

DAMANVEER S. GREWAL

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EDUCATION

- 2016-Present **PhD (Geochemistry/Planetary Science)**
Rice University, Houston, USA
Origin of nitrogen and carbon in rocky bodies of the inner Solar System
- 2007-2012 **Integrated MSc (Applied Geology)**
Indian Institute of Technology (IIT), Kharagpur, India

PROFESSIONAL APPOINTMENTS

- 2022 (January) Barr Foundation Postdoctoral Fellow, California Institute of Technology, Pasadena, USA
- 2016-Present Research Assistant, Rice University, Houston, USA
- 2014-15 Chemistry Teacher, Lakshya Institute, Patiala, India
- 2012-14 Chemistry Teacher, iQuest Eduventures, Patiala, India
- 2010 Research Intern, Christian-Albrechts-Universität zu Kiel, Germany

GRANTS, FELLOWSHIPS, AND AWARDS

- 2022 Barr Foundation Postdoctoral Fellowship, California Institute of Technology (\$136,500)
- 2021 Alexander von Humboldt Postdoctoral Fellowship (€73,680) *deferred*
- 2021 SESE Exploration Postdoctoral Fellowship, Arizona State University (\$247,000) *declined*
- 2021 Outstanding Graduate Student Award, Rice University (\$2000)
- 2021 Goldschmidt Registration Grant
- 2019 Future Investigators in NASA Earth and Space Science and Technology (FINNEST) (\$90,000)
- 2019 Lodieska Stockbridge Vaughn Fellowship, Rice University (\$16,750)
- 2019 Torkild Rieber Award in Geology, Rice University (\$2000)
- 2019 Goldschmidt Travel Grant (\$1000)
- 2018 Goldschmidt Travel Grant (\$1800)
- 2015 Award for teaching excellence, Lakshya Institute
- 2014 Best teacher, iQuest Eduventures
- 2013 Best teacher, iQuest Eduventures
- 2007 Innovation in Science Pursuit for Inspired Research, Department of Science and Technology, India

PEER-REVIEWED ARTICLES

Published

(# designates supervised interns)

9. **Grewal, D.S.**, Dasgupta, R., Aithala, S.[#] (2021) The effect of carbon concentration on its core-mantle partitioning behavior in inner Solar System rocky bodies. *Earth and Planetary Science Letters*. doi: [10.1016/j.epsl.2021.117090](https://doi.org/10.1016/j.epsl.2021.117090)
8. **Grewal, D.S.**, Dasgupta, R., Hough T.[#], Farnell, A.[#] (2021) Rates of protoplanetary accretion and differentiation set nitrogen budget of rocky planets. *Nature Geoscience* **14**: 369-376. doi: [10.1038/s41561-021-00733-0](https://doi.org/10.1038/s41561-021-00733-0)

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7. **Grewal, D.S.**, Dasgupta, R., Marty, B. (2021) A very early origin of nitrogen in inner Solar System protoplanets. *Nature Astronomy* **5**: 356-364. doi: [10.1038/s41550-020-01283-y](https://doi.org/10.1038/s41550-020-01283-y)
6. **Grewal, D.S.**, Dasgupta, R., Farnell, A.[#] (2020) The speciation of carbon, nitrogen, and water in magma oceans and its effect on volatile partitioning between major reservoirs of the Solar System rocky bodies. *Geochimica et Cosmochimica Acta* **280**: 281-301. doi: [10.1016/j.gca.2020.04.023](https://doi.org/10.1016/j.gca.2020.04.023)
5. Dasgupta, R., **Grewal, D.S.** (2019). Origin and Early Differentiation of Carbon and Associated Life-Essential Volatile Elements on Earth. In Orcutt, B., Daniel, I., Dasgupta, R. (Eds.) *Deep Carbon: Past to Present* (Cambridge University Press). 4-39. doi: [10.1017/9781108677950.002](https://doi.org/10.1017/9781108677950.002)
4. Hakim, K., Spaargaren, R., **Grewal D.S.**, Rohrbach A., Brendt J., Dominik, C., van Westrenen, W. (2019) A laboratory approach to probe the mineralogy of carbon-rich rocky exoplanets. *Astrobiology* **9**: Number 7. doi: [10.1089/ast.2018.1930](https://doi.org/10.1089/ast.2018.1930)
3. **Grewal, D.S.**, Dasgupta, R., Holmes, A.K.[#], Costin, G, Li Y., Tsuno K. (2019) The fate of nitrogen during core-mantle separation on Earth. *Geochimica et Cosmochimica Acta* **251**: 87-115. doi: [10.1016/j.gca.2019.02.009](https://doi.org/10.1016/j.gca.2019.02.009)
2. **Grewal, D.S.**, Dasgupta, R., Sun, C., Tsuno K., Costin, G. (2019) Delivery of Carbon, Nitrogen and Sulfur to the Silicate Earth. *Science Advances* **5**: eaau3669. doi: [10.1126/sciadv.aau3669](https://doi.org/10.1126/sciadv.aau3669)
1. Tsuno, K., **Grewal, D.S.**, Dasgupta, R. (2018). Core-mantle fractionation of carbon in Earth and Mars: The effects of sulfur. *Geochimica et Cosmochimica Acta* **238**: 477-495. doi: [10.1016/j.gca.2018.07.010](https://doi.org/10.1016/j.gca.2018.07.010)

