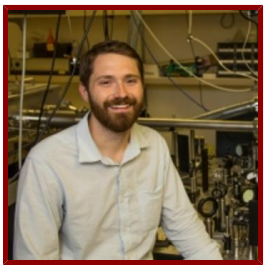
Stanford



James P. Cryan

Associate Professor of Photon Science and, by courtesy, of Applied Physics

Photon Science Directorate

Curriculum Vitae available Online

Bio

BIO

I am interested in photo-induced dynamics of atoms and molecules. I am particularly interested in the dynamics of excited states in these systems, and how energy transfer takes place inside a molecule. The relevant timescales for these interactions is typically in the range of attoseconds to picoseconds. These dynamics include photo-triggered chemistry such as non Born-Oppenheimer molecular dynamics and quantum phenomena in strong-field driven systems. I also develop tools for studying these dynamics in the time domain.

My research builds on my extensive experience with ultrafast optical laser science and technology. As a graduate student at Stanford University I participated in the first experiments at the Linac Coherent Light Source, where we studied a new regime of X-ray-matter interactions. I was a postdoctoral scholar at Lawerence Berkeley National Laboratory before returning to SLAC to lead the attosecond science group.

CURRENT ROLE AT STANFORD

Principal Investigator, Stanford PULSE Institute

Science Research and Development Division Lead, Linac Coherent Light Source.

ACADEMIC APPOINTMENTS

- Associate Professor, Photon Science Directorate
- Associate Professor (By courtesy), Applied Physics
- Principal Investigator, Stanford PULSE Institute

HONORS AND AWARDS

- APS Fellow, American Physical Society (2020)
- William E. and Diane M. Spicer Young Investigator Award, SLAC National Accelerator Laboratory (2012)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Science, Research, and Development Division Lead, Linac Coherent Light Source, SLAC National Accelerator Laboratory (2026 - present)
- Atomic, Molecular, and Optical Sciences Department Head, Linac Coherent Light Source, SLAC National Accelerator Laboratory (2021 - present)
- Principle Investigator, Stanford PULSE Institute (2014 - present)

PROFESSIONAL EDUCATION

- B.S., The Ohio State University , Engineering Physics (2007)
- Ph.D., Stanford University , Physics (2012)

SERVICE, VOLUNTEER, AND COMMUNITY WORK

- Physical Review X Editorial Board (January 20, 2025)

LINKS

- AMO Science Department @ LCLS: https://lcls.slac.stanford.edu/depts/amo
- My Lab Website: https://ultrafast.stanford.edu/research/attosecond-phenomenon

Teaching

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Selene She

Doctoral Dissertation Advisor (AC)

Javin Ohara, John Walters

Professional

PROFESSIONAL INTERESTS

I am interested in photo-induced dynamics of atoms and molecules. I am particularly interested in the dynamics of excited states in these systems, and how energy transfer takes place inside a molecule. The relevant timescales for these interactions is typically in the range of attoseconds to picoseconds. These dynamics include photo-triggered chemistry such as non Born-Oppenheimer molecular dynamics and quantum phenomena in strong-field driven systems. I also develop tools for studying these dynamics in the time domain.

Publications

PUBLICATIONS

- **Attosecond X-ray sources, methods, and applications at present and future free-electron lasers: tutorial** *ADVANCES IN OPTICS AND PHOTONICS*
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  Franz, P., Li, S., Driver, T., Robles, R. R., Cesar, D., Isele, E., Guo, Z., Wang, J., Duris, J. P., Larsen, K., Glownia, J. M., Cheng, X., Hoffmann, et al
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  Guo, Z., Driver, T., Beauvarlet, S., Cesar, D., Duris, J., Franz, P. L., Alexander, O., Bohler, D., Bostedt, C., Averbukh, V., Cheng, X., Dimauro, L. F., Doumy, et al
  2024
- **Photon energy-resolved velocity map imaging from spectral domain ghost imaging** *NEW JOURNAL OF PHYSICS*
  Wang, J., Driver, T., Allum, F., Papadopoulou, C. C., Passow, C., Brenner, G., Li, S., Duesterer, S., Tul Noor, A., Kumar, S., Bucksbaum, P. H., Erk, B., Forbes, et al
  2023; 25 (3)
- **Attosecond coherent electron motion in Auger-Meitner decay.** *Science (New York, N.Y.)*

Li, S., Driver, T., Rosenberger, P., Champenois, E. G., Duris, J., Al-Haddad, A., Averbukh, V., Barnard, J. C., Berrah, N., Bostedt, C., Bucksbaum, P. H., Coffee, R. N., DiMauro, et al

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- **The development of attosecond XFELs for understanding ultrafast electron motion** *ADVANCES IN ATOMIC, MOLECULAR, AND OPTICAL PHYSICS, VOL. 71*

  Cryan, J. P., Driver, T., Duris, J., Guo, Z., Li, S., O'Neal, J. T., Marinelli, A.

