Title: 3D Printed Orthopaedic Implants.

Institute: Department of Orthopaedic Surgery and Centre for Bioengineering & Nanomedicine, University of Otago, Christchurch, New Zealand.

Supervisor: Associate Professor Tim Woodfield.

Dates: Start as soon as possible, 3 years full time.

Application deadline: 30 April 2016.

Contact: Please send your CV, copy of your academic transcripts and letters of reference from 3 referees to Peter Hilton, Project Facilitator. Email to peter.hilton@otago.ac.nz.

Stipend: $25,000 PA (tax exempt) + tuition fees (approx. $9,300).

Essential background: Bachelor’s degree with first or upper second class honours or equivalent (including a research component) or a Master’s degree (including an appropriate research component) in one of the following disciplines: Mechanical Engineering; Biomedical Engineering; Biomedical Sciences.

Key skills: High level of critical thinking and strong academic merit in engineering design, materials and computational mathematics; brilliant problem solving; outstanding communication; an ability to work independently and as part of a diverse team.

Project description: Undertake the development of a commercially viable additively manufactured (AM) implant using the latest medical printing (EBM and DMP titanium alloy) and tissue engineering concepts (polymers and bio-inks with cells and biologics). A strong focus on the engineering design process and hands-on validation. Core involvement with an initial translational large animal study (AS1, 2016) to evaluate manufacturing options followed by a pre-clinical evaluation of the device (AS2, 2017). Generate novel data and submit publications to international journals and conferences. Ultimately developing a next-generation orthopaedic/tissue engineering solution for clinical translation.

Key tasks:

1. Develop specifications for an additively manufactured scaffold implant by investigating literature, market, industry partners and customers.
   a. Engage with industry partners and manufacturers with a goal of translating the end use device to commercial use;
   b. Assessing the commercial relevance from a regulatory, market and intellectual property perspective and an in depth focus on manufacturability including product cleaning and sterility as well as in-market products through existing clinical data;
   c. Using current and emerging AM techniques for manufacturing medical devices including AM titanium production using electron beam melting and laser melting, degradable polymer and gel printing with and without cells and biological factors;
2. Generate concept designs and design elements and evaluate against the specifications through in silico, bench and in vivo testing.
   a. Computational and statistical modelling;
   b. CAD and FEA modelling;
   c. Morphological characterisation using SEM, micro CT and other techniques;
d. Mechanical testing;

e. In vivo testing (AS1 pre-clinical animal trials) including field work, involvement with surgery, imaging, and ex vivo analysis of biological performance including histology and biomechanical testing.

3. Embodiment design to meet the specifications.

a. Adaptation of successful concept design elements into the final design solution (including outcomes of AS1);

b. Incorporation of physiological modelling information from collaborators at University of Auckland;

c. Incorporation of topological modelling information from University of Otago, Christchurch;

d. Engagement with industry partners and manufacturers to prepare device for pre-clinical application.

4. Evaluation of the device in a pre-clinical setting.

a. Planning and execution of a translational animal model to assess the performance of prototype device (AS2) using evaluation methods described in Task 2;

b. Support regulatory filing and generate journal publications.

For more information on the CReaTE Group and the Centre for Bioengineering & Nanomedicine at University of Otago Christchurch visit...

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