



Research Interests: Planetary Sciences, Cosmochemistry, Origin of the Solar System

Education

Degree	Institute/Board	CGPA/Percentage	Year
Master of Science (Research)	Indian Institute of Science	-	2023-2024
Bachelor of Science (Research)	Indian Institute of Science	8.1/10	2019-2023
Senior Secondary (Science & Math)	Central Board of Secondary Education	92%	2017-2019
Secondary	Central Board of Secondary Education	10/10	2017

Research Projects

- Investigating HED Petrogenesis and Magmatic Evolution Through In-Situ Trace Element Abundances, and Sm-Nd, Ca, and Oxygen Isotopic Compositions** August 2023 – Present

Master of Science (Research) Thesis Advisors:

Prof. Ramananda Chakrabarti

Dr. Dwijesh Ray

Prof. Mahesh Anand

Indian Institute of Science (IISc, Bangalore)

Physical Research Laboratory (PRL, Ahmedabad)

The Open University (Milton Keynes)

- Will be building upon the work done during my Bachelor's by measuring in-situ and isotopic data to dive deep into HED petrogenesis and the magmatic evolution of Vesta.
- Will investigate the in-situ REE (Rare-Earth Elements) patterns using LA-ICP-MS to analyse the Ce anomalies to understand whether it is a product of terrestrial weathering or an impact related process
- LA-ICP-MS will also help in looking into HSE (Highly Siderophile Elements) abundances in individual grains of pyroxenes and plagioclase to comment upon the pristinity of these samples.
- This work will also include determining the Sm-Nd and Ca isotopic compositions using TIMS, which would tell a story about Vestan differentiation and its crustal evolution, respectively.
- The dating of zircon grains found in Lakangaon will lead to precise determination of the age of highly ferroan basaltic eucrites (like Lakangaon and Nuevo-Laredo).

- Modelling The Sources of Lunar Mare Basalts Mapped by Chandrayaan-2** May 2023 – June 2023

Summer Intern Project Advisor: Dr. Shyama Narendranath

Indian Space Research Organisation (ISRO)

- Modelled the crystallisation pathway of the Lunar Magma Ocean (LMO) using FXMOTR program starting from specific P-T conditions to form cumulate layers of distinct mineral modes and compositions at different depths.
- Gradient descent optimisation algorithm was used to retrieve the contribution from shallow and deep cumulate mantle layers after linear mixing.
- Results of the model are compared with elemental abundances from CLASS data (from Chandrayaan-2) over the mare.
- Manuscript under preparation. Abstract submitted in LEAG 2023. [Link](#)

- Petrogenesis and Geochemistry of Fall HED Meteorites**

Bachelor of Science (Research) Thesis Advisors:

Prof. Ramananda Chakrabarti

Dr. Dwijesh Ray

July 2022 – May 2023

Indian Institute of Science (IISc, Bangalore)

Physical Research Laboratory (PRL, Ahmedabad)

- Petrography of four HED fall (Lakangaon, Piplia Kalan, Lohawat, Vissannapeta) samples under EPMA.
- Acquired the ICP-MS data of these four samples to look at the bulk-rock trends, REE patterns, and HSE (Highly Siderophile Elements) concentrations.

- In this study, an attempt has been made to model the formation of basaltic eucrites using a two-stage model (and a single-stage model for cumulate eucrites) based on the rare-earth element compositions assuming a chondritic (CI) precursor.
- Explored the possibility of impact contamination in eucrites and howardites through MSE (Moderately Siderophile Element) concentrations, and mixing models of pristine eucritic material with carbonaceous chondrites (CM/CR) material.
- Manuscript under preparation. [Link](#) (will be updated by Dec 2023) Thesis [Link](#). Abstract accepted in MetSoc – 2023. [Link](#)

• **The Lakangaon eucrite: a unique, non-cumulate piece of rock from the Vesta**

May 2022 - July 2022

Summer Research Project Advisor: Dr. Dwijesh Ray

Physical Research Laboratory (PRL), Ahmedabad

- Petrography and Petrogenesis of Lakangaon, an Indian Basaltic Eucrite derived from the HED Parent Body.
- Studied mineral chemistry, accessory phases, whole-rock chemistry, and Rare-Earth Element (REE) patterns to understand the formation of this unusually Fe-rich basaltic eucrite on the surface of 4Vesta, using EPMA and ICP-MS.
- Manuscript submitted in Geochemistry - [Link](#). Abstract accepted in MetMESS – 2022. [Link](#)

• **Gas-Solid Reactions Relevant to Planetary Processes**

May 2021 - July 2021

Summer Research Project Advisor: Prof. Penelope King

Research School of Earth Sciences

- Declined offer due to COVID-19 travel restrictions

Australian National University

• **Aqueous alteration in the CM parent bodies in the early Solar System**

May 2021 - Oct 2021

Summer Research Project Advisor: Prof. Ramananda Chakrabarti

Indian Institute of Science (IISc, Bangalore)

- Analyzed the existing data of CM chondrites, their trace element concentration patterns and Ca isotopic composition.
- Studied REE (Rare-Earth Elements) patterns using data from existing studies of various CM1 AND CM2 chondrites.
- Compared mass spectrometric techniques and reference standards corresponding to the papers on calcium isotopes.

