



भौतिक अनुसंधान प्रयोगशाला, अहमदाबाद

Physical Research Laboratory, Ahmedabad

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PRL Ka Amrut Vyakhyaan-13

Wednesday, 27 October 2021

@ 16:00 hrs. (IST)

**“What are exoplanets made of?
Molecular line lists to aid the
characterisation of exoplanets.”**

Prof. Jonathan Tennyson FRS

Massey Professor of Physics and Head of
Department, Department of Physics and
Astronomy, University College London (UCL),
Chief Scientist, Quantemol Ltd, UCL.



You Tube <https://youtu.be/UEpSGtYFs20>

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Abstract

Over the last two decades thousands of exoplanets have been discovered and we now know that essentially every star supports a planetary system. Interest is therefore turning to characterising these planets: understanding what they are made of, how they formed and, of course, if any of them are capable of supporting life. This can only be achieved using spectroscopic observations, laboratory data and detailed models. The ExoMol project which runs from my group at UCL is dedicated to providing the spectroscopic data needed to characterise exoplanets. This talk will describe the methods we use to provide these data, the progress in understanding the composition of exoplanets and the prospects for doing this better in the near future.

The Speaker

Prof. Jonathan Tennyson is a physicist whose research covers a range of topics on the theory of small molecules. During the course of his work, Jonathan collides electrons with these small molecules and computes their spectra. He is primarily interested in the astrophysical, atmospheric, plasma-related and other consequences of this process, and his findings are of great importance in astronomy and planetary studies.

Prof. Tennyson leads a large and successful research team at University College London (UCL) who study the way molecules absorb and emit light, with a particular emphasis on astrophysics and the Earth's atmosphere. He has performed specific calculations for problems relating to atmospheric processes, astrophysics, neutrino mass determination and radiation damage in biological systems, amongst others.

The author of over 600 scientific papers, Prof. Tennyson has also written a number of popular science articles. He also wrote the textbook *Astronomical Spectroscopy: An Introduction to the Atomic and Molecular Physics of Astronomical Spectra* (2005), which enables undergraduate-level readers to understand and interpret astronomical spectra. Prof. Tennyson is an elected Fellow of the Royal Society (FRS).



About PRL

The Physical Research Laboratory (PRL), known as the “cradle of space science” in India, is



one of the premier research institutes founded in 1947 by Prof. Vikram Sarabhai, a renowned Cosmic Ray Scientist, a great visionary and institution builder. PRL played a seminal role in producing a highly motivated cadre of space scientists and the technologists of highest international repute. The first scientific rocket launched from Thumba on 21st November-1963 and many other rockets launched thereafter contained payloads developed at PRL. Dr. Sarabhai initiated many of these scientific and technical activities at PRL which eventually led to the formation of the Indian Space Research Organization (ISRO). Therefore, PRL is known as the “cradle of space science” in India. Further, the research in

the area of Plasma Physics expanded to the formation of the Institute of Plasma Research (IPR).

As an institution PRL is unique in that it conducts fundamental research in a wide range of research areas from the Earth to the cosmos, and comprising Astronomy and Astrophysics; Solar Physics; Space and Atmospheric Sciences; Theoretical Physics; Geosciences; Atomic, Molecular and Optical Physics, Astrochemistry; and Planetary Sciences and Space Exploration. PRL is one of the rare research institutes of international repute wherein research in such diverse fields of sciences is carried out using several state-of-the-art experimental facilities that exist under one umbrella.

Along with the ongoing research, several new initiatives have been taken up during the last few years. The Multi-Application Solar Telescope (MAST) at Udaipur Solar Observatory has been operationalized. PRL initiated scientific programmes in frontier areas of research, which include a search for exo-planets, laboratory studies of interstellar grains, laboratory synthesis of cold astromolecules and experimental studies in the field of quantum optics. PRL is also developing several scientific payloads as a part of ISRO’s larger vision and contributing to roadmap for competitive scientific exploration of the solar system and beyond. In particular, PRL has been contributing significantly not only in building instruments for space missions, such as Chandrayaan-1, Chandrayaan-2, AstroSat and upcoming Aditya-L1, Chandrayaan-3 and planetary and space missions, but also by bringing out new and insightful science results.

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