CMQT
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CMQT Symposium

Guest Lecture Information

Joel Yuen-Zhou

Joel Yuen-Zhou received his BSc in Chemistry and Mathematics from the Massachusetts Institute of Technology (MIT) in 2007 and a PhD in Chemical Physics from Harvard University in 2012 under the supervision of Alan Aspuru-Guzik. He carried out postdoctoral work at MIT with a Robert J. Silbey Fellowship between 2013-2015. Since 2015, Joel leads a research team on theoretical chemistry at UCSD where he explores novel regimes of molecular light-matter interactions in the weak, strong, and ultrastrong regimes. His work has been recognized with a number of Early Career awards: NSF CAREER (2017), DOE Early Career (2018), ACS Open Eye Junior Faculty Award in Computational Chemistry (2019), Finalist in the 2020 Blavatnik National Awards for Young Scientists (2020), Sloan Fellowship Award (2021), Camille Dreyfus Teacher Scholar Award (2021), Journal of Physical Chemistry C Lectureship Award (2022), and Nanophotonics Early Career Award (2023). More recent recognitions include a W. M. Keck Foundation Research Grant (2021), a Hirschfelder Visitorship (UW Madison) (2024), and the Isaiah Shavitt Lectureship (Technion) (2024).

Exploiting organic spin photophysics for sensing and catalysis

Abstract: The transduction of quantum information from the microwave to the UV-visible range can be surprisingly robust in open-shell organic molecules. At the heart of this possibility is the observation that small changes in spin dynamics can lead to drastic changes in electronically excited processes. In my talk, I will describe our recent efforts designing organic molecules whose ground-state properties can be exploited for magnetometry, serving as organic analogues of NV centers; some of the predictions have been demonstrated by recent experiments of the Wasielewski group. These examples provide clear evidence that chemical design can serve to augment the toolbox of quantum information. Conversely, I will conclude by suggesting that the opposite should also be true: subtle control of spin dynamics should lead to dramatic changes in chemical behavior in appropriately designed schemes for photoredox catalysis.

[1] Y. R. Poh and J. Yuen-Zhou, Enhancing the optically detected magnetic resonance signal of organic molecular qubits, ACS Cent. Sci. 11, 1, 116–126 (2025).

[2] S. M. Kopp, S. Nakamura, B. T. Phelan, Y. Rui Poh, S. B. Tyndall, P. J. Brown, Y. Huang, J. Yuen-Zhou, M. D. Krzyaniak, M. R. Wasielewski, Luminescent organic triplet diradicals as optically addressable molecular qubits, J. Am. Chem. Soc. 146, 40, 27935 (2024).

[3] Y. R. Poh, D. Morozov, N. P. Kazmierczak, R. G. Hadt, G. Groenhof, and J. Yuen-Zhou, Alternant hydrocarbon diradicals as optically addressable molecular qubits, J. Am. Chem. Soc. 146, 22, 15549 (2024).