Sanford Underground Research Facility, South Dakota, USA | FRONTIERS IN ENERGY RESEARCH
- 2016 Isolation and characterization of electrochemically active subsurface *Delftia* and *Azonexus* species | FRONTIERS IN MICROBIOLOGY
- 2016 Disentangling the roles of free and cytochrome-bound flavins in extracellular electron transport from *Shewanella oneidensis* MR-1 | ELECTROCHIMICA ACTA
- 2014 *Shewanella oneidensis* MR-1 nanowires are outer membrane and periplasmic extensions of the extracellular electron transport components | PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES

PROFESSIONAL EXPERIENCE

Today Feb 2024	Visiting Assistant Professor, SPASE, IIT KANPUR Developing an astrobiology and space biology research laboratory. <ul style="list-style-type: none">› Lab- and field-based experiments to study lifeforms in extreme environments on Earth› CubeSat- and LEO-payload-based experiments to study the effect of space environment on Earth-based lifeforms› Lab-based experiments to analyze physiological changes in microbes under simulated microgravity)› Identifying non-invasive biomarkers suitable for space environment <div>Spaceflight stressors Microgravity Biomarkers</div>
July 2023 Sept 2021	Postdoctoral Research Associate, BBE, CALTECH Unlocking stable co-existence at the aerobic and anaerobic transition in facultative anaerobes. <ul style="list-style-type: none">› Initiated continuous bioreactor to grow denitrifying bacteria at steady state› Study the effect of environmental fluctuations on microbes <div>Chemostat metagenomics and metatranscriptomics single-cell mRNA-FISH particle size analysis</div>
Sept 2021 May 2018	Postdoctoral Trainee, GPS, CALTECH Kinetic investigations of microbial degradation of insoluble chitin degradation coupled with mineral respiration. <ul style="list-style-type: none">› Designed and built anaerobic bioelectrochemical reactor› Enriched a stable microbial community degrading complex insoluble biopolymers and producing electricity› Identified active microbes, chitin-degrading genes, and redox-active processes present in the complex community. <div>16S metagenomics electrochemistry anaerobic microbiology 16S rRNA-FISH Nano-SIMS BONCAT</div>
May 2016 Mar 2012	Graduate Research Assistant, PHYSICS, USC Electrochemical studies of subsurface microorganisms. <ul style="list-style-type: none">› In-situ and ex-situ electrochemical enrichment of electrochemically active microbes from the deep terrestrial subsurface.› Disentangling extracellular electron transport in extensively studied mineral-reducing bacteria. <div>Chronoamperometry pulsed voltammetry fluorescence microscopy microfluidics electron microscopy nanolithography</div>

EDUCATION

- 2016 **Ph.D. (Biophysics)**, University of Southern California, Los Angeles, USA.
2009 **MS (Physics)**, Indian Institute of Technology, Bombay, Maharashtra, India
2007 **BS (Physics)**, University of Delhi, Delhi, India

SELECTED CONFERENCES/ INVITED TALKS

- 2025 It takes two to tango : active crossfeeding in anoxic marine subsurface | INTERNATIONAL MICROBIOME SYMPOSIUM, IIT MADRAS
- 2024 Tale of marine subsurface microbial interaction | AMERICAN SOCIETY FOR MICROBIOLOGY (ASM) MICROBE
- 2022 From chitin degradation to breathing rocks – living in subseafloor sediments | INTERNATIONAL SOCIETY FOR MICROBIAL ELECTROCHEMISTRY AND TECHNOLOGY
- 2021 Stable coexistence at the aerobic and anaerobic transition - an experimental validation | GOLDSCHMIDT CONFERENCE
- 2019 Investigating chitin degrading microbial community in bioelectrochemical reactors | AMERICAN GEOPHYSICAL UNION (AGU), FALL MEETING
- 2018 Investigating continental subsurface biosphere with in situ electrochemical colonization | NORTH-AMERICA INTERNATIONAL SOCIETY FOR MICROBIAL ELECTROCHEMISTRY AND TECHNOLOGY (NA-ISMET)
- 2017 In situ electrochemical enrichment of subsurface bacteria at the Sanford Underground Research Facility | ASTROBIOLOGY SCIENCE CONFERENCE (ABSciCON)
- 2015 Laboratory and In Situ Cultivation of Subsurface Microorganisms | ASTROBIOLOGY SCIENCE CONFERENCE (ABSciCON)
- 2014 Electrode Cultivation of Subsurface Microorganisms | INTERNATIONAL SYMPOSIUM ON SUBSURFACE MICROBIOLOGY (ISSM)

ACADEMIC SERVICE

NASA STAR FELLOW

2024 - 2025

NASA STAR Program

Engaged with hands-on coursework, workshops, and collaborative research designed to bridge microbiology, astrobiology, and space biology.

RESEARCH EXPERT

2024

SSRF meeting

Active domain expert in astrobiology and space biology. Helped frame science priorities and timelines (near/mid/long-term) for India's space biology and astrobiology sectors. Co-authored a white paper, titled AASHA, capturing splinter-group recommendations and thematic priorities.

RESEARCH EXPERT

2024 - TODAY

PROTOPLANET

Developed an astrobiology and space biology collaboration across the globe. Designed purpose-driven training and immersive platform, focused on Climate Conscious Space Exploration. Providing expertise in geomicrobiology and subsurface microbial ecology to Protoplanet's educational and public outreach.

REVIEW EDITOR

2019 - TODAY

Frontiers in microbiology GRL, AGU ScienceDirect Electrochimica Acta iScience, Cell Press

Certified the quality, validity, and clarity of submitted manuscripts. Provided constructive feedback to improve scientific rigor and presentation.

MENTORING AND SCIENCE OUTREACH

- 2025 **Project Mentor (IIT Kanpur, India)**, Led summer internship project for undergraduate students and co-PI for two graduate students
- 2021 **Mentor (California Institute of Technology, USA)**, Trained graduate and SURF undergraduate students on designing research questions in microbial electrochemistry field
- 2016 **Demonstrator (Computing Lab, Department of Physics, University of Oxford, Oxford, UK)**, Introduced first-year physics undergraduate students to programming languages : R, Python, and MATLAB.
- 2016 **Volunteer (Oxford University Museum of Natural History, Oxford, UK)**, Led mineralogy activity within the 'Science Saturday' volunteer group aimed to introduce skills needed to examine and test naturally-occurring mineral specimens.
- 2015 **Mentor (Physics, University of Southern California, USA)**, Advised undergraduate and high school students as part of the Student Opportunities for Academic Research, SOAR-USC, and the Young Research program, YRP-USC, respectively.

AWARDS AND RECOGNITION

- 2025 Travel grant to attend and present at SAMHITA meeting held at SAC, ISRO, Ahmedabad, India
- 2025 Internal IIT Kanpur CARE grant to procure terrestrial microgravity simulator
- 2024 Travel grant to attend and present at the Space Science Roadmap Formulation meeting held at URSC, ISRO, Bangalore, India
- 2018 Travel grant by Center for Environmental Microbial Interactions (CEMI), Caltech, Pasadena, USA
- 2015 Women in Science and Education (WiSE) Merit Fellowship for Current Doctoral Students, USC, Los Angeles, USA
- 2013 Scholarship to attend the International Summer School in Astrobiology in Santander, Spain
- 2009 Research Scholarship by National Institute of Material Sciences, Japan and National University of Singapore, Singapore (Waived)
- 2009 Junior Research Fellowship of the Council of Scientific and Industrial Research (CSIR), India