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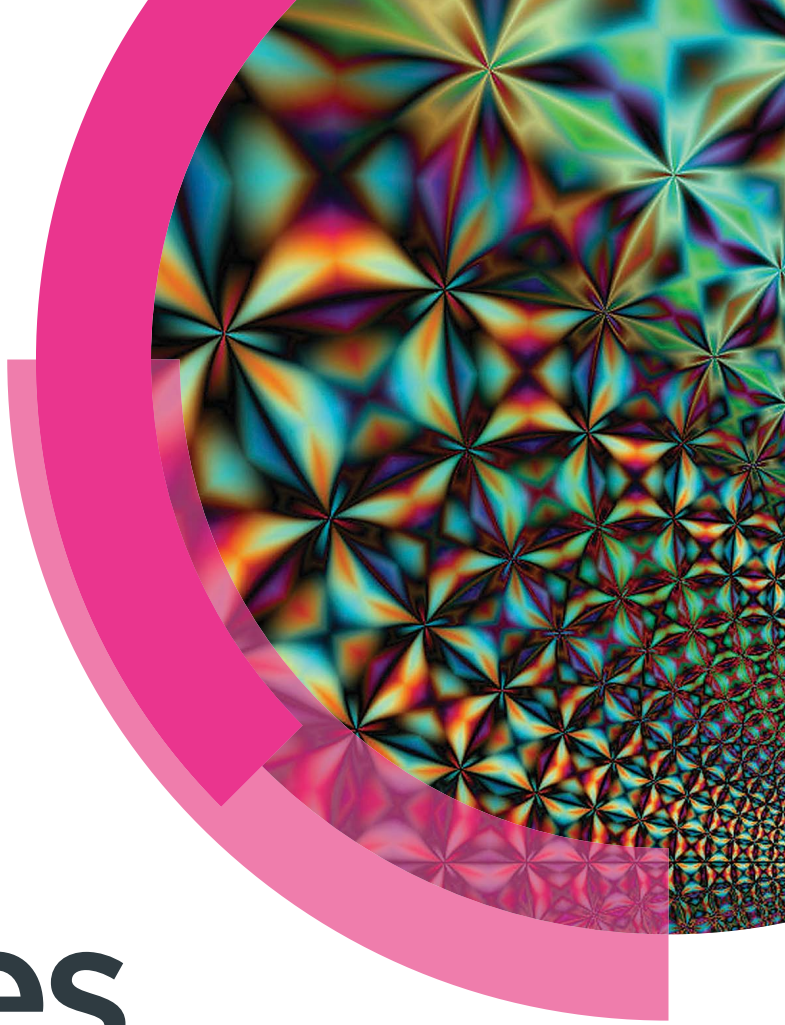

