Materials-Processing by Ultrafast Laser (Marjoribanks (Physics) / Lilge (Dept. Medical Biophysics)

This applied-physics project seeks to improve state-of-the-art control of a special 'burst-mode' ultrafast laser, to deliver femtosecond laser pulses in different ways for laser processing of special and difficult materials. First, you'll help to study exactly what goes on with ionization, ablation, and shockwave-formation in glass (for instance), and then use this basic knowledge to direct improvements to how brittle materials like glass for mobile devices can be laser-treated or cut.

We want fast computer-control of the shaping of laser pulse intensity and timing, according to different processing needs as the research reveals. In particular, we want to design a computer-control system that can 'learn' what values to assign to control-parameters in order to give a desired output.

The student on the project should have an interest in physics for applications, and some knowledge in optics, computer programming, FPGAs, or related areas. He or she will have opportunity to learn about and work with state-of-the-art fiber lasers, sophisticated electronics, and to interact with a highly skilled research electronics technologist in our group, with colleagues in Electrical Engineering, and with sophisticated R&D staff at a small Canadian company.

Contact:
marj@physics.utoronto.ca
http://www.physics.utoronto.ca/~marj

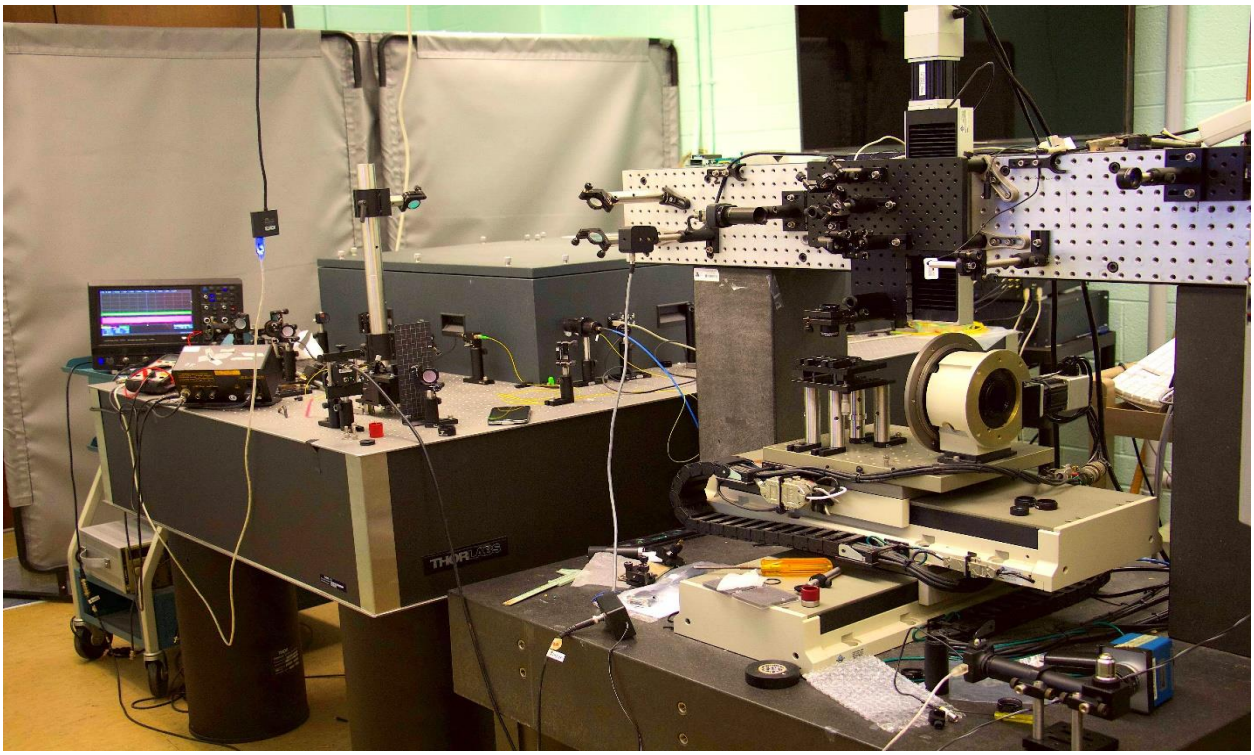
1. 

Photo 1: Our new compact and robust burst-mode ultrafast fiber laser gives us new capabilities for applied physics studies of materials-processing using femtosecond laser pulses in 200MHz 'bursts' of pulses. New methods of making microfluidic structures, treating strengthened glass, processing new forms of condensed matter, specially treating high-value crystals and others are examples of the ways that new physics approaches can have a big impact on R&D in industry