Under review

10. **Grewal, D.S.**, Seales, J., Dasgupta, R. (202x) Magma Ocean differentiation regime of Solar System's earliest protoplanets constrained by nitrogen and carbon fractionation. *Earth and Planetary Science Letters*

In preparation

([#] designates supervised interns)

11. **Grewal, D.S.**, Sun, T., Aithala[#], S., Hough T.[#], Dasgupta, R., Yeung, L., Schauble, E. (202x) Minimal nitrogen isotope fractionation during core-mantle differentiation.

SEMINARS AND COLLOQUIA

- **Grewal, D.S.** A very early origin of nitrogen in inner Solar System protoplanets. *Prebiotic Chemistry and Early Earth Environments Consortium Seminar Series* (August 2021)
- **Grewal, D.S.** Origin of nitrogen in the inner Solar System protoplanets and planets. *Geodynamics Research Center, Ehime University* (June 2021)
- **Grewal, D.S.** Origin of nitrogen in the inner Solar System protoplanets and planets. *University of Cambridge (Geochemistry group)* (June 2021)
- **Grewal, D.S.** Origin of nitrogen in the inner Solar System protoplanets and planets. *CRPG Nancy* (April 2021)
- **Grewal, D.S.** Origin of major volatiles in rocky bodies of the inner Solar System. *University of California, Riverside (Biogeochemistry group)* (April 2020)

PRESENTATIONS AT SCIENTIFIC MEETINGS AND CONFERENCES

(* designates presenting author, [#] designates supervised interns)

31. **Grewal, D.S.***, Dasgupta, R., Aithala, S.[#] The effect of carbon concentration on its core-mantle partitioning behavior in inner Solar System rocky bodies. *American Geophysical Union Fall Meeting* (December 2021) [ORAL]