Field Training

• **Inter-University Exchange Program on Sustainable Earth**

8 – 23 July, 2023

Niigata University, Japan

- Field training program as part of the Inter-University Exchange Project, Human Resource Development Program on Field Science Research in the Indo-Pacific Region supported by MEXT (Ministry of Education, Culture, Sports, Science and Technology, Japan).
- Studied sedimentary outcrops to understand type of flow, sedimentation, and collected fossils.
- Visited the Fossa Magna Museum (UNESCO Geopark) and the North-American plate - Eurasian plate fault line.
- Visited the labs which study natural hazards at the Niigata University and INPEX company to see their operations on natural gas.

• **Field Trip to KGF (Kolar Gold Fields), Karnataka, India**

26 Feb, 2023

Indian Institute of Science (IISc, Bangalore)

- Field training at Kolar Gold Fields, one of the oldest gold producing mines in the world, which lies on an archaean Dharwar Craton in Southern India.
 - A thin band of banded iron formation runs almost N-S in the western part of the area. Texturally there were four distinct types of amphibolites classified as massive, schistose, granular and fibrous.
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Experience

Presented Abstract at LEAG (Lunar Exploration and Analysis Group) – 2023, titled “Modelling the Sources of Lunar Mare Basalts Mapped by Chandrayaan-2”	20-22 September, 2023
Presented Abstract at MetSoc – 2023, titled “Petrogenesis and Geochemistry of Fall HED Meteorites”	13-18 August, 2023
Presented Abstract at MetMESS – 2022, titled “The Lakangaon eucrite, a unique, non-cumulate piece of rock from the Vesta”	24 - 25 November, 2022
Attended Platinum Planetary Seminar Series (PPP-SS), conducted by Physical Research Laboratory (PRL), Ahmedabad	Jan. 2022 - Nov. 2022
Attended online 'Cosmic Explorations Speaker Series' (CESS) by Lunar and Planetary Institute (LPI)	March 2020 – March 2022
Attended two-day symposium on ‘Meteoroids, Meteors and Meteorites: Messengers from Space’ (MetMESS - 2021) by Physical Research Laboratory (PRL), Ahmedabad	29 - 30 November 2021
Attended two-day 'Lunar Science Workshop 2021' by Indian Space Research Organisation (ISRO)	6 - 7 September 2021

Technical Skills

- **Programming Languages:** C, C++, Python (including Machine Learning libraries), HTML, Git, LATEX
- **Scientific Software and Packages used:** MATLAB, OriginPro, SPICE Suite, SciDavis, Matplotlib, Numpy & Pandas
- **Characterization & Wet Lab:** ICP-MS, TIMS, EPMA

Key Courses Taken

- **Earth and Environmental Sciences:** Introduction to Earth System, Introduction to Basic Geology, Fundamentals of Climate Science, Experimental Methods in Environmental Chemistry, Design Principles in Environmental Engineering, Origin and Evolution of the Earth, Isotope Geochemistry, Introduction to Petrology, Introduction to Satellite Geodesy, Introduction to Chemical Oceanography, Geophysical Processes, Solid Earth Geophysics, Atmosphere Fluid Dynamics
- **CSE & Mathematics:** Algorithms & Programming, Analysis and Linear Algebra (I,II), Probability & Statistics
- **Physics & Engineering:** Introductory Physics- Mechanics, Oscillations and Waves; Electricity, Magnetism and Optics; Modern Physics, Introduction To Electrical And Electronics Engineering, Nanoscience and Device Fabrication, Intermediate Mechanics, Oscillations And Waves, Intermediate Electromagnetism And The Quantum Physics Of Radiation, Intermediate Thermal Physics And The Physics Of Materials, Mathematical Methods Of Physics
- **Others:** Introductory Biology (I,II,III), Basic Chemistry (Physical, Organic, Inorganic), Ways of Doing : Mapping Science - Society Relationship, Mapping India through the Folk Arts, Journalism for Scientists, Introduction to Governance

Positions of Responsibility

- **Co-Founder**, Investments & Learning, a Club under EntIISc* *Nov. 2021 – Nov. 2022*
- **Coordinator**, Pravega** *Oct. 2020 – Sept. 2021*
- **Volunteer**, Notebook Drive*** *Nov. 2019 – Present*
- **Volunteer**, SFRI**** *July 2022 – Present*
- **Tutorial Assistant (TA)** – Undergraduate Earth Science & Mineralogy Course *March 2023 – Present*

Languages

- English, Hindi, & Marathi: Fluent
- Spanish, French, & Japanese: Beginner

* EntIISc is the Entrepreneurship and Innovation Cell of IISc.

** Pravega is the Annual Science, Tech. and Cultural Festival at IISc. Bangalore, organized by the Undergraduate students.

*** Non-profit organization in IISc, which is aimed at improving the quality of education in under-privileged schools in Bangalore.

**** SFRI (Science for Rural India) is a community within IISc, working to improve science education in rural India.