

# Ritabrata Dobe - *Curriculum vitae et studiorum*

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## RESEARCH TOPICS

### ***Structural geology, metamorphic petrology, microstructure, tectonics***

My main research interests are focused on studying the effects of reducing fluids on the rheology of the Earth's crust. I study the genesis of reducing fluids, their transport pathways in the Earth's crust, and the modifications they induce in the deformation behavior of constituent components of the Earth's crust. My research methods involve geological mapping and structural analysis, microstructural characterization and analyses and modelling (thermodynamic and finite-element). In my analyses on large-scale dynamic systems, structural field-derived datasets are integrated with microstructural, petrological and high and low-temperature geochemical studies using optical microscopy, SEM-EDS, EBSD, Electron Microprobe, Micro-CT, and Atomic Force Microscopy. My scientific questions are addressed using a multidisciplinary approach, working in collaboration with scientists from other branches of geosciences, as well as scientists from metallurgy and chemical engineering.

## EDUCATION

**PhD**– Indian Institute of Technology, Kharagpur (March 2022). Thesis title: *Geological studies across the Singhbhum Craton-Rengali Province boundary: insights into continental crustal processes using novel petrofabric analytical techniques*

**Advisors:** Saibal Gupta; Co-advisor: Mruganka Kumar Panigrahi (Indian Institute of Technology, Kharagpur)

**(M.Sc.) Master of Science in Geology**- Indian Institute of Technology, Kharagpur (July 2014).

Thesis title: *Petrographic and Fluid Inclusion Studies of Charnockites and Enderbites from the Angul Domain of the Eastern Ghats Mobile Belt*

**Advisors:** Saibal Gupta; Co-advisor: Mruganka Kumar Panigrahi (Indian Institute of Technology, Kharagpur)

**(B.Sc.) Bachelor of Science in Geology**- (*graduated with first class honours*), Presidency College, Kolkata, June 2012

## AWARDS

- (*B.Sc.*) Awarded the Chandranath Mitra medal by Presidency College, Kolkata for securing the highest marks in geology in the part I and part II undergraduate examinations conducted by Calcutta University
- Awarded a Student Travel Grant by the American Geophysical Union to attend the AGU Fall Meeting 2019
- Awarded a Fall Meeting Virtual Berkner Travel Fellowship by the American Geophysical Union for AGU Fall Meeting 2020

## FUNDED RESEARCH ACTIVITIES AND SCHOLARSHIPS

**2014-2019:** Council for Scientific and Industrial Research (CSIR) Senior Research Fellow (SRF); *Project title: Tectonism, Fluid Mobility and Crustal Evolution Studies along the Southeastern Margin of the Singhbhum Craton, Odisha, India*

**2023-2025:** Postdoctoral researcher (ERC project DeepSeep) at the Department of Biological, Geological and Environmental Sciences, Alma Mater Studiorum, University of Bologna. Mentored by Professor Alberto Vitale Brovarone (alberto.vitaleb@unibo.it).

## FIELDWORK

*Bachelor of Science:*

- Structural analysis and sedimentary formations mapping: 3 weeks in 2009, *Kalka (India)*.
- Structural analysis and regional mapping: 3 weeks in 2010, *Rajasthan (India)*
- Structural analysis and regional mapping of ore-bearing litho-units: 3 weeks in 2011, *Nagpur (India)*

*Master of Science:*

- Reconstruction of tectonic events and deformation history of the granulites of the Eastern Ghats Mobile Belt: 3 weeks in 2012, *Angul, (India)*
- Regional mapping and basin analysis: 2 weeks in 2013, *Jharkhand, (India)*

*PhD:*

- Structural analysis, metamorphic imprints, tectonic reconstructions and determination of deformation history along the southeastern margin of the Singhbhum Craton, *Odisha, (India)*