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30. **Grewal, D.S.***, Dasgupta, R., Hough T.[#], Farnell, A.[#] Rates of protoplanetary accretion and differentiation set nitrogen budget of rocky planets. *American Geophysical Union Fall Meeting* (December 2021) [ORAL]
29. **Grewal, D.S.***, Dasgupta, R., Marty, B. A very early origin of nitrogen in inner Solar System protoplanets. *Goldschmidt Conference* (July 2021) [ORAL] *Invited*
28. Dasgupta, R.*, **Grewal, D.S.**, Hough T.[#], Farnell, A.[#] (2021) Nitrogen depletion in the inner Solar System planets linked to the rates of protoplanetary accretion and differentiation. *Goldschmidt Conference* (July 2021) [ORAL]
27. **Grewal, D.S.***, Dasgupta, R., Marty, B. A very early origin of nitrogen in inner Solar System protoplanets. *Lunar and Planetary Science Conference* (July 2021) [ORAL]
26. **Grewal, D.S.***, Dasgupta, R., Marty, B. A very early origin of nitrogen in inner Solar System protoplanets. *Habitable Worlds Workshop* (February 2021) [POSTER]
25. **Grewal, D.S.***, Dasgupta, R. Magma Ocean differentiation regime in the earliest formed rocky bodies - Internal or External? *Habitable Worlds Workshop* (February 2021) [POSTER]
24. **Grewal, D.S.***, Dasgupta, R., Aithala, S.[#] The effect of bulk carbon on its core-mantle partitioning behavior. *American Geophysical Union Fall Meeting* (December 2020) [ORAL]
23. Dasgupta, R., **Grewal, D.S.*** Magma Ocean differentiation regime in the earliest formed rocky bodies inferred from volatile abundances in iron meteorites. *American Geophysical Union Fall Meeting* (December 2020) [ORAL]
22. **Grewal, D.S.***, Dasgupta, R. The Effect of Differentiation via Internal Versus External Magma Oceans on the Carbon and Nitrogen Budgets of Rocky Planets. *Goldschmidt Conference* (June 2020) [ORAL]
21. **Grewal, D.S.***, Hough T.[#], Dasgupta, R., Aithala, S.[#] Protoplanetary Differentiation is the Primary Cause of Nitrogen Depletion in Bulk Silicate Reservoirs of Rocky Bodies. *Lunar and Planetary Science Conference* (March 2020) [ORAL] *Cancelled due to COVID-19*
20. **Grewal, D.S.***, Dasgupta, R., Hough T.[#] The core-mantle partitioning of carbon and nitrogen in carbon-undersaturated ultramafic systems. *American Geophysical Union Fall Meeting* (December 2019) [POSTER]
19. **Grewal, D.S.***, Hough T.[#], Dasgupta, R. The core-mantle partitioning of nitrogen in carbon-undersaturated ultramafic Systems. *Goldschmidt Conference* (August 2019) [ORAL]
18. Dasgupta, R.*, **Grewal, D.S.**, Tsuno K. Control of Accretion and Early Differentiation Process on the Diversity of Volatile Inventory of Rocky Solar System Objects. *Goldschmidt Conference* (August 2019) [ORAL]
17. Dasgupta, R.*, **Grewal, D.S.**, Tsuno K. Origin of Life-essential Volatile Elements in Rocky Planets – Insights from Accretion and Early Differentiation of Inner Solar System Objects. *Astrobiology Science Conference* (June 2019) [ORAL]
16. **Grewal, D.S.***, Dasgupta, R., Holmes, A.K.[#], Costin, G, Li Y., Tsuno K. The fate of nitrogen during core-mantle separation. *Lunar and Planetary Science Conference* (March 2019) [ORAL]
15. **Grewal, D.S.***, Dasgupta, R., Farnell, A.[#], Hough T.[#], Costin, G, Tsuno K, Li Y., Holmes, A.K. The compositions of the early atmospheres formed by magma ocean degassing. *Lunar and Planetary Science Conference* (March 2019) [POSTER]
14. Dasgupta, R., **Grewal, D.S.***, Sun, C., Tsuno, K., Costin, G. The Origin of Earth's Major Volatiles via Accretion of a Large Planetary Embryo. *Lunar and Planetary Science Conference* (March 2019) [POSTER]

