Head of Numerical Physics
Job Ref 39

First Light Fusion

First Light Fusion Ltd is a lean, focused and agile corporation researching energy generation by inertial confinement fusion. The company was spun out from the University of Oxford in June 2011 and is based near Oxford. First Light continues to work closely with the academic community, both in the UK and internationally. The company is well-funded by both institutional investors and private individuals.

Inertial confinement fusion (ICF) for energy generation is a well-established research field and is being pursued in many laboratories worldwide, perhaps most notably in the US at the National Ignition Facility. First Light is exploring a number of alternative research directions that harness the same fundamental physics, with the prime focus being power generation. First Light's work to-date has included theoretical analysis, detailed numerical simulation and experimental validation. This has allowed description of the accessible parameter space and has led to a clear vision of the pathway to fusion.

First Light has also considered the costs and engineering practicalities of a reactor implementing its technology and can articulate a number of advantages over other approaches. Additionally, the energy focusing processes being pursued form the foundations of a new technological platform where secondary opportunities exist in a number of alternative applications, for example material processing and chemical manufacture.

Vacancy Specification

Numerical simulations are an essential and fundamental part of First Light Fusion's technical capability. Our technology is based on exquisite understanding of the complex hydrodynamics that occur within our fusion targets. We believe that a world-class simulation capability is essential to our success.

These simulations are notable for the complexity of the physics that is required to be modelled. The underlying phenomenon is well-approximated with a continuum modelling approach (i.e. hydrodynamics) but physics of dissociation and ionisation mean that the properties of matter are a complex piece of the whole. Non–hydrodynamic energy transport processes are also very important, particularly heat conduction, which is strongly non-linear with temperature, and radiative transport. This can initially be modelled as an additional diffusive process and properties of matter, such as opacities, are again a notable challenge.

As Head of Numerical Physics the successful candidate will have ownership of the primary simulation tool being developed and used at First Light. You will lead the development and execution of the high-level strategy for this tool. This will involve leading a multi-disciplinary team comprising software engineers, numerical scientists and theoretical physicists. You will also work closely with our network of external collaborators and consultants, who bring significant experience and expertise on the physics of ICF and on the established best-practice numerical methods.

The successful candidate will contribute to the expertise of their team through their own knowledge and experience; hands-on development will be a part of the role. The core capability must be in simulation of compressible fluid dynamics, particularly stencil-based and explicit-in-time methods. Expertise of simulations and methods in one or more of the following broad topics would be beneficial: DNS turbulence, reactive flows, multiphase flows (in particular interface tracking methods), MHD, radiation-hydrodynamics, adaptive mesh refinement techniques and simulations in an MPI environment.

In addition to simulation capability, First Light Fusion also has an experimental physics team and a suite of in-house experimental platforms and diagnostics. This team is able to deliver high-fidelity experimental data tightly focused on specific questions. There is a strong coupling between the experimental and numerical work. The experimental team are able to run simulations to explore and explain their results. They are also able to produce specifically targeted results to provide verification data for the simulations.

This role will report directly to the CTO and will be part of the technical leadership team.

Essential

- Master's degree in Maths, Physics or Engineering
- Deep knowledge of numerical methods applied to compressible flow
- Experience of architectural design of high-performance scientific software written in modern C++
- Strong grasp of software engineering best practice
- Experience of technical staff management
- Proven project leadership, identifying mid-term strategic objectives, agreeing these and leading successful execution
- Willingness and ability to forge strong collaborative relationships with academic and industrial partners
- Passion for fusion and for taking a bold approach to a high-risk transformational technology
- Demonstrated self-motivation, enthusiasm to work in a dynamic team environment and evidence of taking the initiative
- Strong communication and interpersonal skills

Desirable

- PhD in Maths, Physics or Engineering
- Knowledge of numerical methods for interface tracking and multiphase flow
- Expertise in modelling diffusive terms in a compressible flow system (e.g. heat conduction, viscous dissipation)
- Experience with agile management techniques (e.g. scrum, lean, kanban)
- Understanding of user centred design and its application to technical problem solving

Benefits

A competitive package and entry into a company option's scheme. Relocation packages will be considered.

How to apply

Please upload your CV and cover letter using the interface on our website, http://firstlightfusion.com/careers/.

Informal enquiries may be addressed to careers@firstlightfusion.com.

CVs sent by recruitment agencies will not be read, and in the event that the company receives a CV from both the direct applicant and a recruitment agency the CV will be treated as a direct application by the individual only. Unsolicited contact from Recruitment agencies will be disregarded.