## TEACHING AND MENTORING EXPERIENCE

- Teaching assistant in the igneous petrogenesis laboratory course for M.Sc. first year students (2015-2020)
- Supervision of students' master thesis (*M.Sc.*): field logistics (Odisha, India) and scientific mentoring with Professor Saibal Gupta at Indian Institute of Technology, Kharagpur

## MEMBERSHIPS

- European Geosciences Union (EGU), 2018- present
- American Geophysical Union (AGU), 2019-present

## PARTICIPATION IN WORKSHOPS

- “Seismic image interpretation” (2018) conducted by Dr. Achyut Ayan Mishra as part of the 5<sup>th</sup> edition of the Rock Deformation and Structures conference, hosted by Delhi University, India
- “Modern methods of fabric analysis in deformed rocks” conducted by Dr. M.A. Mamtani, Renjith A.R. and S. Bhatt; part of Tec-Task educational activity at Geological Society of India Annual General Meeting (2016)
- “Deformation processes in the lower crust (Bohemian massiff, Austria)” pre-EGU field trip conducted by Dr. Anna Rogowitz, Dr. Bernhard Grasemann, Dr. Luca Menegnon, Dr. Lucie Tajcmanova and Dr. Petr Jerabek (2018)
- “Structural geology in the 21<sup>st</sup> century” (TecTask-Workshop; 26-28 February 2020, Department of Geology and Geophysics, IIT Kharagpur, INDIA)
- "Thermodynamic modeling of magmatic processes with alphaMELTS 2" online workshop conducted by Dr. Paula Antoshechkina and Dr. Paul Asimow
- “Phase equilibrium modelling: approaches and pitfalls” (May 10-14, 2021) online workshop conducted by Dr. Jacob Forshaw, Dr. Pierre Lanari, Dr. Dave Pattison, Dr. Mark Caddick, Dr. Doug Tinkham and Dr. Dave Waters

## PRODUCTS OF THE RESEARCH

### Published in Peer-Reviewed Journals and Book Chapters

- **Dobe, R.** and Gupta, S. Discriminating Tectonic and Magmatic Fabrics in the Remal Granite Gneiss: Implications for Terrane Amalgamation Processes in Southeastern Singhbhum, India. J Geol Soc India (2018) 92: 657. <https://doi.org/10.1007/s12594-018-1083-7>
- Gupta S., **Dobe R.**, Sawant A.D., Misra S., Mohanty W.K. (2020) The Northern Margin of the Eastern Ghats

Mobile Belt: Evidence for Strike-Slip Tectonics Along a Craton-Mobile Belt Boundary. In: Biswal T., Ray S., Grasemann B. (eds) Structural Geometry of Mobile Belts of the Indian Subcontinent. Society of Earth Scientists Series. Springer, Cham (2020) 153-174. [https://doi.org/10.1007/978-3-030-40593-9\\_7](https://doi.org/10.1007/978-3-030-40593-9_7)

- **Dobe, R.**, Das, A., Mukherjee, R., and Gupta, S. (2021). Evaluation of grain boundaries as percolation pathways in quartz-rich continental crust using Atomic Force Microscopy. *Scientific Reports*, 11(1), 9831. <https://doi.org/10.1038/s41598-021-89250-z>
- Gupta, S., Chatterjee, S., Arora, D., Bose, S., and **Dobe, R.** (2021). Locating the Indo-Antarctica suture – Correlating the Rengali, Rauer and Ruker terranes in Gondwana. *Polar Science*, 100689. <https://doi.org/10.1016/j.polar.2021.100689>
- **Dobe, R.**, Vukmanovic, Z., Bose, N., Panigrahi, M.K., and Gupta, S. (2022). Origin of magmatic and tectonic fabrics in the Remal granite-gneiss, Singhbhum Craton, India. *Geological Magazine*, <https://doi.org/10.1017/S0016756822000486>

