

# Stanford

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## Jake D Koralek

Staff Scientist, SLAC National Accelerator Laboratory

### Bio

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#### BIO

I am a condensed matter physicist with research interests in quantum materials, ultrafast optics and X-ray science. I grew up in the Stanford neighborhood where I attended Palo Alto High School. I went on to the College of Creative Studies at UCSB where i worked in the lab of David Awschalom studying semiconductor spintronics. I got my PhD in physics from the University of Colorado, Boulder, working with Dan Dessau, where we developed the first system to perform angle-resolved photoemission spectroscopy (ARPES) using a table-top laser rather than a large synchrotron facility. I moved to Lawrence Berkeley National Lab for my postdoctoral research with Joe Orenstein where we applied a wide variety of ultrafast optical techniques to study emergent properties in quantum materials and semiconductor devices. I stayed in Berkeley to work with Bob Schoenlein developing ultrafast X-ray techniques to study quantum materials. In 2014 I moved to SLAC where I am now a staff scientist in the Materials Science Department at the Linac Coherent Light Source (LCLS), the world's first X-ray free-electron laser.

#### EDUCATION AND CERTIFICATIONS

- BS, University of California, Santa Barbara, College of Creative Studies , Physics (1999)
- PhD, University of Colorado, Boulder , Physics (2006)

### Publications

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#### PUBLICATIONS

- **Generation and characterization of ultrathin free-flowing liquid sheets** *NATURE COMMUNICATIONS*  
Koralek, J. D., Kim, J. B., Bruza, P., Curry, C. B., Chen, Z., Bechtel, H. A., Cordones, A. A., Sperling, P., Toleikis, S., Kern, J. F., Moeller, S. P., Glenzer, S. H., DePonte, et al  
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- **Tracking Cooper Pairs in a Cuprate Superconductor by Ultrafast Angle-Resolved Photoemission** *SCIENCE*  
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- **From a Single-Band Metal to a High-Temperature Superconductor via Two Thermal Phase Transitions** *SCIENCE*  
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- **Emergence of the persistent spin helix in semiconductor quantum wells** *NATURE*  
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- **Laser based angle-resolved photoemission, the sudden approximation, and quasiparticle-like spectral peaks in Bi<sub>2</sub>Sr<sub>2</sub>CaCu<sub>2</sub>O<sub>8</sub>+ $\delta$**  *PHYSICAL REVIEW LETTERS*  
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2006; 96 (1): 017005
- **Enhanced charge density wave coherence in a light-quenched, high-temperature superconductor.** *Science (New York, N.Y.)*  
Wandel, S., Boschini, F., da Silva Neto, E. H., Shen, L., Na, M. X., Zohar, S., Wang, Y., Welch, S. B., Seaberg, M. H., Koralek, J. D., Dakovski, G. L., Hettel, W., Lin, et al  
2022; 376 (6595): 860-864
- **Spontaneous fluctuations in a magnetic Fe/Gd skyrmion lattice** *PHYSICAL REVIEW RESEARCH*  
Seaberg, M. H., Holladay, B., Montoya, S. A., Zheng, X. Y., Lee, J. T., Reid, A. H., Koralek, J. D., Shen, L., Esposito, Coslovich, G., Walter, P., Zohar, S., Thampy, Lin, et al  
2021; 3 (3)
- **Observation of a highly conductive warm dense state of water with ultrafast pump-probe free-electron-laser measurements** *MATTER AND RADIATION AT EXTREMES*  
Chen, Z., Na, X., Curry, C. B., Liang, S., French, M., Descamps, A., DePonte, D. P., Koralek, J. D., Kim, J. B., Lebovitz, S., Nakatsutsumi, M., Ofori-Okai, B. K., Redmer, et al  
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- **The Photoactive Excited State of the B12-Based Photoreceptor CarH.** *The journal of physical chemistry. B*  
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- **Antivitamins B12 in a Microdrop: The Excited-State Structure of a Precious Sample Using Transient Polarized X-ray Absorption Near-Edge Structure.** *The journal of physical chemistry letters*  
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- **Coherent X-rays reveal the influence of cage effects on ultrafast water dynamics** *NATURE COMMUNICATIONS*  
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- **Stimulated X-Ray Emission Spectroscopy in Transition Metal Complexes** *PHYSICAL REVIEW LETTERS*  
Kroll, T., Weninger, C., Alonso-Mori, R., Sokaras, D., Zhu, D., Mercadier, L., Majety, V. P., Marinelli, A., Lutman, A., Guetg, M. W., Decker, F., Boutet, S., Aquila, et al

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- **Nonlinear Ultrafast Spin Scattering in the Skyrmion Phase of Cu<sub>2</sub>OSeO<sub>3</sub>** *PHYSICAL REVIEW LETTERS*  
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- **Nanosecond X-Ray Photon Correlation Spectroscopy on Magnetic Skyrmions** *PHYSICAL REVIEW LETTERS*  
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Hinton, J. P., Koralek, J. D., Yu, G., Motoyama, E. M., Lu, Y. M., Vishwanath, A., Greven, M., Orenstein, J.  
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- **Doppler velocimetry of spin and charge currents in the 2D Fermi gas**  
Koralek, J. D., Yang, L., Tibbetts, D. R., Reno, J. L., Lilly, M. P., Orenstein, J., Chergui, M., Taylor, A., Cundiff, S., DeVivier, R., Yamagouchi, K.  
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- **Coherent Propagation of Spin Helices in a Quantum-Well Confined Electron Gas** *PHYSICAL REVIEW LETTERS*  
Yang, L., Koralek, J. D., Orenstein, J., Tibbetts, D. R., Reno, J. L., Lilly, M. P.  
2012; 109 (24): 246603
- **Observation of Coherent Helimagnons and Gilbert Damping in an Itinerant Magnet** *PHYSICAL REVIEW LETTERS*  
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Plumb, N. C., Reber, T. J., Koralek, J. D., Sun, Z., Douglas, J. F., Aiura, Y., Oka, K., Eisaki, H., Dessau, D. S.  
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● **Mass-renormalized electronic excitations at  $(\pi,0)$  in the superconducting state of  $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$**  *PHYSICAL REVIEW B*

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