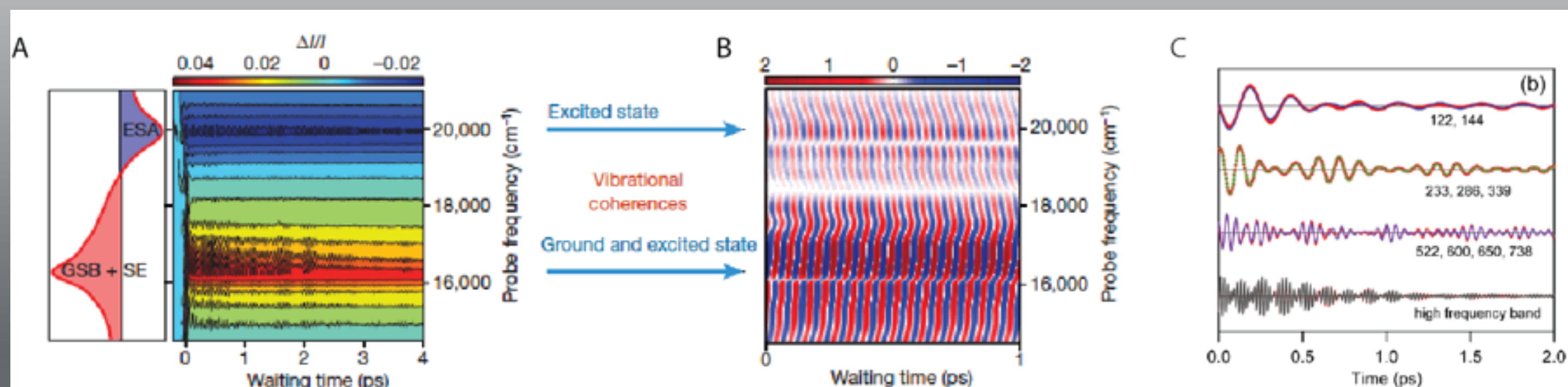


# Milton Kahn 2019 Annual Lecture

Professor Gregory D. Scholes, Princeton University

Friday, April 19<sup>th</sup>, 2019, at 4:00pm in the Science and Math Learning Center, Room 102

## Probing Ultrafast Chemical Dynamics Inspired by the Rhythms of Fireflies



Coherence phenomena arise from interference, or the addition, of wave-like amplitudes in phase<sup>[1]</sup>. While coherence has been shown to yield transformative new ways for improving function, advances have been limited to pristine matter, as quantum coherence is considered fragile. Here I will discuss how vibrational and vibronic wavepackets entrain ensembles of molecules, like the synchronized flashing of fireflies. I will discuss how this can be used to probe mechanisms of ultrafast dynamics and how in-step vibrational motion might be employed to control function on ultrafast timescales. I will give examples that include light-harvesting in photosynthesis, energy flow in organometallic molecules that is 'wired' by Fermi resonance, and ultrafast electron transfer in molecular systems.

<sup>[1]</sup> Scholes, et al. "Optimal Coherence in Chemical and Biophysical Dynamics" *Nature* 543, 647-656 (2017).



Greg Scholes is the William S. Tod Professor of Chemistry at Princeton University and Director of the Energy Frontier Research Center BioLEC (Bio-inspired Light-Escalated Chemistry). Originally from Melbourne, Australia, he later undertook postdoctoral training at Imperial College London and University of California Berkeley. He started his independent career at the University of Toronto (2000-2014) where he was the D.J. LeRoy Distinguished Professor. Dr. Scholes is the Deputy Editor for the *Journal of Physical Chemistry Letters*, Fellow of the Royal Society of Canada, a Senior Fellow in the Canadian Institute for Advanced Research program Biology, Energy, Technology, Adjunct Professor at the Beijing Institute of Technology, and a Professorial Fellow at the University of Melbourne. Dr. Scholes was elected a Fellow of the Royal Society of Canada in 2009 and has received numerous awards that include the Raymond and Beverly Sackler Prize for his contributions to ultrafast laser science (2011), Royal Society of Chemistry Bourke Award (2012), and the NSERC John C. Polanyi Award (2013).

Dr. Scholes has had a long-standing interest in mechanisms of electronic energy transfer and ultrafast excited state dynamics. His current research includes studies of photosynthesis, working out how vibrational wavepackets can report on mechanism of ultrafast processes, inquiring how chemical systems might encode unexpected quantum information, and demonstrating coherent or quantum phenomena in chemistry. Dr. Scholes has various other interests that include hi-fi audio, writing with fountain pens, and making furniture in his woodworking shop.