

Surjyendu Bhattacharjee

Postdoctoral Associate
Department of Earth & Planetary Sciences
Yale University

210 Whitney Avenue,
New Haven, CT-06511, USA

E-mail: surjyendu.bhattacharjee@yale.edu
Google Scholar: [Surjyendu Bhattacharjee](#)

Research Interests

Cosmochemistry, isotope geochemistry, aqueous alteration of celestial bodies (Earth, Mars, hydrous asteroids, carbonaceous chondrites), extraterrestrial organics, Secondary Ion Mass Spectrometry, Orbitrap mass spectrometry, first principle quantum mechanical modelling of isotope effects

Education

2019 – 25 *Ph.D. and M.S. (Geochemistry)*, California Institute of Technology (Advisor: John Eiler)
2017 – 19 *M.Sc. (Applied Geology)*, Indian Institute of Technology (IIT), Roorkee
2014 – 17 *B.Sc. (Honors in Geology)*, Jadavpur University

Professional Appointments

2025 – present	<i>Postdoctoral Associate</i> ; Yale University
2019 – 2025	<i>PhD Candidate</i> ; California Institute of Technology
Summer 2019	<i>Visiting Researcher</i> ; Monash University, Australia
Summer 2018, Winter 2019	<i>Visiting Student</i> ; California Institute of Technology
Summer 2017	<i>Undergrad Summer Researcher</i> ; Indian Institute of Technology (IIT), Kanpur
2015 – 2017	<i>Undergrad Research Trainee</i> ; PGE Research Laboratory, Jadavpur University

Grants

Bhattacharjee, S (2024). Goldschmidt travel grant.

Bhattacharjee, S. & Present, T. (2022 – 24) Constraining conditions of Magnesite formation from Mg-Si-O isotopic composition of magnesite-silicates on Earth and Mars. (*Caltech Center for Comparative Planetary Evolution*; US\$ 35,000 for ion-microprobe).

Awards

- SN Bose Visiting Scholar Fellowship; 2018 (Awarded to 20 students pan India)
- University Gold Medal, Jadavpur University; 2017 (Securing highest marks in UG overall)
- Indu Bhusan Putatunda and Shanti Sudha Putatunda Memorial Award Gold Medal, 2016 (Securing highest marks in year 2, UG)
- Ashima and Benoy Krishna Bhattacharyya Memorial Award Gold Medal, 2015 (Securing highest marks in year 1, UG)
- Govt. of India DST-INSPIRE Scholarship for Higher Education; 2014 – 2019 (Awarded to 1% students pan India)