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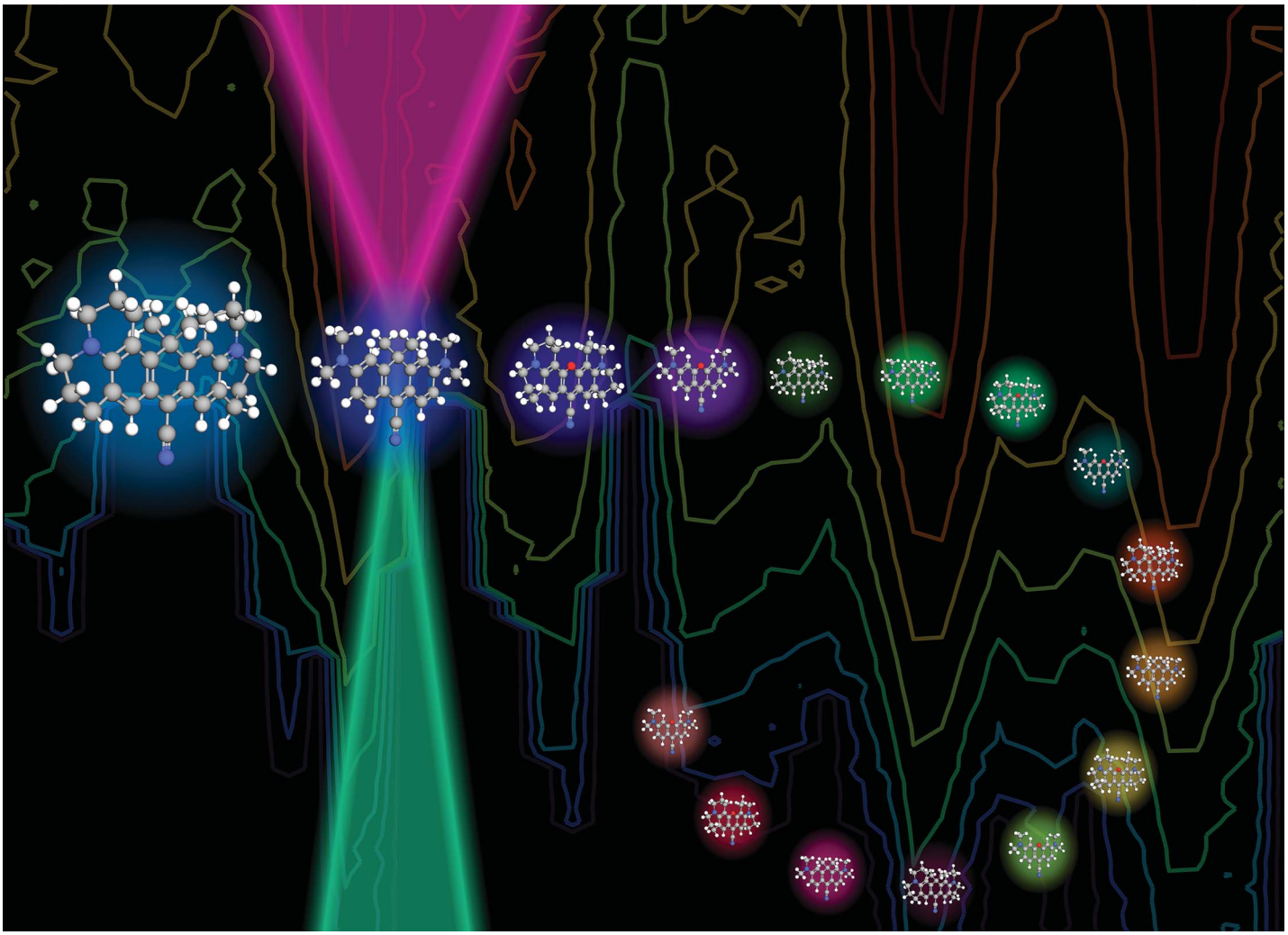

Showcasing research from Professor Lu Wei's laboratory, Division of Chemistry and Chemical Engineering, California Institute of Technology, Pasadena, CA 91125, USA.

Two-dimensional bond-selective fluorescence spectroscopy: violations of the resonance condition, vibrational cooling rate dispersion, and super-multiplex imaging

We describe two-dimensional bond-selective fluorescence-detected infrared-excited (2D-BonFIRE) spectro-microscopy: an ultrasensitive 2D vibrational spectroscopy and hyperspectral imaging technique. 2D-BonFIRE spectroscopy provides new insights into the nature of high-frequency vibrations in large organic dyes and reveals the inherent heterogeneity of vibrational relaxation. Further, the high specificity of 2D-BonFIRE allows for distinguishing between highly overlapped fluorophores, culminating in proof-of-concept demonstrations of single-shot 16-colour imaging and vibrational lifetime multiplex imaging, with high potential for further expansion.

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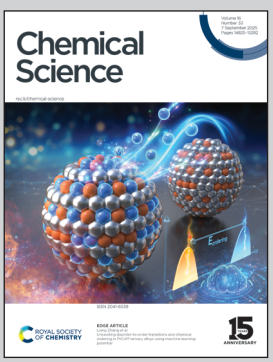

See Lu Wei *et al.*, *Chem. Sci.*, 2025, **16**, 14905.

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