



September 2021, Departments of Chemistry and Physics & Astronomy

**2 POSTDOCTORAL SCHOLAR POSITIONS in  
Theoretical and Computational Chemical Physics  
In the Mukamel Group, University of California Irvine**

RESEARCH TOPICS:

**(A) Nonlinear Spectroscopy with Quantum Optical Fields**

Novel optical signals which use entangled photons and quantum light, pulse shaping, and coherent control algorithms will be designed and simulated for probing electronic and vibrational dynamics in molecular systems

**(B) Ultrafast Nonlinear X-ray Spectroscopy of Molecules**

Emerging X-ray free electron laser (XFEL) beam sources offer new types of probes of matter with unprecedented spatial and temporal resolutions. Cutting-edge theoretical and simulation tools for nonlinear multidimensional X-ray/optical spectroscopies will be developed.

Time-dependent many-body approaches will be developed to nonlinear x-ray core-electron spectra and conical intersections. Computational tools will be implemented for the design and analysis of measurements involving multiple ultrafast optical and x-ray pulses.

Recent Ph.D. is required. Salary will be commensurate with experience.

Send a curriculum vitae, publication list and arrange for three letters of recommendation to

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**Selective Publications**

- 1 Roadmap on Quantum Light Spectroscopy. Shaul Mukamel. 2020 J. Phys. B: At. Mol. Opt. Phys. **53**, 072002
- 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 Entangled two-photon absorption spectroscopy", Frank Schlawin, Konstantin.E. Dorfman, and S. Mukamel. *Acc. Chem. Res.*, 51, 2207-2214 (2018) DOI: 10.1021/acs.accounts.8b00173n,
- 4 "Quantum phase-sensitive diffraction and imaging using entangled photons", Shahaf Asban, Konstantin E. Dorfman, and, Shaul Mukamel. PNAS (2019) 116, 11673-11678 <https://doi.org/10.1073/pnas.1904839116>
- 5 "Visualizing Conical Intersection Passages via Vibronic Coherence Maps Generated by Stimulated X-Ray Raman Signals", Daniel Keefer, Thomas Schnappinger, Regina de Vivie-Riedle and Shaul Mukamel. PNAS (2020) <https://doi.org/10.1073/pnas.2015988117> <http://arxiv.org/abs/2008.06191>
- 6 "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).
- 7 "Imaging Conical Intersection Dynamics During Azobenzene Photoisomerization by Ultrafast X-ray Diffraction", Daniel Keefer, Flavia Aleotti, Jeremy Rouxel, Francesco Segatta, Bing Gu, Artur Nenov, Marco Garavelli, and Shaul Mukamel. PNAS January 19, 2021 118 (3) e2022037118 <https://www.pnas.org/content/118/3/e2022037118>
- 8 "High temporal and spectral resolution of stimulated x-ray Raman signals with stochastic free-electron-laser pulses", Stefano M. Cavaletto, Daniel Keefer, and Shaul Mukamel. Phys. Rev. X 11, 011029 (2021) DOI: 10.1103/PhysRevX.11.011029 <https://link.aps.org/doi/10.1103/PhysRevX.11.011029>
- 9 "Distinguishability and "which pathway" information in multidimensional interferometric spectroscopy with a single entangled photon-pair", Shahaf Asban and Shaul Mukamel. Science Advances 2021. arXiv:2107.05228v1[quant-ph]

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