

### SIP 2022\_Available Projects

Sr. No.	Name of PRL Faculty	PRL Email id	Vacancy	Division	Tentative Title of the Project
1	Arvind Singh Rajpurohit	arvindr@prl.res.in	1	Astronomy and Astrophysics	Title of the Project : "Atmospheric Studies of very low mass stars". Brief Description: The selected candidate is supposed to work on the high resolution spectra taken from VLT. He/she will work on comparing the observed spectra with the atmospheric models to derive their elemental abundances.
2	Mudit Srivastava	mudit@prl.res.in	1	Astronomy and Astrophysics	1.) Title: Development of spectroscopy data reduction pipeline and instrumentation automation code for MFOSC-P instrument Description : The project involve developing a series of data analysis / instrumentation automation codes for MFOSC-P instrument in C/Python. The candidate is expected to be experienced in coding and should be having working knowledge of LINUX operating system. The project requires dedicated efforts over 1.5- 2 months and the candidate would be working in close collaboration with MFOSC-P engineering and science teams. He/She may be required to visit Mt. Abu observatory for instrument testing along with instrument team.  2.) Title: Optical design studies of an ultraviolet telescope/spectrometer and laboratory characterization of polarization components. Description: The project involves the design and analysis of a UV telescope/spectrometer. The candidate must be having working knowledge of ZEMAX optical design software. The candidate would also be working in laboratory to characterize the polarization components required for the instrumentation development for Mt Abu telescope, under the supervision of instrument team. Candidate from optics or related fields may be the suitable candidate.
3	Manash Ranjan Samal	manash@prl.res.in	1	Astronomy and Astrophysics	1. Understanding the evolution of star clusters with Gaia. 2. Investigating role of stellar feedback on the future generation star formation of the W4 cloud complex.
4	Aveek Sarkar	aveeks@prl.res.in	1	Astronomy and Astrophysics	Numerical simulation of the solar atmosphere Being the closest star, the Sun has got significant attention in astrophysics. It has been observed extensively in all wavelengths. It is also being observed from space with the present generation of instrumentation. However, understanding the physics behind these detailed observations is a significant challenge. It needs a theoretical and computational framework to overcome these challenges. We plan to develop a numerical tool to model the atmosphere of the Sun. The student has to solve partial differential equations using python or C++ code. The code has to run on a local supercomputer efficiently. S/He should have motivation and interest in numerical code development and theoretical astrophysics. A prior knowledge in code development will be useful.

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5	Ravindra Pratap Singh	rpsingh@prl.res.in	1	Atomic, Molecular and Optical Physics	Student would be working in the broad area of Quantum Communication
6	Rajesh Kushawaha	kushawaha@prl.res.in	1	Atomic, Molecular and Optical Physics	Ion trajectory simulation for development of Time-of-Flight mass Spectrometer Plasma chemistry: Study the CN, C2 formation in laser produced plasma
7	Satyendra Nath Gupta	satyendra@prl.res.in	1	Atomic, Molecular and Optical Physics	Understanding the properties of plasmonic nanoantenna
8	Naveen Chauhan	chauhan@prl.res.in	1	Atomic, Molecular and Optical Physics	1. Surface exposure dating using luminescence: The technique is a new promising technique to estimate the time of sun exposure of rock surfaces. The exposure of surfaces can be linked to several events as, glaciations, tectonics and climate change. In the present work summer intern student will work on samples collected from Glacial moraine deposits linked to glacial advancement in Ladakh region. (Physics/Geology student can apply) 2. Luminescence Sensitivity as a provenance tool: The luminescence sensitivity is significantly influenced by the nature of source of minerals as well as process it is undergoing during natural sediment transport process. The work will look into the sensitivity of samples collected from Ladakh and South India and try to estimate the proportion of sediment flux at confluences of the rivers.
9	Bhalamurugan Sivaraman	bhala@prl.res.in	1	Atomic, Molecular and Optical Physics	Hypervelocity impacts on icy bodies
10	Shashi Prabhakar	shaship@prl.res.in	1	Atomic, Molecular and Optical Physics	Title: Effect of atmospheric turbulence on entangled photons Brief description: The project is to characterise the entangled photons after passing through atmospheric turbulence. Additionally, one needs to find a suitable algorithm to find ways to mitigate the effect of turbulence. The project involves experiments and simulations.