List of Publications

- [1] **Bhattacharjee, S.**, Grewal, D. S., Blättler, C., Zaki, A., Guan, Y., Ma, C., Swindle, C., Sliwinski, M. G., Asimow, P. D., Valley, J. W., Present, T. & Eiler, J. M. (Submitted) *Isotopic evidence that advanced silicate weathering fed a crustal carbonate sink on early Mars*. Science Advances.
- [2] **Bhattacharjee, S.**, Thakur, H., Manilal, V., Kita, N., Guan, Y., Hammett, M., Wostbrock, J. A. G., Wittmann, A., Kitajima, K., Garvie, L. A. J. & Grewal, D. S. (In Revision) *Isotopic evidence that advanced silicate weathering fed a crustal carbonate sink on early Mars*. Science Advances.
- [3] **Bhattacharjee, S.**, Wostbrock, J. A. G., Blättler, C. L., Present, T. M., Śliwiński, M. G., Guan, Y. and Grewal, D. S. (2026). *Accurate in situ C-Mg-Ca isotope ratio analysis in carbonates using SIMS*. Journal of Analytical Atomic Spectrometry.
- [4] Cardarelli, E., Present, T., Vasconcelos, P., Kah, L., Swindle, C., **Bhattacharjee, S.** & Farley, K. (In Revision). *Formation and alteration of magnesite nodules from Kunwarara, Queensland, Australia, as an analogue to Mg-carbonate formation on Mars*. Journal of Geophysical Research: Planets.
- [5] Machado H. G., Mueller E. P., Ribeiro J. C. O., Bevilaqua G. B., Dos Santos G. F., Ferreira A. A., Rocha Y. S., **Bhattacharjee S.**, Eiler J. M. and Gontijo B. (2026). *Lessons Learned in Orbitrap MS-Based Isotope Ratio Analysis of Organic Acid Mixtures*. Analytical Chemistry, 98, 9764–9775.
- [6] Swindle C., Vasconcelos P., Dalleska N., Cardarelli E., **Bhattacharjee S.**, Dimarco Z., Farley K. A. and Present T. (2025). *Trace Element Compositions and Redox Shifts Preserved in Magnesites, Sediments and Soils from the Kunwarara Magnesite Mine*. Applied Geochemistry, 106494.
- [7] Swindle C., Vasconcelos P., Dimarco Z., Dalleska N., Nguyen A., Cardarelli E., **Bhattacharjee S.**, Farley K. and Present T. (2025). *Elemental signatures of metamorphic, diagenetic, and pedogenic magnesites from Central Queensland, Australia*. Chemical Geology, 123068.
- [8] **Bhattacharjee, S.** & Eiler, J. M. (2025). *Kinetics of oxygen isotope exchange between ketones and water using electrospray ionization Orbitrap mass spectrometry, and implications for oxygen isotopic compositions of environmental, geologic and meteoritic organics*. Geochimica et Cosmochimica Acta, 404, 257–273.
- [9] **Bhattacharjee, S.**, Patel, A. S., Cheng, J., Raudsepp, M. J., Wilson, S., Goddard, W. A., Asimow, P. D. & Eiler, J. M. (2025). *Equilibrium carbon, magnesium and position-specific oxygen isotope fractionations in the magnesium carbonate – water – carbon dioxide system based on quantum mechanical calculations and laboratory precipitation experiments*. Geochimica et Cosmochimica Acta, 409, 212–229.
- [10] Grewal, D. S., **Bhattacharjee, S.**, Mardaru, D. & Asimow, P. D. (2025). *Tracing the origin of volatiles on Earth using nitrogen isotope ratios in iron meteorites*. Geochimica et Cosmochimica Acta, 388, 34–47.
- [11] Grewal, D. S., **Bhattacharjee, S.**, Nie, N., Miyazaki, Y. & Zhang, B. (2025). *Enrichment of moderately volatile elements in first-generation planetesimals of the inner Solar System*. Science Advances, 11(6), eadq7848.
- [12] **Bhattacharjee, S.** & Eiler, J. M. (2024). *Oxygen isotope equilibria of O-bearing organic compounds based on first principle quantum mechanical models, and implications for their use in the study of extraterrestrial organics*. Geochimica et Cosmochimica Acta, 380, 96–111.
- [13] Zeichner, S. S., Aponte, J. C., **Bhattacharjee, S.**, Dong, G., Hofmann, A. E., Dworkin, J. P., ... & Eiler, J. M. (2023). *Polycyclic aromatic hydrocarbons in samples of Ryugu formed in the interstellar medium*. Science, 382(6677), 1411–1416.

