

Liquid Metal Experimentalist

Start on/after: April 30, 2021

For full consideration, apply by: March 30, 2021.

If a potentially good or excellent match, we will contact you within 1 week from applying.

Renaissance Fusion -the first magnetic confinement fusion company in the EU- is currently prototyping two fusion-enabling technologies, with the goal of fully demonstrating and commercializing them (albeit in non-fusion markets, initially) within 3 years. The two technologies are (1) radically reinvented High-Temperature Superconducting (HTS) magnets and (2) controllable, plasma-facing liquid metal walls that will extract heat from the reactor, shield it from neutrons and thus prevent it from becoming radioactive. These innovations will enable our own stellarator reactor design, form a versatile cornerstone of the emerging fusion market (as they could be easily adapted to tokamaks and other reactors) and find their way in other markets. We are forming a team of the brightest, most driven scientists and engineers to realize this vision within 11 years.

Here we are looking for a talented engineer, physicist or material-scientist to sustain and stabilize thick, gravity-defying, free-surface liquid metal flows. This will include the production of innovative alloys and components such as special pumps for in-house experiments and, eventually, for production and sales.

Our team is young, agile, international and based in the exciting city of Grenoble, by the French Alps.

Responsibilities:

- Individual research responsibilities
 - o Develop low-melting alloys with specific characteristics (melting point, density, viscosity, thermal, electrical and corrosion properties).
 - o Build pumps, substrates and other parts for ducted and free-surface liquid metal experiments.
 - o Prepare, conduct and analyze reduced-scale self-similar tests, and eventually full-scale demonstrations of gravity-defying, thick liquid metal flows in realistic geometries. This applies also to the solid substrate and to pebbles and corrosion by-products suspended in the liquid.
 - o Develop reactor-grade diagnostics of liquid metal properties, resolved in space and time. Properties include thickness, velocity and temperature. They also include the distribution of pebbles and Tritium.
 - o Develop actuators to control the liquid metal thickness and speed. Deliberately apply electromagnetic, mechanical and thermal perturbations. Prove passive, active and feedback stabilization, including in worst-case scenarios. Fine-tune turbulent spectrum: neither too little, nor too much.
 - o Identify non-fusion applications of liquid metal products and technologies.
- Responsibilities as a team member

- o Work with physicists and engineers within the company, as well as external clients and collaborators, to identify experimental needs (flow-rate, thickness, thickness uniformity etc.) and translate them in adequate materials, designs and prototypes.
- o Collaborate with numerical modelers on the prediction and interpretation of liquid metal flow measurements, including the equilibrium and stability of the coupled plasma-liquid metal system.
- o Collaborate with material scientists and chemical engineers, e.g. on the prediction and interpretation of corrosion results.
- o Give and receive advice to/from colleagues in other departments (Stellarator Engineering, HTS, Materials and Integration) on how to best integrate liquid metals with other materials (thermally, chemically and otherwise), and how to integrate parts and devices in the final product (mechanically, electromagnetically and otherwise).
- o Participate in Tritium extraction and heat removal experiments with chemical, thermohydraulic, nuclear engineers and other colleagues. Demonstrate Tritium cycle and continuous operation of plasma-exposed breeder/blanket.

Qualifications -essential:

- PhD degree in physics, nuclear, chemical or electrical engineering, materials science or related field, or, equivalently:
 - o Master's degree + 2 years of research or professional experience, or
 - o Bachelor's degree + 4 years of research or professional experience.
- 2 or more years of experimental research in one or more of the following topics: fluid dynamics, electrical engineering, metallurgy, control engineering.
- 6 months or more of experience in Computer Aided Design (CAD).
- Very good understanding of electromagnetism and fluid dynamics.
- Good written and oral communication skills.
- Ability to understand and clearly, concisely explain complicated technical concepts.
- Organizational and problem-solving skills, attention to detail and willingness to learn.
- Ability to work independently as well as in a team.

Qualifications -desirable:

- Research experience in magnetohydrodynamics of plasmas and/or liquid metals.
- Research experience in multi-phase and/or multi-component flows.
- Experience in Finite Element Analysis (FEA).
- Coding experience in Python, Matlab or other programming language.