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11	Arvind Singh	arvinds@prl.res.in	1	Geosciences	<p>Title: Can mineral addition to ocean solve the climate problem?</p> <p>Description: The project deals with removing atmospheric CO<sub>2</sub> through ocean alkalinity enhancement. It is quite clear that over the coming decades we might need reservoirs that can store up to trillions of tons of CO<sub>2</sub> emitted from industrial and other man-made emissions, which would otherwise pose a serious threat to climate and ecosystems if it were left in the atmosphere. We proposed that the enhanced ocean alkalinity through large-scale mineral dissolution has the potential to provide a solution to store large amount of CO<sub>2</sub> in the ocean. Mineral dissolution will lead to a change in the ocean carbonate chemistry equilibrium towards HCO<sub>3</sub><sup>-</sup> and CO<sub>3</sub><sup>2-</sup> (i.e., increase in alkalinity) so that additional CO<sub>2</sub> from the atmosphere could be dissolved and stored for a long time (&gt;1000 years) in the ocean. It may be possible to sequester up to trillion tons of carbon without surpassing present-day carbonate saturation states in the ocean. In turn, the impacts of elevated alkalinity will be potentially small and may even help to reduce the effects of ocean acidification on the microbial ecosystem but these aspects have not been tested experimentally. To initiate the execution of the project, in this summer project, we first want to identify minerals that can be used to enhance ocean alkalinity in a sustained way.</p>
12	Amzad Hussain Laskar	amzad@prl.res.in	1	Geosciences	<p>Title: Estimating residence times of groundwater in semi-arid regions of Gujarat</p> <p>Description: Major parts of India is facing acute shortages of freshwater due to steep rise in water demand because of rapid urbanization and economic and lifestyle changes. To avoid future crisis of groundwater, a sustainable management policy needs to be formulated for which a detailed understanding of the groundwater dynamics is essential. The aim of the present project is to understand the groundwater dynamics by estimating the residence times of groundwater in shallow and deep aquifers, recharge rates, flow direction and velocity in some selected districts of Gujarat using radiocarbon and stable isotopes in dissolved inorganic carbon.</p>
13	Neeraj Rastogi	nrastogi@prl.res.in	1	Geosciences	Understanding the effects of anthropogenic aerosols on air quality and climate
14	Ravi Bhushan	bhushan@prl.res.in	1	Geosciences	<p>1) Paleoceanographic studies from the northern Indian Ocean</p> <p>2) Role of Cosmogenic Radionuclide in Earth Sciences</p>

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15	M.G.Yadava	myadava@prl.res.in	1	Geosciences	Title:Radiocarbon dating of ocean sediments and peat deposits Brief:This work requires extraction of carbon from ocean sediments and peat deposits in graphite form and subsequent measurement of carbon isotope ratio by Accelerator Mass Spectroscopy method for estimating their ages. Handling of high vacuum glass lines and optimization procedure of sample processing protocols will be involved. This will also give opportunity to understand fundamentals of Accelerator Mass Spectrometry.
16	Anil Shukla	anilds@prl.res.in	1	Geosciences	Students with Engineering Physics or equivalent Background to work on following projects: 1. Optimization of the physical parameters (like reduction of plasma expansion, optimization of wetness of the plasma,etc. ) of LA-MC-ICP-MS. 2. Mass Spectrometric Data Processing, Pipelining and Reduction using AI, ML and optimization techniques. The project requires a student with intermediate - advance background in python libraries like scipy, tensorflow and keras.
17	Vineet Goswami	vineetg@prl.res.in	1	Geosciences	Title: Application of isotopes and mass spectrometry in earth science studies Brief description: Radiogenic isotopic composition of earth materials is used to understand various earth system processes and timings. Further, using the mass spectrometers, it has now become possible to analyze the isotopic compositions with very high precisions. This project will focus on (i) application of radiogenic isotopes to understand some key earth processes, and (ii) application of mass spectrometer (TIMS) to measure isotopic ratios. This project will introduce the student to some key concepts in isotope geochemistry. Further, this project will provide hands on experience to the student in mass spectrometric techniques.
18	Kuljeet Marhas	kkmarhas@prl.res.in	1	Planetary Sciences and Exploration	(1) organics from meteorites: thermal degradation experiments (2) Stellar sources of Circumstellar grains contributing to the Solar system.
19	Vijayan S	vijayan@prl.res.in	1	Planetary Sciences and Exploration	Remote Sensing exploring of Planetary bodies: Planetary/Satellite explorations from Mercury to Pluto are carried out to understand their evolution over time. Multi wavelength Remote Sensing images are available from Mercury to Pluto and all these bodies in common host impact craters. This project aims to explore the impact craters and their roles in evolution of rocky/icy bodies.
20	Dwijesh Ray	dwijesh@prl.res.in	1	Planetary Sciences and Exploration	1. Impact spherule: Morphology, chemical composition and understanding Asteroid impacts on Earth 2. The HED meteorites: Magmatic history of Asteroid 4 Vesta
21	Amit Basu Sarbadhikari	amitbs@prl.res.in	1	Planetary Sciences and Exploration	1) Planetary (meteorites and returned) samples: Chemical and mineralogical study 2) Geology/geochemistry from recent missions of Mars and Moon