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- **Controllable X-Ray Pulse Trains from Enhanced Self-Amplified Spontaneous Emission.** *Physical review letters*

  Duris, J. P., MacArthur, J. P., Glownia, J. M., Li, S., Vetter, S., Miahnahri, A., Coffee, R., Hering, P., Fry, A., Welch, M. E., Lutman, A., Decker, F., Bohler, et al

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- **Electron correlation effects in attosecond photoionization of CO2** *PHYSICAL REVIEW A*

  Kamalov, A., Wang, A. L., Bucksbaum, P. H., Haxton, D. J., Cryan, J. P.

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- **Electronic Population Transfer via Impulsive Stimulated X-Ray Raman Scattering with Attosecond Soft-X-Ray Pulses.** *Physical review letters*

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- **Imaging Valence Electron Rearrangement in a Chemical Reaction Using Hard X-Ray Scattering** *PHYSICAL REVIEW LETTERS*

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- **Spectrotemporal Shaping of Attosecond X-Ray Pulses with a Fresh-Slice Free-Electron Laser.** *Physical review letters*
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- **"Beam à la carte": Laser heater shaping for attosecond pulses in a multiplexed x-ray free-electron laser** *APPLIED PHYSICS LETTERS*
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- **Tracking dissociation pathways of nitrobenzene via mega-electron-volt ultrafast electron diffraction** *JOURNAL OF PHYSICS B-ATOMIC MOLECULAR AND OPTICAL PHYSICS*
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- **Efficient prediction of attosecond two-colour pulses from an X-ray free-electron laser with machine learning.** *Scientific reports*
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- **Applying Bayesian inference and deterministic anisotropy to retrieve the molecular structure ÷Ψ(<bold>R</bold>)÷² distribution from gas-phase diffraction experiments** *COMMUNICATIONS PHYSICS*
  Hegazy, K., Makhija, V., Bucksbaum, P., Corbett, J., Cryan, J., Hartmann, N., Ilchen, M., Jobe, K., Li, R., Makasyuk, I., Shen, X., Wang, X., Weathersby, et al
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- **Compact single-shot soft X-ray photon spectrometer for free-electron laser diagnostics** *OPTICS EXPRESS*
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- **Femtosecond Electronic and Hydrogen Structural Dynamics in Ammonia Imaged with Ultrafast Electron Diffraction.** *Physical review letters*

Champenois, E. G., List, N. H., Ware, M., Britton, M., Bucksbaum, P. H., Cheng, X., Centurion, M., Cryan, J. P., Forbes, R., Gabalski, I., Hegazy, K., Hoffmann, M. C., Howard, et al
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- **Rehybridization dynamics into the pericyclic minimum of an electrocyclic reaction imaged in real-time.** *Nature communications*
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- **The time-resolved atomic, molecular and optical science instrument at the Linac Coherent Light Source.** *Journal of synchrotron radiation*
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- **Characterization of single-shot attosecond pulses with angular streaking photoelectron spectra** *PHYSICAL REVIEW A*
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  2022; 105 (1)
- **Role of nuclear-electronic coupling in attosecond photoionization of H-2** *PHYSICAL REVIEW A*
  Wang, A. L., Serov, V. V., Kamalov, A., Bucksbaum, P. H., Kheifets, A., Cryan, J. P.
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- **Time-resolved pump-probe spectroscopy with spectral domain ghost imaging.** *Faraday discussions*
  Li, S., Driver, T., Alexander, O., Cooper, B., Garratt, D., Marinelli, A., Cryan, J. P., Marangos, J. P.
  2021
- **Transient resonant Auger-Meitner spectra of photoexcited thymine.** *Faraday discussions*
  Wolf, T. J., Paul, A. C., Folkestad, S. D., Myhre, R. H., Cryan, J. P., Berrah, N., Bucksbaum, P. H., Coriani, S., Coslovich, G., Feifel, R., Martinez, T. J., Moeller, S. P., Mucke, et al
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- **Inner Valence Hole Migration in Isopropanol**
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- **Arrival Time Monitor for Sub-10 fs Soft X-ray and 800 nm Optical Pulses**
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