Candidate Information

Position:	Research Fellow
School/Department:	School of Mathematics and Physics
Reference:	26/113352
Closing Date:	Monday 22 June 2026
Salary:	£41,519 per annum.
Anticipated Interview Date:	Monday 6 July 2026
Duration:	2 years or until 31 August 2028, whichever is soonest.

JOB PURPOSE:

To actively develop the relativistic R-matrix and AUTOSTRUCTURE codebases to generate atomic data for the modelling of neutron star mergers and other exploding transients.

To integrate these data into subsequent radiative transport codes TARDIS and ARTIS, and work within our ERC Heavymetal collaboration to support the running and interpretation of simulations with these codes. The appointed candidate will make significant contributions to computer grant applications, ensure good management of resources and mentor junior members in their usage of such resources. They will also be expected to travel to/visit each of the Heavymetal nodes, and be receptive to undertaking collaborative work in response to the needs of experimental and/or observational components of our project in a timely fashion. The successful candidate will work within the Astrophysics Research Centre in the School of Mathematics and Physics at Queen's University Belfast.

MAJOR DUTIES:

1. Applying the GRASP0 and AUTOSTRUCTURE 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 level resolved electron-impact excitation, dielectronic recombination, radiative recombination, photoionisation and ionisation (by thermal and non -thermal electrons).
3. Carrying out numerical simulations with the TARDIS and ARTIS codes for neutron star mergers that make use of new atomic data.
4. Development work on the aforementioned codes, as required. This will be motivated by the scientific aims of the project which emerge as new ions are explored and new observational/experimental data are obtained. This code development may include, for example, parallel optimization to allow for high Z ions to be considered or the implementation of new physical processes into the modelling codes.
5. Managing large outputs from the atomic physics calculations and the simulations – including archiving and maintaining records of each calculation/simulation and their outputs and incorporating new data in the databases used by radiative transfer codes.
6. Analysis and interpretation of the atomic data and working with collaborators in the Heavymetal project on their application for interpreting experimental measurements and/or astrophysical observations.
7. Assist in the preparation of proposals for access to high-performance computing systems at national and international level, as a required for this work.
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. Mentor postgraduate and undergraduate students within the post holder's area of expertise.
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 relevant PhD
   (Theoretical Atomic Physics or Astrophysical Simulation, or related field) (*must be obtained within 3 months of commencement of employment).
2. Significant relevant research experience. 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, C++ and/or Python 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. Willingness to contribute to the HEAVYMETAL collaboration, including helping to organise meetings between nodes and sharing of expertise and results.
7. Ability to program in FORTRAN/ C / C++ 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.
14. Willingness to travel for periods of time for the purposes of attending conferences or collaborative visits, including to HEAVYMETAL partner institutes.

DESIRABLE CRITERIA:

1. Experience of using structure codes such as GRASP0, AS, GRASP2K, FAC or HULLAC.
2. Experience of using multi-dimensional Monte Carlo transport codes, such as the ARTIS code.
3. Experience and development of parallelisation within computer codes.
4. Experience of using high-performance computing facilities in research, including resource management.
5. Experience in the use of atomic data in the interpretation of experimental work and astrophysical spectra.
6. Experience of managing code development, including version control and testing.
7. Experience of writing proposals for high-performance computing facilities.
8. Experience of working in multiinstitute collaborations.
9. Experience of managing highperformance computer resources.
10. Experience of interdisciplinary research that entails the application of atomic theory to the study of experiment and astrophysical observation.

ADDITIONAL INFORMATION:

Informal enquiries can be directed to: Stuart Sim - s.sim@qub.ac.uk.