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22	Megha Bhatt	megha@prl.res.in	1	Planetary Sciences and Exploration	<p>1) Title of the Project: Experimental setup for spectral characteristics determination of planetary surface analogs. Brief Description: We look for a student with engineering background for setting up experimental setup for spectral characteristics determination in the UV and NIR wavelength ranges. The major responsibility will be to design an interface of motors with computer for commanding the movement of the probes inside a vacuum chamber.</p> <p>2) Title of the Project: Analysis and Characterization of Lunar Polar Regions Using Mini-RF and DFSAR data Brief Description: A student of Engineering Physics will work on the Chandrayaan-1 and Chandrayaan-2 microwave sensor data sets to understand lunar surface properties.</p> <p>3) Title of the Project: Hapke modeling of telescopic data Brief Description: A student of Engineering Physics will work on the telescopic images. This work involves image processing and development of Hapke model.</p>
23	Sanjay K. Mishra	sanjaym@prl.res.in	1	Planetary Sciences and Exploration	<p>Title: Dust ponds on airless bodies Description: The electrostatic features of the small bodies drive the plasma transport and formation of dust ponds on their surface. We shall investigate the physics and physical scenario responsible for the formation of these structures over small airless bodies.</p>
24	K. Durga Prasad	durgaprasad@prl.res.in	1	Planetary Sciences and Exploration	<p>1. Title : Temperature dependent thermal properties of planetary analogues Brief Description: The project involves carrying out experimental studies on planetary analogue soils under lab and simulated environmental conditions to decipher the parametric variation of thermal properties. Based on the experimental results, a trend or relationship will be obtained whose significance will be discussed.</p> <p>2. Observation of local meteorology using miniaturised sensor system Brief Description: This project aims at carrying out time-dependent measurements of local meteorological parameters by deploying a miniaturised sensor system. It also involves assembly and calibration of such a sensor system. Observed trends for a particular site will be discussed.</p>
25	Kinsuk Acharyya	acharyya@prl.res.in	1	Planetary Sciences and Exploration	<p>Simulating interstellar medium in the laboratory Study of Kuiper belt and Oort Cloud objects</p>
26	Neeraj Srivastava	sneeraj@prl.res.in	1	Planetary Sciences and Exploration	<p>Lab Reflectance Spectroscopy of Moon and Mars analogues: The experiment will be useful for analyzing data from planetary remote sensing missions of ISRO.</p>
27	Dipak K Panda	pdipak@prl.res.in	1	Planetary Sciences and Exploration	<p>1. Petrology and Mineralogy study of Chondrites 2. Isotope study in Chondrite meteorite</p>

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28	Nandita Srivastava	nandita@prl.res.in	1	Solar Physics	3D Parameters of the Earth-Impacting Coronal Mass Ejections (CMEs) Earlier works suggest that the three-dimensional parameters of CMEs play a crucial role in deciding their space weather impact and arrival time. Based on the GCS model, the 3D parameters of geoeffective CMEs will be estimated in order to develop an empirical statistical model to forecast the arrival time.
29	Lokesh Sahu	lokesh@prl.res.in	1	Space and Atmospheric Sciences	Title: Advances in parameterization of control mechanisms in air-sea flux of trace gases  Brief description: Reactive trace gases, despite being present in the atmosphere in small quantities, play a significant role in atmospheric chemistry and climate change. Many of these reactive trace gases detected in the atmosphere are both emitted from and deposited to the global oceans via exchange across the air-sea interface. The transfer, from both the water- and air-side, is driven by several physical processes that can modulate the kinetics of flux across the interface. This project would involve reviewing the work focused on the parameterization of these driving mechanisms in terms of quantifiable variables.
30	Ravindra Pratap Singh	ravindra@prl.res.in	1	Space and Atmospheric Sciences	Study of vertical coupling of atmospheres using multi wavelength nightglow emissions.
31	K. Venkatesh	venkateshk@prl.res.in	1	Space and Atmospheric Sciences	Ionospheric characterization through observations and modelling.
32	Som Kumar Sharma	somkumar@prl.res.in	1	Space and Atmospheric Sciences	1. Investigation of Atmospheric Clouds and Precipitation Patterns 2. Study of the atmospheric Ozone, Water vapour and AOT using Ground and Satellite Based Observations

