PhD Studentship project for full-time PhD study: Space & Atmospheric Physics Group, Physics Department, Imperial College London

PhD Project: Laboratory Astrophysics: Spectroscopy of astrophysically important elements and applications of the new atomic or molecular data to astrophysics.

Research areas: atomic & molecular physics, spectroscopy, astrophysics and atmospheric physics

Background: The spectra of planetary atmospheres and stars are usually extremely complex: all the elements of the periodic table may contribute, as molecules or atoms in more than one stage of ionisation, blends of several lines are the rule rather than the exception. New high resolution spectrographs on ground- and space based telescopes give exciting spectra of stars and planetary atmospheres, but the laboratory atomic and molecular data that are vital for the interpretation of the astrophysical spectra, are often too inaccurate and incomplete. Vast improvements are needed in many cases in knowledge of atomic and molecular spectra in the laboratory.

The Space & Atmospheric Physics group’s Spectroscopy Laboratory has a Fourier Transform spectrometer which is unique - holding the short wavelength record for an instrument of its kind, and with its very high resolution and broad spectral range is ideal for studies of astrophysically important atoms, ions and molecules in the visible to ultra violet spectral range. Once an atomic or molecular spectrum has been recorded in the laboratory, an analysis of the spectrum is carried out to yield new atomic or molecular data over a broad spectral range (infra red through to ultraviolet) at unprecedented accuracy. We collaborate internationally on applications of the new atomic or molecular data. Current examples include our work on the Gaia ESO survey of 100,000 Galactic stars, and the APOGEE survey which aims to understand Galactic evolution.

Research Objectives: An STFC funded Ph.D. project is available to investigate astrophysically important atomic or molecular spectra using high resolution spectroscopy. Spectra to be studied will be carefully selected to be most relevant and urgently needed for astrophysics applications. The initial stage of the project is experimental in nature with spectra being studied in the UV and visible spectral region at Imperial College, and in the infra-red possibly at the National Institute of Standards and Technology (Washington) or in Lund University (Sweden), with whom we regularly collaborate. The student would then undertake a full analysis of the spectra. We anticipate collaboration with theoretical groups during this analysis stage. The new atomic or molecular data will then be applied in particular astrophysical spectral analyses through collaboration with astronomers. Examples include: working with teams investigating topics as diverse as Galactic evolution, time variation of the Fundamental constants, and understanding volcanism on Jovian moon Io.

The student will gain: experimental expertise in a world-class laboratory, using unique instruments; experience undertaking experiments in laboratories abroad; learn about atomic or molecular physics; skills in theoretical analysis of spectra learning computational and analytical skills; experience working on applications of the new atomic or molecular data to analyses of particular astrophysical spectra, stellar or planetary atmospheres.

The Student: The strongest candidates will have a first class degree in physics or astrophysics. This PhD suits a student who enjoys a combination of computational, analytical and experimental work.

Applications: forms are at: http://www3.imperial.ac.uk/pgprospectus/applicationforms

Once you have submitted your application online, please save the full application in pdf format and send a copy to Mr Paul Grocott (p.grocott@imperial.ac.uk) and another to Dr Juliet Pickering j.pickering@imperial.ac.uk. Eligibility information for Research Council studentship funding and other funding routes can be found at: http://www.imperial.ac.uk/study/pg/fees-and-funding/

Applications will be considered as they arrive, early application is recommended.

STFC Studentship starts: October 2016