2016/2017 Summer Studentship Project Application Form

Send to: Research Office, University of Otago Christchurch, PO Box 4345, Christchurch, by 5pm on **4 July 2016**

Supervisor Information (First named supervisor will be the contact):	
First Supervisor's Name and Title: Mohsen Ramyar, PhD student (after submission)	
Department - UOC &/or CDHB (if applicable): Radiology UOC	
First Supervisors Phone: 02102416806	First Supervisors Email: rammo204@student.otago.ac.nz
First Supervisors Mailing Address: Radiology and Centre for Bioengineering, UOC	
Co-Supervisors Name and Title(s):A/Prof Nigel Anderson, A/Prof Tim Woodfield	

Research Category (Choose one category only – to be used for judging the students' presentations):		
Clinical	**Laboratory X**	**Community**

Project Title (20 words MAXIMUM):

Determining the health of joint cartilage in osteoarthritis with MARS spectral

Project Description:

Introduction:

The prevalence of osteoarthritis is increasing, with an increasingly unmet demand for joint replacement. In 2010 arthritis care cost $3.**2B. Currently our radiographic assessment of articular (joint) disease is limited to plain film X-rays, MRI and CT scans** which are very poor at assessing cartilage health. MARS is a new technology developing in Christchurch that can measure the x-ray attenuation of different tissues using a spectral scanner to provide molecular imaging at the microscopic level. We have shown that MARS can measure and map within articular cartilage the contrast agent (Iodine) concentration which is inversely related to glycosaminoglycans, (GAG) a marker of cartilage health. Nine osteoarthritic tibia plateaux removed at the time of total knee replacement have been incubated in contrast agent (Gadolinium) and scanned by MARS spectral to allow mapping and measurement of GAG content and distribution.

Aims:

1-To map and measure Gadolinium concentration from the MARS images of osteoarthritic tibial plateaux incubated in Gadolinium..
2-To determine GAG concentration in the osteoarthritic cartilage.

Possible Impact (in lay terms):

Once methodology for assessing cartilage health noninvasively is translated to clinical use via the human MARS scanner project expected to be available within 4 years, clinicians will have the opportunity to measure cartilage health and institute therapies which could prevent progression to irreversible joint damage, and therefore limit the demand for joint replacement, with all the health, social, and economic benefits that would result. The student will gain valuable knowledge about MARS spectral, image processing and its application to joint imaging. The student will be working in a large research group with national and international collaborations in place.

Methods:

MARS spectral CT scanning of the samples is complete. The next phase of this work, and the subject of this studentship, is the most interesting: analysis of the images to obtain gadolinium and therefore GAG concentrations. The student will compare the gadolinium (Gd) attenuation in the cartilage with a calibration curve derived from a series of known Gd concentrations to quantify the amount and distribution of Gd in the osteoarthritic cartilage. Validation of the MARS results will be via quantitative

biochemical analysis of GAG content using dimethylmethylene blue (DMMB) and histology, outside the requirement of this studentship.