



Western University
Department of Physics and Astronomy

PHYSICS & ASTRONOMY COLLOQUIUM

Date: THURSDAY, 1st March 2018
Time: 1:30 p.m.
Location: Physics & Astronomy Seminar Room 100

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Indian Institute of Technology (IIT), Delhi

“Optics in material science: From ultra-fast timescales to ultra-high pressures”

ABSTRACT

Ultrafast Optics-the science, technology, and applications of ultrafast laser pulses-is one of the most exciting and dynamic fields of science. The development of such ultrafast laser sources has enabled a variety of different spectroscopy techniques to look at dynamics on picosecond and femtosecond time scales in slow motion using photons of varying wavelengths. While ultrafast laser pulses seem quite exotic, their applications are many, ranging from the study of ultrafast defect dynamics in semiconductors to telecommunications to micro-machining to name a few.

In addition to the above, high pressure physics is shedding new light on the very common materials, for example, CO₂. The resulting ‘strange’ phases of CO₂ are ‘breaking grounds’ in the field of earth sciences and ecological conservation as they are related to our understanding of deep carbon cycle and energy sequestration, including opening up new avenues for hydrogen storage and super batteries.

In this talk, I will attempt to provide an introduction to some common ultrafast spectroscopy techniques and their cutting-edge use in exploring temporal dynamics of carriers, defects, electrons, atoms, and molecules, and of collective modes, such as molecular vibrations and rotations and phonons. Different spectroscopy techniques, such as optical, terahertz time-domain, and their combinations, will be introduced along with their implementation methods and applications in material sciences with particular emphasis on semiconductors. Finally, I will also discuss about using high pressure-high temperature techniques for the synthesis of novel materials pertinent to today’s energy and technological needs and also towards efficient and cost-effective sequestration of CO₂.

COFFEE + light snacks will be available in the Atrium, 2nd floor, at 1:15 p.m.