S N BOSE NATIONAL CENTRE
FOR BASIC SCIENCES
Block JD, Sector III, Salt Lake, Kolkata 700 106

DEPARTMENTAL SEMINAR

Astrophysics and Cosmology

23rd December'2021 **3.30 PM** **ONLINE**

SPEAKER

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TITLE OF THE TALK

STUDY OF PLANETARY NEBULAE

ABSTRACT

Planetary nebulae (PNe) are formed out of the expelled outer layers of evolved stars whose progenitors had main-sequence mass ranging between 1–8 solar masses. PNe offer great scope of study in various aspects, such as morphologies, abundances, stellar parameters, and dust and molecular properties. Although large number of PNe (~3500) are discovered so far, only a small fraction of them have been studied in detail. One of the motivations of our study is to perform detailed analyses of the fainter and so-far-scarcely-studied PNe, for which only sparse data is available. We have observed a handful of such PNe at 2 m Himalayan Chandra Telescope, Hanle, India, operated by Indian Institute of Astrophysics. We have performed detailed studies of some of these PNe (PB 1, PC 19, MaC 2-1, and Sp 4-1). We perform 3D morpho-kinematic modelling (using SHAPE) and photoionization modelling (using Cloudy and py Cloudy) of the nebulae. The nebular radial density profile and the shell radii in the photoionization models are consistent with those in the 3D morphological models of the nebulae, hence, the models are well-constrained. From the complete analysis, we have obtained a detailed description of each PN with results including 3D morphology, gas and dust phase elemental abundances, dust and molecular properties, distance to PN, important physical parameters of the central star (e.g., effective temperature, luminosity, mass, etc.) and the nebula (e.g., hydrogen density profiles, radii, etc.). We study PDR characteristics of PNe by computing a grid of Cloudy PDR models. The main application of the calculated grid is to study PDRs observed among PNe. Among PNe, many nebulae may have a 'thin' PDR (visual extinction ~ unity). We vary central star temperature and luminosities within a specific value range observed among PNe. We calculate the models for different nebular densities, C/H, O/H, and PAH and AC abundances. We compare the results from our model grid with PN observations.

HOST FACULTY

Dr. Ramkrishna Das

Associate Professor & Seminar Coordinator, Astrophysics & Cosmology

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