

## Applications for PhD positions in Department of Earth Sciences (DES), IISER Kolkata

### Minimum eligibility criteria:

Applications are invited for the Doctor of Philosophy (PhD) program in the Department of Earth Sciences from candidates having either:

- 1) Masters degree with at least **55% aggregate marks** in Geology / Applied Geology / Geophysics / Earth Sciences / Marine geology / Environmental Sciences / Environmental Studies / Atmospheric Science / Geographical Science / Agricultural Science or any other branch of Geological sciences. OR
- 2) Masters degree with at least **55% aggregate marks** in Physics / Chemistry / Mathematics / Biological Sciences / Computational Seismology and interested to pursue research with the DES faculty member in the matching specialization. OR
- 3) 4-year BS with at least **75% aggregate marks** in any subject and interested to pursue research with the DES faculty member in the matching specialization.

A relaxation of **5%** marks may be allowed for those belonging to SC/ST/OBC (non-creamy layer)/Differently-Abled, Economically Weaker Section (EWS) and other categories of candidates as per Gol norms. Candidates belonging to the respective reserved category need to submit relevant certificates and documents.

Final year MS/BS students who are yet to obtain their degree may also apply; however, they must have completed their respective degree at the time of admission.

### Channel 1: Self funded category:

For candidates in the self-funded category, apart from satisfying minimal eligibility criteria all candidates must have valid **CSIR-NET JRF / UGC-NET JRF / DST-INSPIRE / other equivalent fellowship**. Candidates must have **physics, chemistry and mathematics at 10+2 level**, and **at least one of these subjects at their bachelor level**.

The research areas in which department is looking for young and bright minded **self-funded** students are listed below-

**Paleobiology** - *Dr. Subhronil Mondal* is looking for a motivated PhD candidate to work on problems related to the evolutionary patterns of marine invertebrates across space and time. For details, please check the lab webpage: <https://sites.google.com/site/subhronilindia/Home>

**Metamorphic Petrology-** The group led by *Dr. Tapabrato Sarkar* is interested in understanding the processes involved in the formation and evolution of continental crust through geological time by studying the high-grade metamorphic rocks in orogenic belts using the tools of petrology, geochemistry and geochronology.

The group is currently working on the different problems related to the Southern Granulite Terrane and Eastern Ghats Belt. The goal of these studies is to combine state-of-the-art petrological, geochemical and geochronological analyses on the studied rocks to understand crustal evolution. Highly motivated candidates interested in field excursions are encouraged to apply.

For more information visit the group website: <https://www.iiserkol.ac.in/~tapabrato/>

**Near-surface isotope and trace element geochemistry - *Dr. Tarun Kumar Dalai*** is interested in prospective candidates to work on any of the following research areas.

Areas of research

1. The fate of biospheric and petrogenic carbon in the river basins: This project would use proxies of biospheric carbon (i.e.  $^{13}\text{C}/^{12}\text{C}$  ratios and  $^{14}\text{C}$ ) and petrogenic carbon ( $^{13}\text{C}/^{12}\text{C}$  ratios and rhenium) of suspended and bed sediments in the rivers of Eastern India. The eventual goal is to assess the net effect on the atmospheric carbon due to  $\text{CO}_2$  consumption via silicate weathering vs. the release of  $\text{CO}_2$  via oxidation of biospheric and petrogenic carbon in the river basins.
2. Behaviour of elements and isotopes during weathering and transport: The primary goal of this project is to test the robustness of isotopes of neodymium ( $^{143}\text{Nd}/^{144}\text{Nd}$ ), lithium ( $^7\text{Li}/^6\text{Li}$ ), strontium ( $^{87}\text{Sr}/^{86}\text{Sr}$ ) as proxies of silicate weathering. We will use these isotopes and selected trace elements in our investigations.
3. The study of relative mobility of redox-sensitive elements (e.g., Mo, V, Re, Cr, Mn) during weathering and transport. Understanding of cycling of these elements has implications for fractionation of their isotopes, contaminant transport and their utility as proxies for paleo-redox conditions.
4. Any other areas of mutual interest based on discussions with prospective candidates.

**Preferred requirements:** Bachelor and master degrees of the candidate should be in the field of earth sciences.

**Seismology-** *Dr. Kajaljyoti Borah* is looking for a bright and motivated PhD candidate to work on the '**Evolution of Archean cratons: insight from Bastar craton**' with the help of seismology. Archean cratons are the prime targets of the scientific community for a long time because they store records of the long Earth's history and they have economic significance as a major source of the World's minerals. The crustal thickness, crustal composition (inferred from seismic wave velocities), structure and physical properties of crust-mantle

transition (commonly used as Moho by the seismologists), and lithospheric discontinuities are the key parameters for understanding the formation and evolution of cratonic lithosphere. This project is focussed at elucidating the origin and evolutionary history of the relatively unexplored Bastar craton along with other Archean cratons all over the globe by modelling the physical properties of the underlying crust and mantle using seismological data from these regions.

**Structural Geology:** *Dr. Kathakali Bhattacharyya* is looking for a bright and motivated PhD student, interested in conducting fieldwork in remote areas, to address rock deformation processes.

