Indian Institute of Technology Delhi

School of Interdisciplinary Research (SIRe)

Project Proposal for Ph.D.

SIRe Project Number
2026-02-09

(will be assigned by SIRe)

Project Details (The research problem must clearly indicate the need for an interdisciplinary approach)	
Project Title	Deciphering the Cellular and Molecular Mechanisms of Brain and Retinal Regeneration Using Zebrafish and Axolotl Models
Project Summary (Minimum 500 and maximum 2000 characters)	Regeneration of the adult central nervous system (CNS) is highly restricted in mammals but occurs efficiently in regenerative vertebrates such as zebrafish and axolotl. Understanding the cellular and molecular mechanisms underlying this remarkable regenerative capacity may provide important insights into strategies for neural repair. This project aims to investigate and compare the mechanisms governing brain and retinal regeneration, with a particular emphasis on injury-induced cellular responses, activation of endogenous progenitor populations, and signalling pathways regulating proliferation and neuronal differentiation. Using zebrafish and axolotl as complementary experimental models, the study will employ established injury paradigms, molecular and cellular analyses, advanced imaging, genetic and pharmacological perturbations, and transcriptomic approaches to identify key regulators of neural regeneration. Comparative analyses across tissues and species will help distinguish conserved regenerative programmes from tissue-specific mechanisms. The interdisciplinary approach integrates developmental and regenerative biology, molecular genetics, imaging, and computational analysis to uncover fundamental principles of CNS regeneration and identify potential molecular targets for enhancing neural repair in mammals.

Ph.D. Supervisors[+]
(Supervisor 1 and Supervisor 2 cannot be from the same department of IITD)

Role	Name of Faculty	Date of Superannuation[$] (DD/MM/YYYY)	Academic Unit in IITD/Institute/University	Email ID (Official) & Contact Number
Supervisor 1*	Prof. Shilpi Minocha	18/10/2047	Kusuma School of Biological Sciences, IIT Delhi	
Supervisor 2	Prof. Soutik Betal	30.11.2052	Department of Electrical Engineering	

*Supervisor 1 must be from IIT, Delhi.
+All cells in this table are mandatory fields that need to be filled by faculty for consideration of proposal.
[$]The date of superannuation of supervisors should be at least three years from the date of registration of selected candidates.

Project requirements (Student qualifications, experience required, etc)
***The candidate will be shortlisted based on common shortlisting criteria decided by ScRC (SIRe)**

• M.Sc./M.Tech./M.S. or equivalent in Biological Sciences, Biotechnology, Bioengineering, Bioinformatics or a related discipline, subject to SIRe eligibility criteria. First-class academic record throughout (from Class X onwards).
• Interest in neurobiology, regeneration, molecular/cell biology and interdisciplinary research; experience with mice or zebrafish, imaging, gene-expression analysis or computational biology is desirable, not mandatory.

Source of fellowship/funding and project number
(CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)

The candidate must possess a valid national-level JRF fellowship (CSIR/UGC/DBT/ICMR or equivalent)

Role of Faculty Members involved:

Supervisor-1	Prof. Shilpi Minocha, IIT Delhi: Will lead investigations into the molecular mechanisms of brain regeneration using zebrafish models, focusing on the gene expression and signalling axis. Responsibilities will include experimental design, brain injury models, molecular and cellular analyses, transcriptomics, and functional assessment of neural regeneration.
Supervisor-2	Prof. Rajesh Ramachandran, IISER Mohali: Will lead investigations into retinal regeneration using zebrafish and axolotl models, focusing on the role of the signalling axis in retinal injury responses, Müller glia activation, neuronal regeneration, and associated molecular mechanisms.

Note :-

1. **Approval from the respective DRC/CRC/ScRC of your Department/Centre/School will be required for using the "Full-time Institute Assistantship (Category-wise) (FIA)" for selecting the students in SIRe.**

2. **Declaration:- Faculty members, please ensure that you have at least 3 years of service left before superannuation along with adequate sitting space & lab facilities for the SIRe student.**

3. **PI/s are also encouraged to submit joint proposals with AIIMS, NII, JNU and institutes with which IITD has an existing MoU. If the Co-PI (Supervisor 2) is from outside IITD, kindly share his/her detailed CV.**

4. **If a research scholar is to be considered for selection under the project fellowship, then the project should have a minimum of two-year duration remaining.**

5. **A candidate applying with a valid JRF/INSPIRE/any national level fellowship should have at least two-year validity from the date of joining the Ph.D. program.**

6. **The third supervisor's name (if required) can be added only after the formation of Student Research Committee (SRC) subject to a strong recommendation of SRC and subsequent approval from the competent authority.**

7. **If institute fellowship is being sought then the DRC approval of the parent departments of both supervisors is required at the time of selection.**