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13. **Grewal, D.S.***, Dasgupta, R., Farnell, A.[#], Hough T.[#], Costin, G, Tsuno K, Li Y., Holmes, A.K. Evolution of the C/N ratio of the Bulk Silicate Earth as a probe to understand the roles of volatile accretion and differentiation. *American Geophysical Union Fall Meeting* (December 2018) [POSTER]
12. Dasgupta, R.*, **Grewal, D.S.** Origin and Early Differentiation of Carbon and Associated Life-Essential Volatile Elements on Earth. *American Geophysical Union Fall Meeting* (December 2018) [POSTER]
11. **Grewal, D.S.***, Dasgupta, R., Holmes, A.K.[#], Costin, G, Li Y., Tsuno K. The fate of nitrogen during core-mantle separation on Earth. *Goldschmidt Conference* (August 2018) [ORAL]
10. **Grewal, D.S.***, Dasgupta, R., Costin, G, Tsuno K, Li Y., Holmes, A.K.[#] Evolution of the C/N ratio of the Bulk Silicate Earth as a probe to understand the roles of volatile accretion and differentiation. *Gordon Research Conference* (June 2018) [POSTER]
9. **Grewal, D.S.***, Dasgupta, R., Sun, C., Tsuno K., Costin, G. Delivery of Carbon, Nitrogen and Sulfur to the Silicate Earth. *Carbon in the Solar System Workshop* (April 2018) [ORAL]
8. **Grewal, D.S.***, Dasgupta, R. The origin of volatiles on Earth. *Pre-IRESS Workshop, Rice University* (February 2018) [ORAL]
7. **Grewal, D.S.***, Dasgupta, R., Sun, C., Tsuno, K. Simultaneous alloy-silicate fractionation of carbon, nitrogen, and sulfur at high pressures and temperatures: Implications for establishing the volatile budget of the Earth. *American Geophysical Union Fall Meeting* (December 2017) [ORAL]
6. Tsuno, K.*, Dasgupta, R., **Grewal, D.S.** The effects of sulfur on carbon partitioning and solubility in high pressure-temperature alloy-silicate systems: Implications for fractionation of carbon and sulfur during accretion and core formation of Earth and Mars. *American Geophysical Union Fall Meeting* (December 2017) [ORAL]
5. **Grewal, D.S.***, Dasgupta, R., Sun, C., Tsuno, K., Costin, G. Delivery of Carbon, Nitrogen and Sulfur to the Silicate Earth by a Giant Impact. *Deep Carbon Observatory Extreme Physics and Chemistry Workshop, Arizona State University* (November 2017) [ORAL]
4. Tsuno, K.*, Dasgupta, R., **Grewal, D.S.** The effects of sulfur on carbon partitioning and solubility in high pressure-temperature alloy-silicate systems. *Deep Carbon Observatory Extreme Physics and Chemistry Workshop, Arizona State University* (November 2017) [POSTER]
3. **Grewal, D.S.***, Dasgupta, R., Sun, C., Tsuno, K., Costin, G. Delivery of Carbon, Nitrogen and Sulfur to the Silicate Earth by a Giant Impact. *Graduate Interdisciplinary Earth Science Symposia, Rice University* (November 2017) [ORAL]
2. **Grewal, D.S.***, Dasgupta, R., Tsuno, K. Simultaneous alloy-silicate fractionation of carbon, nitrogen, and sulfur at high pressures and temperatures: Implications for establishing the volatile budget of the Earth. *Gordon Research Conference* (June 2017). [POSTER]
1. Tsuno, K.*, Dasgupta, R., **Grewal, D.S.** The effects of sulfur on carbon partitioning and solubility in high pressure-temperature alloy-silicate systems. *Gordon Research Conference* (June 2017). [POSTER]

SELECTED POPULAR MEDIA COVERAGE

- *Our Nature Geoscience* (2021) was covered by [Universe Today](#), [CosmoQuest](#), [Science Daily](#), [Centauri Dreams](#), [Space Daily](#), [Newswise](#), [Phys.org](#), and [Scienmag](#), amongst other news outlets.
- *Our Nature Astronomy* (2021) was covered by [Many Worlds](#), [EOS](#), [TechExplorist](#), [Medium](#), [Science Daily](#), [Phys.org](#), [Sciencenewsnet](#), and [SciTechDaily](#), amongst other news outlets.
- Our *Science Advances* (2019) paper had one of the highest altimetric score of research published in geochemistry/planetary science ([1435](#); top 0.02% of all research papers ever tracked) with press

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release being covered by 161 news outlets across the globe including [CNN](#), [BBC](#), [The Guardian](#), [Daily Mail](#), [Spain's News](#), [Times of India](#), [China Daily](#), [Phys.org](#), [Universe Today](#), [Space Daily](#), [Sky News](#), [Space.com](#), [Yahoo News](#), [USA Today](#), [Vice](#), [Science Daily](#), [Gizmodo](#), [Sky & Telescope](#), [The Wire](#), and [Inverse](#).

