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ENTANGLED PHOTON INTERACTIONS IN BIOLOGICAL MATERIALS

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Abstract: The use of non-classical fields of light may provide scientists with an enhanced tool set to study light-matter interactions. For example, the use of quantum entanglement in spectroscopy may offer new opportunities for the detection and understanding of physical chemical properties in organic and biological molecules. The phenomenon of entangled two-photon absorption (ETPA) has been theoretically predicted to exhibit interesting non-classical effects such as linear rather than quadratic dependence of absorption rate on the excitation intensity which is dominant molecular systems at low excitation density regimes. ETPA has been experimentally demonstrated in both atomic and molecular systems and now in biological molecular and cellular systems. In this talk the results of entangled photon spectroscopy and microscopy biological macromolecules, cells and in tissue will be reported. These results have widespread impact in applications ranging from spectroscopy to chemical and biological sensing and protection, imaging and microscopy.

Bio: Theodore Goodson III is the Richard Barry Bernstein Professor of Chemistry at the University of Michigan. Dr. Goodson's research centers on the investigation of ultra-fast, nonlinear optical, and quantum optical properties in organic multi-chromophore and metal cluster systems for particular optical and electronic applications in the condensed phase. He has published over 200 scientific publications and one book and has given more than 300 invited talks. Dr. Goodson has been awarded numerous national and international awards for his research in nonlinear optical and quantum optical effects in novel materials. His lab utilizes entangled photons to do both spectroscopy and microscopy and has been leading this field in to new and promising directions. He has founded two companies, the first on high density capacitors for automotive and medical applications, and another on the use of an entangled photon microscope for biological detection and diagnostics with low light levels. He has been awarded for his leadership and mentorship of undergraduate and graduate students. He is Executive Editor of The Journal of Physical Chemistry

for the American Chemical Society and has served on a number of academic and technological advisory boards across the country. He is chair of the National Academy of Science Committee on Quantum Information Science in Chemistry. Professor Goodson received his BA in liberal arts from Wabash College in 1991 and his Ph.D. from U of Nebraska-Lincoln in 1996. He was a postdoctoral assistant at the University of Chicago and Postdoctoral fellow at Oxford University (physics).