



The University of Western Ontario

Faculty of Science

Department of Applied Mathematics

APPLIED MATHEMATICS COLLOQUIUM

Date: Wednesday, April 2, 2008

Time: 2:30 pm

Location: Middlesex College Room 204

The Mechanism of Rhodopsin Activation: Insights from Molecular Dynamics Simulation

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Abstract:

The G-protein coupled receptors (GPCRs) are the largest family of proteins in mammalian genomes, and are critically important to a broad range of signaling processes. The most studied GPCR is rhodopsin, the primary dim-light receptor; until this year, it was the only GPCR for which the structure was known to atomic detail. However, despite some 50 years of experimental work, there are still a number of details about its mechanism and interaction with the environment which remain unclear. We performed extensive molecular dynamics simulations of both the dark-adapted and activated forms of the protein in a native-like lipid bilayer; by combining microsecond-scale simulations with careful comparisons to experiment, we have been able to generate several important new insights into the role played by polyunsaturated lipids and cholesterol in modulating rhodopsin function. We also found dramatic changes in the internal hydration of the protein as the Metarhodopsin-I state forms.