

Christchurch Regenerative Medicine and Tissue Engineering (CReaTE) Group
University of Otago Christchurch
Department of Orthopaedic Surgery | Centre for Bioengineering & Nanomedicine

PhD position available:

A 3 year fully funded PhD project is available immediately in the CReaTE Group (University of Otago Christchurch) as part of a 4 year project funded by the Ministry of Business Innovation & Employment (MBIE) in collaboration with medical device industry partners and the University of Auckland (ABI).

Project: Topology optimisation of 3D Printed titanium scaffolds for bone regeneration

- Primary supervisor: Dr Tim Woodfield (UoO Christchurch)
- Co supervisors: Dr Justin Fernandez (UoA), Prof Gary Hooper (UoO)

Rationale:

Additive manufacturing (AM) is driving a revolution in personalised medicine by allowing implants to be tailored to exactly match each patient. With a growing population and an epidemic of joint disease there is an acute need for effective and long lasting treatments. AM enables the creation of implants that not only match the patients anatomy, but encourage bone growth and remodelling to enhance implant survivorship and reduce implant related disease.

The CReaTE group develops bone-interfacing implants and porous scaffolds through a variety of platform technologies in AM and biofabrication using metals, polymers and gels/bio-inks. **We are seeking motivated PhD candidates with a background in bioengineering, computational mechanics and 3D Printing** to investigate scaffold architecture optimisation in AM titanium implants, as well as design of scaffold surface topography to promote bone formation. Both architecture and topography are critical factors involved in influencing bone formation *in vivo*, and results from this PhD will be evaluated in *in vivo* models and in close collaboration with industry partners.

Project Objectives:

1. Develop and apply topology optimisation algorithms to drive scaffold design.
2. Model scaffold topology to achieve optimal biomaterial properties for macro-scale models of sheep proximal tibia and distal femur with daily loading forces.
3. Validate optimisation strategies with material characterisation including topology, topography and mechanical properties, novel CT imaging techniques.
4. Investigate *in vivo* response against computational predictions using *in silico/vitro* models in bone including biomechanical and bone histology techniques.

The specific skills required:

1. Experience with computational modelling, optimisation routines, computational mechanics, Matlab, FEA software, mechanical testing are essential.
2. Interest in 3D Printing, medical device design, bone biology, computer-aided design (CAD), CT imaging,



biomaterial/surface characterisation techniques, are also highly desirable.

Successful candidates will join the CReaTE Group - a multidisciplinary research team of bioengineers, biologists and clinicians working at the interface of cell-biology, biomaterials science and engineering. There will be significant opportunities for PhD candidates to interact with medical device industry partners as well as orthopaedic surgeons. Furthermore, travel opportunities exist to visit partnering international institutions and labs in Europe as part of an EU/FP7 Mobility Grant research programme between NZ/EU focussing on skeletal regeneration.

Qualifications:

Applicants must hold an Undergraduate and/or Masters degree in one of the following areas: Engineering, Bioengineering, Biomaterials, Applied Mechanics, Computational Biology, Mathematics, **and must have an 'A' grade average (or equivalent GPA).**

Funding Arrangements:

NZ\$25,000 per annum stipend including fees (approx. \$8500) for the duration of the 3yr PhD degree.

To Apply:

All NZ and international candidates with high motivation, enthusiasm, and independent thinking are welcome to apply. Please send a copy of your full CV including references to publications/conference proceedings; copies of undergraduate/postgraduate academic transcripts; letters of reference from two referees, and any other supporting information relevant to the project (e.g. modelling, software/hardware expertise) to tim.woodfield@otago.ac.nz by **27th Feb 2015**.

For more information on the CReaTE Group, other Additive Manufacturing/3D Printing and Regenerative Medicine PhD positions available at the University of Otago Christchurch visit...

www.bioengineering.otago.ac.nz/create

<http://www.otago.ac.nz/christchurch/research/create/index.html>

www.otago.ac.nz/christchurch/study/postgraduate/#phd



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