M3D
ARC Training Centre for M3D Innovation

2 PhD Scholarships

Partnership between:

Australian Nuclear Science and Technology (ANSTO), Sydney/Melbourne and Australian National University (ANU), Canberra

The **ARC Training Centre for Multiscale 3D Imaging, Modelling and Manufacturing (M3D)** will train a new generation of PhD candidates in the emerging area of Digital Materials and Advanced Manufacturing, including the Heritage Sciences/Museum Sector.

Projects within the M3D Training Centre are run in collaboration with our industry partners from Australia and overseas and promise to deliver real-world outcomes with ground-breaking results within diverse fields. The program will give PhD candidates a chance to obtain practical experience through industry-based research training with the relevant industry partner. Visit: https://m3d.edu.au

3D imaging of samples through Computed Tomography with sub-millimetre resolution (micro-CT) forms the core investigative tool of the M3D Innovation ARC Training Center. This capability is to be provided by CTLab at ANU and the imaging beamlines at ANSTO (Aust. Synchrotron: IMBL, XFM, MCT and OPAL reactor: DINGO). Two broad topics for student projects that arise from this collaboration and draw from these capabilities are:

Project 1.1 - Multimodal imaging and tomography;

Project 1.2 - Tomography of dynamic processes.

These could involve all aspects of instrumentation from hardware and acquisition protocols, to developing computational imaging and tomographic reconstruction algorithms, as well as 3D image analysis techniques. (Full Project Descriptions Attached)

Rate: AUD $33,413/pa for 3 years with a possible 6 months extension

Candidates must hold a First Class Bachelor degree with Honours or a Master degree in Material or Mechanical Engineering, Bioengineering, Mathematics, Physics, Materials Science, Geology, Zoology, Computer Graphics, Visualisation, or in a related field of research. Knowledge of programming, modelling or image processing is desirable.

Applications open until 10 December 2021or until positions are filled.

Applications and further information:
M3D Innovation Enabling Technology Leader: Dr Andrew Kingston,
Andrew.Kingston@anu.edu.au

Information about ANU positions:
M3D Innovation Centre Manager:
Dr Ankie Larsson,
Ankie.Larsson@anu.edu.au

Resources | Non-destructive Evaluation | Medical Devices | High Value Materials | Heritage Science/Arts | Energy & Environment

P1.1 - Multimodal imaging and tomography

Supervisor: Andrew Kingston

Industry supervisors: Dr Ulf Garbe (DINGO), Dr Martin de Jonge (XFM), Dr Chris Hall (IMBL), Dr Andrew Stevenson (MCT)

As part of M3D Innovation engagement, synchrotron and neutron imaging can be performed on samples in other Training Centre projects where the complementary contrast can aid in material identification or discrimination and in some cases can be quantitative. This project involves developing techniques to combine multi-modal data for correlative tomographic analysis (e.g. X-rays & neutrons) and/or quantitative tomography (e.g. multi-energy CT or X-ray attenuation and fluorescence).

P1.2 - Tomography of dynamic processes

Supervisor: Andrew Kingston

Industry supervisors: Dr Chris Hall (IMBL), Dr Ulf Garbe (DINGO), Dr Andrew Stevenson (MCT), Dr Martin de Jonge (XFM)

Sample evolution through dynamic processes of interest include fluid flow, reactive flow, or mechanical deformation. Example fluid flow scenarios include oil/water transport through rock for the petroleum industry, or capture of super-critical CO_2 in geo-sequestration experiments for the coal industry. These topics are explored by other industry partners in M3D. The Bayesian dynamic CT algorithm developed at ANU will be developed in this project. This is capable of imaging the fluid distribution between Haynes-jumps using far fewer recorded projections by leveraging a-priori information of the sample; it enables higher temporal-resolution tomography than currently possible.

Example mechanical deformation scenarios include load/compression testing of samples, and deformation of biological samples during scanning. This project involves development of tomographic reconstruction that incorporates a model for non-rigid motion, i.e., the process involves two components: (1) a static reconstruction of the object at a specific instance in time, and (2) a 4D model of 3D deformation (motion map) over time. For the case of load testing, the deformation map provides the sample response to load, for the case of biological imaging, the static reconstruction provides the potential for motion-artefact-free images.

Applications and further information: M3D Innovation Enabling Technology Leader:
Andrew.Kingston@anu.edu.au

Resources | Non-destructive Evaluation | Medical Devices | High Value Materials | Heritage Science/Arts | Energy & Environment