

## MDPH480/PHYS480/ASTR480/MAPH480 Research Projects 2009

Project Title: **MARS biomedical imaging research topics 2009 (topics 1-10)**

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and/or other staff of UC and Otago University, see below

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### **Abstract of the Proposed Research** (use this page only)

There are numerous possible research topics available within the Christchurch MARS biomedical imaging research programme. The programme spans four University of Canterbury departments, Christchurch hospital and several departments of Otago University's Christchurch School of Medicine. Summer interns, and honours, masters and PhD students are sought. Some scholarship funding is available for thesis and summer students.

The team in Christchurch has built and tested a desktop spectroscopic x-ray CT system based on the CERN Medipix x-ray detector. It is involved in the design and construction of the Medipix camera subsystem, the hardware and software for the electromechanical subsystem, the computer tomography (CT) and materials analysis algorithms, the 3D visualisation tools, the radiology and the biomedical science. In the past year the complete system has advanced to the stage where novel biomedical images have been obtained and preliminary results presented at radiology, computing, engineering and physics conferences. Members of the team are focussing on improving each of the component parts of the imaging chain, from the basic physics to advances in diagnosis and treatment.

Possible research tasks include:

1. Testing and characterising the new CdTe sensor, and the Medipix-3 chip.
2. Testing and calibrating the electromechanical systems.
3. Implementing improved algorithms for multi-energy computed tomography.
4. Devising and testing novel algorithms for materials analysis.
5. Devising, implementing and evaluating techniques to improve the perception and visualization of the multispectral datasets.
6. Design, implementing and evaluating techniques to improve the interaction with the 3D spectral datasets.
7. Measuring the properties of atheroma plaque using the scanner.
8. Using the scanner to measure lipid content of mice livers from MARS images.
9. Studying the spectral differences in various lesions in excised breast tissue.
10. Working with Alan Bell at CERN on Medipix in the CMS cavern

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