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33	Duggirala PallamRaju	raju@prl.res.in	1	Space and Atmospheric Sciences	"Optical spectrographs for space weather research" The earth's space environment is replete with several phenomena, the study of which is crucial for a comprehensive understanding of the space weather phenomena. The airglow emissions from this space environment (above 100 km) serves as a tracer whose modifications can be sensed remotely. The prospective summer intern(s) will be involved in the understanding of the concept of the instrumentation, their integration/operation/observation/simulations/analysis of the data obtained from these in-house built techniques. It is required that the student is of M.Sc. (Physics stream) and participates in all these activities to get a broader appreciation of the techniques and the science that can be done from it.
34	Harish Gadhavi	hgadhavi@prl.res.in	1	Space and Atmospheric Sciences	(1) Evaluation of aerosol optical depths in Global Climate Models. (2) Statistical approach to correct values of black carbon concentrations observed using aethalometer.
35	Partha Konar	konar@prl.res.in	1	Theoretical Physics	Title of the Project(s): Neural Network And Machine Learning Applications For Theoretical High Energy Physics and Solar Physics Research (Prerequisite: Proficiency In DNN, CNN, Python etc For Machine Learning Applications) Brief Description: Different Machine Learning applications give unique opportunity to explore complex phenomena in nature, and it is now widely used different streams of research. In this project, we test and develop machine learning applications to improve the detection of new physics search, especially in the context of theoretical physics and solar physics.
36	Navinder Singh	navinder@prl.res.in	1	Theoretical Physics	1: Anomalous skin effect in metals: effects of pseudogap 2. Resistivity of a disordered correlated metal

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37	Paramita Dutta	paramita@prl.res.in	1	Theoretical Physics	<p>(1) BCS theory of superconductivity: The trainee will study the second quantization formalism at first, then Mean-field theory, BCS wave function, and BCS gap equation. Further extensions like Andreev reflection phenomena in superconducting junctions will be explored if time permits. Necessary prerequisites: Quantum Mechanics-1, Basic Solid State Physics, Electromagnetism-1. This project involves rigorous calculations.</p> <p>(2) Transport signatures of superconducting junctions: In this project the trainee will study Nambu-Gorkov formalism and then work on the signatures of various superconducting junctions like normal metal/superconductor junction. The study will be extended to multiple different junctions depending on the time and performance. Necessary prerequisites: Quantum Mechanics-1, Basic Solid state physics, Electromagnetism-1, BCS Superconductivity. This project involves long calculations.</p>
38	Namit Mahajan	nmahajan@prl.res.in	1	Theoretical Physics	<p>Title: CP Violation within and beyond the standard model</p> <p>Brief Description: The project will involve reading about and working out details related to discrete symmetries, and then a systematic study of CP violation, including effective Hamiltonian for meson-antimeson oscillations, deriving CP asymmetries for different processes and finally studying about the baryon asymmetry of the universe.</p>
39	A Raja Bayanna	bayanna@prl.res.in	1	Solar Physics	<p>Designing Optical filters for solar observations: To obtain multi-wavelength observations of Solar atmosphere different optical filters are used. The coatings of the filters are need to be optimized for observing the sun in a particular wavelength band. The student is expected to understand the optical coatings and design filters for a particular wavelength band using the software Essential Macleod.</p>
40	Jayesh Pabari	jayesh@prl.res.in	1	Planetary Sciences and Exploration	Lunar exosphere and NMS LADEE observations
41	Veeresh Singh	veeresh@prl.res.in	1	Astronomy and Astrophysics	Study of spectral properties of Active Galactic Nuclei