SCIENCE ARTICLES

- **Grewal, D.S.**, Furtney, M. When planets collide: Origin of life on Earth. *The Science Breaker* (under review)
- **Grewal, D.S.**, Lv, M., Dorfman, S. Press Release - *Extreme Physics and Chemistry Community Workshop*, Arizona State University, USA. *Deep Carbon Observatory* (November 2017)

SYNERGISTIC ACTIVITIES

Academic

- | | |
|--------------|---|
| 2021 | Co-organizer, CLEVER Planets Seminar Series |
| 2020 | Panelist, Session: Forming Habitable Worlds, Habitable Worlds 2021 Workshop |
| 2017-Present | Reviewer for <i>Earth and Planetary Science Letters</i> , <i>Geochemical Perspectives Letters</i> , <i>Geochimica et Cosmochimica Acta</i> , <i>Journal of Geophysical Research: Planets</i> , <i>Nature Communications</i> , and <i>Science Advances</i> |

Non-academic

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| 2021 | Member of Unlearning Racism in Geosciences (URGE) Admissions and Hiring Policies Group, Rice University, Houston (USA) |
| 2021 | Member of URGE Policies for Working with Communities of Color Group, Rice University, Houston (USA) |
| 2021 | Volunteer Speaker for Department of Earth, Environmental and Planetary Sciences, O-Week Academic Fair, Rice University, Houston (USA) |
| 2012-15 | Volunteer teacher, Tibetan Village Children's School, Suja (India) |
| 2012-14 | Volunteer student recruiter and teacher, Pehal Charitable Trust, Patiala (India) |

PRACTICAL AND ANALYTICAL PROFICIENCY

Performing high P-T experiments using piston-cylinder and multi-anvil apparatus, Electron Probe Micro Analyzer (EPMA), Fourier Transform Infrared Spectroscopy (FTIR), Raman Spectroscopy, programming in MATLAB, and Secondary Ion Mass Spectrometry (in collaboration with others)

TEACHING EXPERIENCE

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| 2020 | Lecturer for ESCI 114 – Discoveries in Earth, Environmental and Planetary Sciences |
| 2019 | Lecturer for ESCI 114 – Discoveries in Earth, Environmental and Planetary Sciences |
| 2018 | Guest Lecturer for ESCI 412/612 – Advanced Petrology |
| 2012-15 | Lectures on undergraduate level Physical, Organic and Inorganic Chemistry to more than 800 students for engineering, medical and science university entrance examinations |
| 2012-15 | Lectures on Physical, Organic and Inorganic Chemistry for International and National Chemistry Olympiads |

RESEARCH SUPERVISION

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| 2019-20 | Melinda Zhou (high school student from Mayde Creek High School, Katy) |
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2019-20	Sanath Aithala (undergraduate from University of Houston)
2019	Naod Araya (undergraduate thesis co-supervisor at Rice University)
2019	Ryan Anselm (high school student from Clemens High School, Sugarland)
2018-19	Alexandra Farnell (high school student from St. John's School, Houston)
2018-19	Taylor Hough (undergraduate student from Brown University)
2017	Rohil P. Bathija (high school student from Awty International School, Houston)
2016-18	Alexandra K. Holmes (undergraduate thesis co-supervisor at Rice University)

GEOLOGICAL FIELD EXPERIENCE

2017	Study of volcanic eruption deposits and collecting xenoliths, South California, USA
2015	Study of volcanic deposits in the Cascades, USA
2011	Structural mapping of a complex metamorphic terrain in the Eastern Ghats Province, Angul (Eastern India)
2010	Reconstruction of Paleocurrent direction and Paleostratigraphy in the Rewa Basin, Madhya Pradesh (Eastern India)
2010	Strike mapping and ore volume estimation in an underground Uranium mine, Jaduguda (Eastern India)
2009	Mapping in a sedimentary-metamorphic terrain of the Singhbhum Shear Zone Jharkhand (Eastern India)
2008	Structural mapping and identification of deformation structures in a Precambrian orogenic belt, Ghatshila (Eastern India)

MEMBERSHIP WITH PROFESSIONAL SOCIETIES

2018-Present	Geochemical Society
2016-Present	American Geophysical Union