#### Conference abstracts

- **Dobe, R.**, Dey, J., Gupta, S. EBSD analyses of Quartz to Decipher Strain Variability across the Singhbhum Craton-EGMB contact (oral presentation) Electron Microscopy Society of India Annual Meeting (4<sup>th</sup> June 2016, Varanasi)
- Sawant, A.D., **Dobe, R.**, Gupta, S. A 500 million year old 'San Andreas Fault' in India : connecting India and Antarctica using textural and EBSD study of rocks (oral presentation) Symposium on Advances in Characterization of Microstructure and Texture iCAMMP-IV (6<sup>th</sup> November 2016, Kharagpur)
- **Dobe, R.**, Gupta, S. Strain Variation across the Singhbhum Craton-Eastern Ghats Belt Contact-India: Record from EBSD Studies on Quartz (poster presentation) Geological Society of India Annual General Meeting (22<sup>nd</sup> October 2016, Kharagpur)
- **Dobe, R.**, Bhuyan, P., Mandal, S., Gupta, S. (2018) abstract ID: EGU2018-348 'Fluid percolation through quartz-rich lithologies: insight from the Coincident Site Lattice (CSL) Theory'. European Geosciences Union Annual General Meeting, 8<sup>th</sup>-13<sup>th</sup> April, 2018
- **Dobe, R.**, Gupta, S. Preserved igneous layering in the Singhbhum granite, Remal Dam, Odisha (poster presentation) Rock Deformation and Structures V (5<sup>th</sup> October 2018, New Delhi)

- Gupta, S., **Dobe, R.** Bhuyan, P., Mandal, S., Misra, S., and Kaithwas, C. (2018). Why are granulites dry? An alternative model based on Coincident site lattice theory. *Granulites and granulites 2018, Abstract volume*, 29
- **Dobe, R.**, Gupta, S. (2019) abstract ID: 576192 ‘Tectonic and Magmatic Fabrics in a Layered Granite Body at Remal Dam Site, India: Implications for the Origin of Low Temperature Gneissic Fabrics’. American Geophysical Union Fall Meeting 9<sup>th</sup>-13<sup>th</sup> December, 2019
- **Dobe, R.**, Gupta, S. (2020) abstract ID: EGU2020-6526 ‘Orthogonal Tectonic and Magmatic Fabrics in a Layered Granite-Gneiss at Remal Dam Site, India: Implications for Fabric Generation and Superposition’. European Geosciences Union Annual General Meeting, 4<sup>th</sup>-8<sup>th</sup> May, 2020.
- **Dobe, R.**, Das, A., Mukherjee R., Gupta, S. (2020) abstract ID: 707286 ‘Grain Boundary Characterization Using Atomic Force Microscopy: Investigating Possible Percolation Pathways in Rocks’. American Geophysical Union Fall Meeting, 1<sup>st</sup>-17<sup>th</sup> December, 2020.
- **Dobe, R.**, Das, A., Mukherjee R., Gupta, S. (2021) abstract ID: 853397 ‘THE USE OF ATOMIC FORCE MICROSCOPY TO STUDY GRAIN BOUNDARY MORPHOLOGY AND GRAIN-SCALE PROCESSES’. American Geophysical Union Fall Meeting, 13<sup>th</sup> -17<sup>th</sup> December, 2021.
- **Dobe, R.**, Gupta, S. (2022) Abstract No: 159-2375 ‘Temporally Discrete Shortening and Strike-slip Deformation in the Rengali Province, Odisha, India: Implications for the Structural Architecture of Proto-India’ 36<sup>th</sup> International Geological Congress.

### RESEARCH DATASETS

- **Dobe, R.**, Gupta, S., Bose, N. (2021) EBSD data from quartzites of the Rengali Province and Eastern Ghats Province. <https://doi.org/10.5281/ZENODO.4771613> [Data collection]

### SOFTWARE COMPETENCE

Matlab (basic), MTEX, HKL Channel 5, Aztec Crystal, TSL OIM 7.2, MELTS family including easyMELTS, MELTS for MS Excel, and alphaMELTS, thermoCALC, ImageJ, GCDkit for R, Origin, PERPLEX