



Department of Chemistry, JULY 2017

**POSTDOCTORAL SCHOLAR POSITIONS
ULTRAFAST NONLINEAR X-RAY SPECTROSCOPY; THEORY AND COMPUTATIONS**

RESEARCH TOPICS:

(A) Attosecond X-ray Spectroscopy of Molecules

Developing time-dependent many-body approaches to nonlinear x-ray core-electron spectra and their description in terms of real-space and real-time wavepackets of electrons and nuclei. Computational tools will be implemented for the design and analysis of measurements involving multiple ultrafast optical and x-ray pulses.

(B) Nonlinear Spectroscopy with Quantum Optical Fields

Novel optical signals which use entangled photons, pulse shaping, and coherent control algorithms are designed and simulated for probing vibrational and exciton dynamics in molecular aggregates and semiconductor nanostructures.

Recent Ph.D. is required (2013 or later). Salary will be commensurate with experience.

To apply, send a curriculum vitae, publication list and arrange for three letters of recommendation to

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Recent Publications

1. "Multidimensional Attosecond Resonant X-ray Spectroscopy of Molecules; Lessons from the Optical Regime", J. Biggs, D. Healion, Y. Zhang, and S. Mukamel. *Ann Rev Phys Chem*, 64, 101-127 (2013).
2. "Suppression of Population transport and Control of Exciton Distributions by Entangled Photons", F. Schlawin, K.E. Dorfman, B.P. Fingerhut, and S. Mukamel. *Nature Communications*, 4:1782; DOI: 10.1038/ncomms2802 (2013).
3. "Catching Conical Intersections in the Act; Monitoring Transient Electronic Coherences by Attosecond Stimulated X-ray Raman Signals", Markus Kowalewski, Kochise Bennett, Konstantin Dorfman, and Shaul Mukamel. *Phys. Rev. Lett.* 115, 193003 (2015).
4. "Nonlinear optical signals and spectroscopy with quantum light", Konstantin E. Dorfman, Frank Schlawin, and Shaul Mukamel. *Rev. Mod. Phys.* 88, 045008 (2016) *arXiv:1605.06746v1*
5. "Multidimensional Resonant Nonlinear Spectroscopy with Coherent Broadband X-ray Pulses", Kochise Bennett, Yu Zhang, Markus Kowalewski, Weijie Hua, and Shaul Mukamel. 2016 *Phys. Scr.* T169,014002. Proceedings of a Nobel symposium
6. "Cavity femtochemistry; Manipulating nonadiabatic dynamics at avoided crossings", Markus Kowalewski, Kochise Bennett, and Shaul Mukamel. *J. Phys. Chem. Lett.* 2016, 7, 2050-2054
7. "Two-dimensional infrared spectroscopy of vibrational polaritons of molecules in an optical cavity", Prasoon Saurabh and Shaul Mukamel. *JCP*, 144, 124115 (2016)
8. "Monitoring Nonadiabatic Avoided Crossing Dynamics in Molecules by Ultrafast X-Ray Diffraction", Markus Kowalewski, Kochise Bennett, and Shaul Mukamel. *Structural Dynamics*, 4, 054101 (2017)
9. "Photoinduced molecular chirality probed by ultrafast resonant X-ray spectroscopy". Jeremy R. Rouxel, Markus Kowalewski, and Shaul Mukamel. *Structural Dynamics*. 4, 044006 (2017); doi: 10.1063/1.4974260
10. "Simulating Coherent Multidimensional Spectroscopy of Nonadiabatic Molecular Processes; from the Infrared to the X-ray Regime", Markus Kowalewski, Benjamin Fingerhut, Konstantin Dorfman, Kochise Bennett and Shaul Mukamel. *Chem Rev* (accepted, 2017). DOI: 10.1021/acs.chemrev.7b00081

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