



M.Sc. Thesis Defence

Monday August 22, 2011-SCIENCE COMPLEX, RM. 1511
10:00 a.m. – 12:00 noon

Ms. Meaghan Ward
Department of Physics

Title: “Solid-State NMR studies of solvent-accessible fragments of a seven-helical transmembrane protein Proteorhodopsin”

ABSTRACT

High-resolution multidimensional proton-detected NMR was used to study the solvent-exposed regions of a seven-helical integral membrane proton pump proteorhodopsin (PR). Fully deuterated PR samples with protons reintroduced to solvent-accessible sites through back exchange were prepared and found to produce NMR spectra with acceptable proton resolution (~ 0.2 ppm). Novel three-dimensional proton-detected chemical shift correlation spectroscopy was used for the identification and resonance assignment of the solvent-exposed regions of PR. Though most of the observed residues were located at the membrane interface there were notable exceptions, particularly in helix G. This helix contains the Schiff base-forming Lys231 and many conserved polar residues in the extracellular half. Solvent accessibility of helix G supports the hypothesis that high mobility of the F-G loop could transiently expose a hydrophilic cavity in the extracellular half of PR, and implies that such a cavity may be part of the protein's proton-conduction pathway.

Advisor: Dr. Vladimir Ladizhansky (Department of Physics)

Co-Advisor: Dr. Leonid Brown (Department of Physics)

Chair: Dr. Hermann Eberl (Department of Mathematics)

Defence committee members:

Dr. John Dutcher (Department of Physics)

Dr. James Davis (Department of Physics)