- [14] Csernica, T., **Bhattacharjee, S.**, & Eiler, J. (2023). *Accuracy and precision of ESI-Orbitrap-IRMS observations of hours to tens of hours via reservoir injection*. International Journal of Mass Spectrometry, 490, 117084.
- [15] Chowdhury, P., Mulder, J.A., Cawood, P.A., **Bhattacharjee, S.**, Roy, S., Wainwright, A.N., Nebel, O. & Mukherjee, S. (2021). *Magmatic thickening of crust in non-plate tectonic settings initiated the subaerial rise of Earth's first continents 3.3 to 3.2 billion years ago*. Proceedings of the National Academy of Sciences, 118(46).
- [16] Scheller, E.L., Swindle, C., Grotzinger, J., Barnhart, H., **Bhattacharjee, S.**, Ehlmann, B. L., Farley, K., Fischer, W. W., Greenberger, R., & Ingalls, M. (2021). *Formation of Magnesium Carbonates on Earth and Implications for Mars*. Journal of Geophysical Research: Planets, 126(7), e2021JE006828.
- [17] **Bhattacharjee, S.**, Mulder, J.A., Roy, S., Chowdhury, P., Cawood, P.A. & Nebel, O. (2021). *Unravelling depositional setting, age and provenance of the Simlipal volcano-sedimentary complex, Singhbhum craton: Evidence for Hadean crust and Mesoarchean marginal marine sedimentation*. Precambrian Research 354, 106038.
- [18] Dey, J., Sen, S. & **Bhattacharjee, S.** (2018). *Geophysical log-based coal characterization of middle Permian Barakar Formation from North Karanpura Coal Field, India*. Journal Geological Society of India, Vol.92, pp.36-44.

In Preparation

- [1] **Bhattacharjee, S.** & Grewal, D. S. *Mg isotopes reveal post-serpentinization carbonate formation in CI-like planetesimals*. (For Nature Astronomy).

Conference Activity

- [1] Guan, Y., **Bhattacharjee, S.** & Grewal, D. S. (2025). *⁵³Mn-⁵³Cr Systematics of Carbonates from Oued Chebeika 002 and Tarda Carbonaceous Chondrites*. Annual Meetings of the Meteoritical Society, LPI Contribution No. 3088, 5136.
- [2] **Bhattacharjee, S.**, Present, T., Blättler, C., Grewal, D. S., Guan, Y., Ma, C., Swindle, C., Sliwinski, M. G., Asimow, P. D., Valley, J. W. & Eiler, J. M. (2024). *Mg isotope evidence that magnesite in Martian meteorite ALH84001 precipitated as hydromagnesite*. Goldschmidt.
- [3] **Bhattacharjee, S.**, Present, T., Swindle, C., Blättler, C., Grewal, D. S., Guan, Y., Ma, C., Asimow, P. D., Valley, J. W. & Eiler, J. M. (2024). *Tracking near-surface aqueous alteration processes on Earth and ancient Mars with multiple stable isotopes in magnesite*. Tenth International Conference on Mars, 3531.
- [4] Swindle, C. R., Vasconcelos, P., Dimarco, Z., Dalleska, N., Cardarelli, E., **Bhattacharjee, S.**, Farley, K. A. & Present, T. (2024). *Near-surface aqueous conditions inferred from the composition of magnesites from central Queensland, Australia: a Jezero Crater analog*. Tenth International Conference on Mars, 3512.
- [5] Present, T., Swindle, C. R., **Bhattacharjee, S.**, Cardarelli, E., Dimarco, Z., Moore, K. R., Eitel, E. M., Jangir, M., Christensen, M., Farley, K. A. & Vasconcelos, P. (2024). *Magnecretes: Formation and alteration of magnesium carbonates in groundwater and regolith in central Queensland, Australia, and processes relevant to martian carbonate deposits*. The Geological Society of America Connects, 56(5).

- [6] **Bhattacharjee, S., & Eiler, J. M. (2022).** *Triple oxygen isotope fractionation between O-bearing organic compounds and water, and their possible uses to study extraterrestrial organics.* Goldschmidt.
- [7] **Bhattacharjee, S., Ryb, U., Eiler, J. M. & Asimow, P.D. (2020).** *Structural and isotopic reordering in magnesite: Insights from heating experiments.* Goldschmidt
- [8] **Bhattacharjee, S. & Sarkar, S. (2018).** *Geochemical and sedimentological investigation of unusual heavy mineral lamination in tidal flat of Chandipur, Odisha, India: Probable influence of anthropological activity.* Geological Society of America Abstracts with Programs. 50(6).
- [9] **Bhattacharjee, S. & Chatterjee, A.P. (2017).** *Manipur Ophiolitic Complex as a prospective host for microdiamonds in Eastern Himalaya, India.* Geological Society of America Abstracts with Programs; 49(6).
- [10] **Bhattacharjee, S. & Mondal, S.K. (2016).** *Detrital chromites: Parental magmas and probable tectonic settings.* Annual General Meeting-2016, Geological Society of India, Conference Abstract Volume, Page- 79-82.

