Candidate Information

Position: Research Fellow
School/Department: Astrophysics Research Ctre
Reference: 23/111178
Closing Date: Tuesday 12 September 2023
Salary: £37,099 - £39,347 per annum
Anticipated Interview Date: Friday 29 September 2023
Duration: Fixed Term for 36 months, or until 31 August 2026, whichever is sooner.

JOB PURPOSE:

To work on the development and application of the R-matrix suite of computer codes to generate atomic data for the modelling of neutron star mergers and other exploding transients. This position will involve the use of the R-matrix suite of packages to compute cross sections for electron impact excitation, photoionization and recombination processes, atomic data necessary as input for the radiative transfer codes ARTIS and TARDIS. Development of the codes will be an important component of this position hence experience in Fortran coding and the use of supercomputer facilities is required. Collaborating with our project partners on the use of these atomic data for the interpretation of astrophysical observations will be essential and will involve extended periods of travel to other institutes in both Europe and the USA. The successful candidate will work within the Astrophysics Research Centre in the School of Mathematics and Physics as part of an ERC funded project.

MAJOR DUTIES:

1. Applying the GRASP0 and AS suite of computer packages to compute radiative atomic data such as energy levels, oscillator strengths and transition probabilities for a large series of ions with atomic number greater the Fe.
2. Applying the R-matrix suite of computer packages to compute cross sections for electron-impact excitation/ionization, photoionization and radiative recombination on national and international HPC facilities for each ion of interest.
3. Carrying out numerical radiative transfer simulations with the ARTIS Monte Carlo simulation tool for neutron star merger models.
4. Development work on the aforementioned codes as required. This development work will be motivated by the scientific aims of the project which emerge as new ions are explored and new observational spectra are obtained. This code development may include, for example, parallel optimization to allow for high Z ions to be considered, the implementation of new physical processes into the modelling codes and/or managing the incorporation of new atomic data into the simulations.
5. Analysis and interpretation of the atomic data computed, incorporation of the new data into the radiative transfer codes and the analysis of the subsequent simulation results compared to the observational spectra.
6. Managing large outputs from the atomic physics calculations and the simulations – including archiving and maintaining records of each calculation/simulation and their outputs.
7. Assist in the preparation of proposals for access to high-performance computing systems at national and international level.
8. Collaborative visits with the other project partners in Copenhagen, GSI Darmstadt and UCD Dublin to drive forward the synergy of the experimental, observational and theoretical effort. This may involve extended visits to these institutes over the duration of the post.
9. Write peer-reviewed publications and present findings at conferences and/or workshops.
10. Help supervise and support/mentor postgraduate and undergraduate students within the post holder's area of expertise and under the direct guidance of a member of academic staff.
11. Ensure up-to-date knowledge of the state-of-the-art within the research field through scholarly activities.
12. Assist in the preparation of funding proposals where relevant.
13. Undertake supplementary duties relevant to the success of the project including administrative duties and additional training and development activities as required.

ESSENTIAL CRITERIA:

1. Normally have or be about to obtain a PhD in Theoretical Atomic Physics (NB 'About to obtain' is normally defined as within 6 months of application date).
2. Specific relevant research experience in the following areas:
   • R-matrix calculations for atoms and ions to include electron-impact excitation, photoionization and/or radiative recombination.
   • Code development experience using Fortran for research.
   • Numerical simulation/modelling for astrophysical applications.
3. Strong publication record commensurate with stage of career.
4. Ability to contribute to broader management and administrative processes.
5. Willingness to help with administration and preparation of computer time proposals.
6. Contribute to the School's outreach programme by links with industry, community groups etc.
7. Ability to program in Fortran and python (or related languages).
8. Ability to assess and organise resources.
9. Ability to communicate complex information in English effectively in oral and written format.
10. Ability to build relationships to develop internal and external networks.
11. Commitment to continuous professional development.
12. Practical problem-solving skills, independence of thought and initiative.
13. Demonstrable ability to positively interact with research colleagues and other staff.

DESIRABLE CRITERIA:
1. Experience of using structure codes such as GRASP0, AS, GRASP2K, FAC or HULLAC.
2. Experience of using high-performance computing facilities in research, including resource management.
3. Experience and development of parallelisation within computer codes.
4. Appreciation of the use of atomic data in astrophysical modelling.
5. Experience of using multi-dimensional Monte Carlo transport codes, such as the ARTIS code.
6. Experience of writing proposals for high-performance computing facilities.
7. Experience of managing high-performance computer resources.
8. Willingness to travel for periods of time for the purposes of attending conferences or collaborative visits.