Indian Academy of Sciences, Bengaluru
Indian National Science Academy, New Delhi
The National Academy of Sciences India, Prayagraj

SUMMER RESEARCH FELLOWSHIPS — 2024

Format for the four-week Report*,^,@

Name of the candidate : KRISHNENDU CHOWDHURY

Application Registration no. : ENGS1959

Date of joining : 21/05/2024

Name of the guide : DR. RANGARAJAN RAMSHARAN

Guide's institution : INDIAN INSTITUTE OF SCIENCE, BENGALURU

Place of stay during the tenure of the fellowship : Hostel provided by Guide Hostel Provided by Guide (IAS Fellows Residency)
Own arrangement
Other (Specify) _____

Signature of the candidate

Date: 21/06/2024

Signature of the guide

Date: 21 June 24.

INSPIRE/KVPY FELLOWSHIP (please fill this box)#		
1.	I am currently a recipient of	INSPIRE FELLOWSHIP ☐ Yes / ☑ No
		KVPY FELLOWSHIP ☐ Yes / ☑ No
		If, YES, fill cols. 2, 3 & 4
2.	**INSPIRE/KVPY** Fellowship is from _____[month]/_____[yr] to _____[month]/_____[yr]	
3.	I receive a monthly fellowship of Rs. _____ from INSPIRE/KVPY towards my living expenses	
4.	I also receive towards contingencies a sum of Rs. _____ per year	
	I affirm that the information given above is correct.	
	Signature of the candidate	

IMPORTANT NOTES:

*** The four-week report could be between 300 and 350 words.**

^ This format should be the first page of the report and should be stapled with the main report.

 # Mandatory to fill this section, this should be filled and signed by you even if you are not an INSPIRE/KVPY Fellow. Otherwise release of fellowship amount will be withheld.

@ The hard copy of the duly signed report should reach the Academy office within 10 days of completing the first month fellowship. If delayed the fellowship amount will not be paid.

(For office use only; do not fill/tear)

Candidate's name:	Fellowship amount:
Student: Teacher:	Deduction:
Guide's name:	Amount to be paid:
KVPY Fellow: INSPIRE Fellow:	A/c holder's name:
PFMS Unique Code:	
Others	



SUMMER RESEARCH FELLOWSHIP PROGRAMME 2024

4 WEEK REPORT

AQUATIC ROBOT, PROPELLED BY SNAP-THROUGH BUCKLING

KRISHNENDU CHOWDHURY

ENGS1959

INDIAN INSTITUTE OF TECHNOLOGY (BHU) VARANASI

GUIDE: PROF. DR. RANGARAJAN RAMSHARAN

INDIAN INSTITUTE OF SCIENCE, BENGALURU

AQUATIC ROBOT, PROPELLED BY SNAP-THROUGH BUCKLING

I, Krishnendu Chowdhury, am an undergraduate at the Indian Institute of Technology (BHU) Varanasi. This report details my work as a Summer Research Fellow under the guidance of Prof. Dr Rangarajan Ramsharan on the project titled "AQUATIC ROBOT, PROPELLED BY SNAP-THROUGH BUCKLING". The project commenced on May 21st, 2024, and focused on designing an innovative aquatic robot that harnesses the propulsive force generated by the snap-through behaviour of a buckled metallic sheet annulus.

The project's initial phase involved a thorough understanding of the specific requirements for the aquatic robot. This included defining crucial design parameters, weight distribution analysis, and ensuring sufficient net water displacement to maintain buoyancy and safeguard electronic components from water ingress. Additionally, achieving a streamlined design for minimal underwater drag and mitigating the pitching movements of the craft were critical considerations.

The design process commenced with a focus on optimising the electronics package. Through an iterative approach utilising Fusion 360 computer-aided design (CAD) software, I was able to achieve a significant reduction in volume (approximately 30%) and weight (approximately 20%) of the electronic components. This optimisation was vital in enhancing the robot's overall efficiency and manoeuvrability.

The next stage involved the development of the aquatic robot's physical structure. Leveraging the capabilities of Fusion 360, three distinct designs for the boat-like hull were created. These designs were subsequently materialised through 3D printing technology. Additionally, several aluminium components were fabricated to serve as mounting brackets for connecting the two hull sections and providing secure attachment points for the electronic devices.

The initial phase of the summer research fellowship has yielded promising results. The successful optimisation of the electronics package and the development of multiple hull design iterations have laid a strong foundation for the

project's continued progress. The forthcoming stages will involve selecting the optimal hull design, integrating the snapping annulus mechanism, and rigorous testing of the complete aquatic robot prototype.

The next phase dives into the exciting world of testing! We'll put the prototype through its paces in a controlled aquatic environment, evaluating its movement and key performance metrics like speed, range, and propulsive efficiency. Based on the test results, any kinks in its journey will be ironed out through targeted design modifications.