Invited talks

- [1] **Bhattacharjee, S.** "Mg isotope analysis of carbonate minerals with ion microprobe". *SIMS Workshop*, Chicago, IL, USA (2024).
- [2] **Bhattacharjee, S.** "Oxygen Isotope Studies of the Roles of Nebular CO and H₂O in Prebiotic Organic Synthesis". *Caltech Center for Comparative Planetary Evolution Symposium*, Pasadena, CA, USA (2022).

Media Feature

[News Article](#): "Earth's first continents emerged from the ocean more than 3 BILLION years ago - 700 million years earlier than previously thought, study claims", *The Daily Mail*.

Teaching & Mentoring Experience

Summer 2026	Mentor for visiting UG summer research student Tengxu Wang (ASU)
Summer 2026	Mentor for UG summer research student Macie Liepe (Yale University)
Fall 2024	Caltech Accountability Partners Program mentor for Zhuoyi Wang (UG, Colorado School of Mines)
Fall 2024	Caltech GPS Buddy Program mentor for graduate student Shounak Dutta (Graduate, Caltech)
Summer 2023	Summer student co-mentor for Mehul Jangir, <i>Caltech</i> .
Winter 2022, 2024	Teaching Assistant; <i>Ge 116: Analytical Techniques Laboratory</i> (SEM, EPMA, XRD; optical, FTIR, Raman spectroscopy, ICPMS); <i>Caltech</i> .

Spring 2023 Teaching Assistant; *Ge 214*: Spectroscopy of Minerals (Visible, infrared, Raman, and Mössbauer spectroscopies as applied to mineralogical problems such as phase identification, chemical analysis, site populations, and origin of color and pleochroism); *Caltech*.

Academic Services

2026– present Co-reviewer, *Nature Communications*
 2024– present Core member, KC Mitra Travel Grant team
 2014 – present Member, European Association of Geochemistry (EAG).
 2021 – 2022 Organizer, Caltech Geoclub Seminar Series.
 2023 – present Group leader and group meeting organizer, Eiler Research Group.

Experience and Skills

Field Experience: Archean carton and sedimentary successions (Singhbhum Craton, India).
 Proterozoic granite - gneissic complex (CGGC, India).
 Modern tidal and estuarine sedimentary environment (Chandipur, India).
 Paleoproterozoic metamorphic terrane (CITZ, India).
 Proterozoic metasomatic Uranium ore deposits (Rajasthan, India).
 Archean granulite terrane (SGT, India).
 Death Valley (CA, USA).
 Metamorphic and volcanic terranes, New Zealand.

Mass-spectrometry: Orbitrap mass spectrometry (Thermo Q Exactive HF ESI and GC Orbitraps).
 SIMS (IMS 7f-GEO, IMS 1280).
 ICMPS (Thermo Neptune and Agilent 8800 Triple Quadrupole ICP-MS).
 EA-IRMS (Isolink CN and Thermo Scientific Delta-V+).
 Carbonate clumped isotope analysis (Thermo MAT 253).
 Cavity Ring Down Spectroscopy (Picarro).
 Accelerator mass spectrometry (¹⁴C dating, UC Irvine).

Coding, visualization: Python, MATLAB, Adobe Creative Studio, Affinity Designer.

QM Calculation: Density functional theory and molecular dynamics with ENTOS, VASP, ORCA, Jaguar, Gaussian, LAMMPS, VESTA, Avogadro, OVITO.

Experimental: Cold seal (TzM) apparatus, Piston-Cylinder apparatus and assembly.

Micro-analytical: SEM, EPMA, XRD, μ -XRF, ATR-FTIR, Raman spectroscopy.