

PhD thesis project

Probing the nanoscale architecture of the bone-tendon interface with X-ray texture tomography

A **36-month PhD position** is available at the Institut Fresnel in Marseille, France, an academic joint laboratory of Aix-Marseille University, CNRS and Ecole Centrale.

The crystallographic texture is a major determinant for the behaviour of materials. Despite this importance, appropriate, quantitative methods to study the crystallographic texture in biomaterials in 3D are missing. In the framework of a project funded by the European Research Council (ERC Starting grant 'TextOM'), our group is aiming to develop texture tomography as a quantitative tool to study the crystallographic texture in 3D, based on previous work [1]. We finally want to use it to study the mechanical behaviour of a functionally graded, hierarchically organized biomaterials, the bone-tendon insertion.

Position

The selected PhD will take active part in the ERC project 'TextOM', which requires:

- Experimental high-resolution characterization of the bone-tendon insertion with multi-modal x-ray imaging (texture tomography, phase-contrast imaging, absorption spectroscopy) at synchrotron light sources (European Synchrotron (ESRF), Grenoble, France)
- Development of correlative optical image- based sample positioning algorithms for synchrotron implementation
- Lab-based stimulated Raman scattering and polarized second-harmonic generation imaging of the bone-tendon interface

The selected PhD should demonstrate a sound scientific interest and the, curiosity willingness to acquire new skills, allowing him/her to conduct the outlined research activities. He/she will work under the direct supervision of a CNRS scientist and will interact with other researchers in the team, scientific collaborators in biomechanics as well as scientists at the ESRF during the implementation of the method. The position entails furthermore multiple scientific visits to the European Synchrotron (ESRF) for the experiments. The working language in the team is English.

Requirements

- Interest in biomechanics, biomineralization or a related discipline
- Experience with X-ray scattering, imaging or absorption spectroscopy is a bonus
- Familiarity with programming in python is a bonus
- Highly-developed critical and analytical skills
- Capability to work in an interdisciplinary, international team

Terms of employment

The PhD position is a three-year full-time appointment under a contract with the French National Centre for Scientific Research (CNRS), starting preferentially in September 2023. The PhD is awarded by the Aix-Marseille Université

Application

Candidates are requested to submit:

- a cover letter explaining shortly the relevance and motivation of the application
- a detailed CV

The application should be addressed to tilman.grunewald@fresnel.fr and documents shall be submitted in English.

Selection will be based on merit and potential, measured in terms of academic record and personal achievement. Creativity, proactivity and capacity for teamwork will also be taken into account.

The selection process will be closed as soon as a good candidate is recruited.

References

[1] T. Grünwald et al, Science Advances 6 (24), 2021 DOI: 10.1126/sciadv.aba4171

Please contact the Principal Investigator for further information

tilman.grunewald@fresnel.fr