Scientists use quantum mechanics to control a biological process

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How much do we really know of how microwaves, light waves and broadcast waves affect our bodies? University of Toronto scientists suggest there is much more to learn: a U of T team earned the cover of *Science* magazine last week with their discovery that biological processes can be manipulated at the level of quantum mechanics – that is, at the infinitesimal level of matter's wave properties.

Valentyn Prokhorenko, Dwayne Miller and Andrea Nagy of U of T's Institute for Optical Sciences have opened up new questions in the fields of biochemistry and physics by showing that the efficiency of the photochemical reaction that underlies vision can be increased or decreased by varying the timing of colours in the laser pulse used to begin the reaction. *Science* published the results Sept 1.

Researchers shot specifically shaped laser pulses at bacteriorhodopsin, a bacterial cousin to the protein that serves as the visual sensor in our eyes. This protein is known to react to light but the team found that varying the timing of the light waves in the laser pulse affected the yield of photochemical reaction over a 40 per cent range.

Other scientists have done similar experiments on atoms or small molecules to investigate how chemical reactions might be susceptible to wave interference effects, but Prokhorenko's team is first to steer a biological process with coherent light.

"We've known for a long time that biological systems are sensitive to

light but not necessarily that they are sensitive to the phase information that may or may not be present in light," explains Prokhorenko. "This finding opens up how we perceive biological systems and raises new questions such as, have biological systems designed themselves to be sensitive to phase information? What other roles do quantum effects play in nature?"

Source: University of Toronto, by Sonnet L'Abbé