



Multi-Scale Mechanics of Biological Composites: Insights from Advanced X-ray Nanotomography

A PhD studentship is available for a joint research project between the groups of [Professor Fabio Nudelman](#), School of Chemistry, University of Edinburgh, UK, and [Dr Claire Donnelly](#), Max Planck Institute for Chemical Physics of Solids, Germany. The studentship is fully funded for 48 months and covers tuition fees and an annual stipend at the UKRI Rate, for 2024-25 this is £19,237 per annum. The student will be registered at the University of Edinburgh and will spend two years in the group of Professor Nudelman and two years in the group of Dr Donnelly. Candidates must satisfy [EPSRC residency criteria](#).

Project Summary

Biological composite materials, such as bone, are three-dimensional, hierarchically structured inorganic-organic composites. Bone, in particular, is a composite tissue consisting of an organic collagen matrix as its fundamental building block, impregnated with the inorganic calcium phosphate mineral hydroxyapatite. The organization of these mineralized collagen fibrils across multiple length scales, from the nanoscale to the macroscopic, is critical to its remarkable properties, enabling it to be both flexible and strong enough to resist fractures.¹ This project aims to develop and apply multimodal (coherent) X-ray nanotomography² to image the microstructural evolution of biological composite materials in response to environmental changes. In the long term, the project seeks to provide insights into the microstructural origins of bone diseases.

Candidate Requirements

Essential

- A Bachelor's (BSc) and/or Master's degree (MSc) in Chemistry, Physics, Materials Science, or a closely related discipline.
- Curiosity-driven interest in microscopy and or biominerals.
- A solid foundation in coding/programming, with experience in one or more programming languages (e.g., Python, MATLAB, or similar).
- Strong analytical skills, and the willingness to work in a multidisciplinary collaborative environment.

Desirable

- Prior experience in X-ray Spectroscopy, Diffraction or Handling of Biological Specimen.
- Familiarity with software development best practices, such as version control (e.g., Git) and modular programming.

How to apply:

In the first instance, the initial application (including cover letter and CV) should be directed to: Professor Fabio Nudelman, School of Chemistry, University of Edinburgh, David Brewster Road, Edinburgh EH9 3FJ, UK. Email: Fabio.nudelman@ed.ac.uk

The position will remain open until filled.

References

1. The role of collagen in bone apatite formation in the presence of hydroxyapatite nucleation inhibitors. *Nature Mater* 9, 1004–1009 (2010)
2. X-ray linear dichroic tomography of crystallographic and topological defects. *Nature* 636, 354–360 (2024)

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IMPORTANT

Before Submitting your cover letter and CV, please complete the online [School of Chemistry Equality, Diversity and Inclusion Form, entry 2025-26](#).

The form will automatically generate a unique 'Response ID number' that you must include in your cover letter.

Equality and Diversity

The School of Chemistry holds a Silver Athena SWAN award in recognition of our commitment to advance gender equality in higher education. The University is a member of the Race Equality Charter and is a Stonewall Scotland Diversity Champion, actively promoting LGBT equality.

The University has a range of initiatives to support a family friendly working environment.

For further information, please see our University Initiatives website:

<https://equality-diversity.ed.ac.uk/inclusion/family-and-carer>