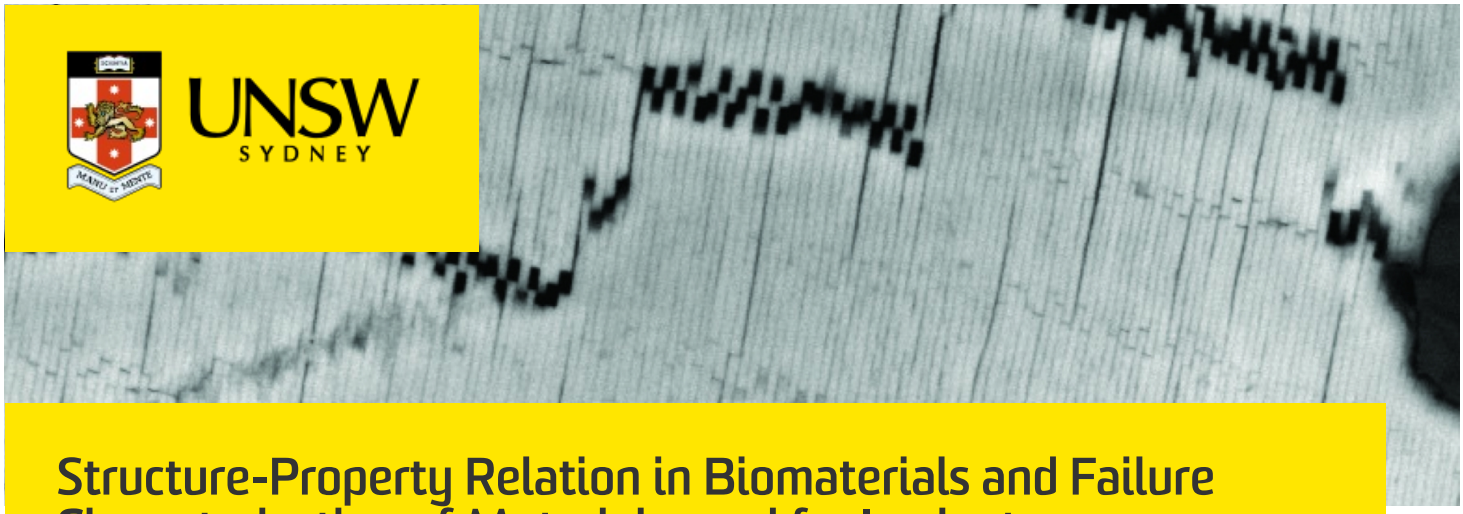

Structure-Property Relation in Biomaterials and Failure Characterisation of Materials used for Implants

Developing a better understanding of biological and nature-inspired materials; researching the impact of diseases like osteoporosis or diabetes on bone quality; and contributing to the design of advanced, damage-tolerant materials for use in prosthetic devices through characterisation, testing, and failure analysis over a wide range of naturally occurring environments.

More Information

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Competitive advantage

- Mechanical performance characterisation in various environments both in-situ and ex-situ
- Simultaneous characterisation of failure evolution on multiple length scales
- Experience working on conventional implant materials and novel composites; e.g. high-entropy alloys, intermetallics and bio-inspired composites

Impact

- Understanding the origin of mechanical performance in biological materials
- Characterising the impact of diseases, including their treatments, on the structural reliability of biomaterials such as bone
- Developing improved material combinations for implants

Successful outcomes

- Understanding the development of bone structure and quality during skeletal growth
- Evaluation of diseases and drug treatments on the mechanical competence of bone
- Understanding the effect of testing conditions on the fracture resistance of human bone
- Small-scale testing of remineralised carious lesions in human teeth
- Damage-tolerance evaluation of biological materials for use in nature-inspired material design
- Characterisation of causes of various implant failures

Capabilities and facilities

- Alemnis in-situ nano-indenter with intrinsic displacement control
- Deben micro-tester for both in-situ and ex-situ observation of deformation and failure
- Instron multi-axial testing frames with temperature and environment control

Our partners

- Various companies requiring failure analysis of orthopaedic, cardiac and respiratory medical implant devices made from

materials such as oxidised zirconium, pyrolytic carbon and nickel-titanium shape memory alloys