Deformed rocks record their progressive deformation paths which is challenging to decipher due to overprinting (and often obliteration) of incremental deformation stages. The project examines how rocks accommodate deformation through space and time during mountain building processes. Multiscale structural analysis will be employed to estimate geometric, kinematic and mechanical evolution of structures resulting from collisional tectonics.

**Crustal Evolution-** The research group under the guidance of *Prof. Sukanta Dey* is looking for a motivated research fellow to work on the following broad theme "How did continental crust form in Early Earth?"

The actual mechanism of continental crust formation in Early Earth (during the Archaean Eon) remains a significant research interest globally. Granite-greenstone belts provide vital clues to the mechanism and geodynamic setting of continental crust formation. Archaean rocks of diverse types are well exposed in the granite-greenstone belts of the cratonic blocks of India. This Ph.D. project aims to study the field and age relationship and geochemistry of granite-greenstone belt rocks to understand their petrogenesis, role in crust formation, and tectonics setting. The project will provide an opportunity to the candidate to get involved in field mapping, followed by petro-mineralogical study, whole-rock geochemistry, and geochronology. Candidates with a flair for fieldwork are encouraged to apply. Those with their own project ideas on early Earth crustal evolution are also welcome to apply.

### **Channel 2: Institute funded category:**

For candidates in the institute-funded category, apart from satisfying minimal eligibility criteria all candidates must have qualified in one of the following examinations, **GATE, UGC/CSIR NET-LS, INSPIRE or other equivalent examinations**. Candidates must have **physics, chemistry and mathematics at 10+2 level**, and **at least one of these subjects at their bachelor level**.

The research areas in which department is looking for young and bright minded students who could be ***funded by IISER Kolkata*** are listed below-

**Near-surface isotope and trace element geochemistry** - *Dr. Tarun Kumar Dalai* is interested in prospective candidates to work on any of the following research areas.

Areas of research

1. The fate of biospheric and petrogenic carbon in the river basins: This project would use proxies of biospheric carbon (i.e.  $^{13}\text{C}/^{12}\text{C}$  ratios and  $^{14}\text{C}$ ) and petrogenic carbon ( $^{13}\text{C}/^{12}\text{C}$  ratios and rhenium) of suspended and bed sediments in the rivers of Eastern India. The eventual goal is to assess the net effect on the atmospheric carbon due to  $\text{CO}_2$  consumption via silicate weathering vs. the release of  $\text{CO}_2$  via oxidation of biospheric and petrogenic carbon in the river basins.
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4. Any other areas of mutual interest based on discussions with prospective candidates.

**Preferred requirements:** Bachelor and master degrees of the candidate should be in the field of earth sciences.

**Stable Isotope Geology-** *Prof. Prasanta Sanyal* is looking for prospective students interested to work on the following research problems using stable isotopes.

1. Past climate and its impact on ecology: Involves reconstruction of rainfall using oxygen isotopes of soil carbonate and hydrogen isotopes of plant molecules; carbon isotopes of soil carbonate and plant molecules. Fluvial and lake sediments will be used for this purpose.
2. Temperature reconstruction of past: Lipid components such as brGDGT, IsoGDGT and 3 OH Fatty acids will be used for this purpose.
3. Understanding the Nitrogen Cycle: Nitrogen and oxygen isotopes of dissolved nitrate will be used for this purpose.

For more details, please visit the webpage: <http://www.iiserkol.ac.in/~silika>

**Seismology-** *Dr. Kajaljyoti Borah* is looking for a bright and motivated PhD candidate to work on the '**3D- shear velocity anisotropic structure in the Indo Burma Ranges and its geodynamic implication**' with the help of seismology. Imaging 3-D shear velocity structure beneath Indo-Burma ranges and the adjoining regions by modeling receiver functions, surface wave data extracted from earthquake and ambient noise to unravel the deep structure across diverse geological terranes. Azimuthal anisotropy estimation from splitting analysis of teleseismic core-refracted phases, which can be used to decipher crust-mantle flow and mantle deformation patterns around the subducting slab.

**Environmental Science-** *Dr. Sujata Ray* is looking for a bright and motivated PhD candidate to study column concentrations of greenhouse and other trace gases to determine the sources and sinks of these pollutants and validate satellite observations. The state-of-the-art instrumentation includes a Fourier transform infrared (FTIR) spectrometer for detection in the IR range and a Multi-Axis Differential Optical Absorption spectrometer (MAX-DOAS) for the UV-Vis. The data collected will be valuable for carbon cycle and air quality studies. This project will offer close collaboration with and guidance from researchers in a Federal research institute in Belgium and a strong international orientation.

**Preferred requirements:**

- Hold a Masters degree preferably in the field of physics or atmospheric sciences.
- Have a good knowledge of remote sensing methods.
- Have a good mathematical basis and IT competencies, mastery of at least one programming language, good knowledge of mixed Microsoft/UNIX/Linux software environments.

**DES Spring 2025 PhD Timeline:**

- PhD application portal opens: **03.10.2024**
- Application portal closes: **20.10.2024**
- Publication of shortlist for the Interview: **30.10.2024**
- Selection Interview window: **11 - 18. 11. 2024**
- Publication of PhD interview results by: **9.12.2024**
- Pre-registration portal opens: **10.12.2024**
- Pre-registration deadline: **24.12.2024**