Stanford



Eric Flint Cunningham

Lead Scientist, LCLS - Linac Coherent Light Source

Bio

CURRENT ROLE AT STANFORD

Lead of Laser Operations of the Linac Coherent Light Source (LCLS)

LCLS Operations Leadership Team member (LCLS)

Lead for the Advanced Laser Sources group in the Laser Science Department of the Science Research & Development Division of LCLS

SLAC Laser Safety Committee member

EDUCATION AND CERTIFICATIONS

- PhD, CREOL, the College of Optics and Photonics, University of Central Florida , Optics and Photonics (2015)
- MS, Department of Physics, Brigham Young University , Physics (2011)
- BS, Department of Physics, Brigham Young University , Physics (2009)

LINKS

- LinkedIn: www.linkedin.com/in/eric-cunningham-299792458c
- Google Scholar: https://scholar.google.com/citations?user=Yb9Po2kAAAAJ&hl=en

Professional

PROFESSIONAL INTERESTS

- large-scale scientific facility and user program operations

- optical laser delivery for LCLS x-ray user experiments

- high-energy and high-power laser systems

PROFESSIONAL AFFILIATIONS AND ACTIVITIES

- IEEE Photonics Conference Sub-Committee for Nonlinear Photonics and Novel Optical Phenomena, IEEE Photonics Society (2024 - 2026)
- 6-Way Facility Directors Working Group on Operations, DOE BES (2024 - present)
- Board Member of the Technical Group for Short Wavelength Sources and Attosecond/High Field Physics, Optica (2018 - 2023)
- CLEO Sub-Committee for Ultrafast Science of Attosecond, XFEL, and Ultra-Intense Light, Optica (2020 - 2024)
- Board Member of the Cañada College Engineering department, Cañada College (2020 - present)
- Member, Optica (2010 - present)

Publications

PUBLICATIONS

- **Electron-ion equilibration in superheated gold.** *Nature communications*
  Griffin, T. D., Gericke, D. O., Haden, D., Lee, H. J., Galtier, E., Cunningham, E., Khaghani, D., Larsen, M., Wollenweber, L., Armentrout, B., Convery, C., Appel, K., Dyer, et al
  2026

- **Time-resolved X-ray imaging of the current filamentation instability in solid-density plasmas.** *Nature communications*
  Schoenwaelder, C., Marret, A., Assenbaum, S., Curry, C. B., Cunningham, E., Dyer, G., Funk, S., Glenn, G. D., Goede, S., Khaghani, D., Rehwald, M., Schramm, U., Treffert, et al
  2026

- **Observation of a mixed close-packed structure in superionic water.** *Nature communications*
  Andriambariarijaona, L., Stevenson, M. G., Bethkenhagen, M., Lecherbourg, L., Lefèvre, F., Vinci, T., Appel, K., Baehtz, C., Benuzzi-Mounaix, A., Bergermann, A., Bespalov, D., Brambrink, E., Cowan, et al
  2025

- **Ultrafast structural dynamics of silicate glasses in extreme environments** *COMMUNICATIONS MATERIALS*
  Madhavi, M., Jangid, R., Yin, D., Smith, S., Mehta, J., Cheng, Y., Rao, P., Doss, K., Hauke, B., Gerace, K., Jeppson, S., Botu, S., Yousefi, et al
  2025; 6 (1)

- **Ultrafast x-ray diffraction of high-pressure phases in dynamically compressed TiO2** *PHYSICAL REVIEW B*
  Ocampo, I. K., Smith, R. F., Kim, D., Prakapenka, V., Speziale, S., Schoelmerich, M., Appel, K., Polsin, D. N., Marshall, M., Tracy, S. J., Miozzi, F., Lee, H. J., Galtier, et al
  2025; 112 (10)

- **Single-shot in-line x-ray phase-contrast imaging of void-shockwave interactions in fusion energy materials** *PHYSICS OF PLASMAS*
  Hodge, D. S., Leong, A. T., Kurzer-Ogul, K., Pandolfi, S., Montgomery, D. S., Shang, J., Aluie, H., Marchesini, S., Liu, Y., Li, K., Sakdinawat, A., Galtier, E. C., Nagler, et al
  2025; 32 (8)

- **Superheating gold beyond the predicted entropy catastrophe threshold.** *Nature*
  White, T. G., Griffin, T. D., Haden, D., Lee, H. J., Galtier, E., Cunningham, E., Khaghani, D., Descamps, A., Wollenweber, L., Armentrout, B., Convery, C., Appel, K., Fletcher, et al
  2025; 643 (8073): 950-954

- **Stability of the fcc phase in shocked nickel up to 332 GPa.** *Nature communications*
  Pereira, K. A., Clarke, S. M., Singh, S., Briggs, R., McGuire, C. P., Lee, H. J., Khaghani, D., Nagler, B., Galtier, E., Cunningham, E., McGonegle, D., Tracy, S. J., Vennari, et al
  2025; 16 (1): 4385

- **Isostructural Phase Transition of Fe_{2}O_{3} under Laser Shock Compression.** *Physical review letters*
  Amouretti, A., Crépisson, C., Azadi, S., Brisset, F., Cabaret, D., Campbell, T., Chin, D. A., Collins, G. W., Hansen, L., Fiquet, G., Forte, A., Gawne, T., Guyot, et al
  2025; 134 (17): 176102

- **X-ray microscopy and talbot imaging with the matter in extreme conditions X-ray imager at LCLS.** *Scientific reports*
  Galtier, E., Lee, H. J., Khaghani, D., Boiadjieva, N., McGehee, P., Arnott, A., Arnold, B., Berboucha, M., Cunningham, E., Czapla, N., Dyer, G., Ettelbrick, R., Hart, et al
  2025; 15 (1): 7588

- **Combined speckle- and propagation-based single shot two-dimensional phase retrieval method** *OPTICS EXPRESS*
  Leong, A., Hodge, D. A., Kelinkurzer-ogul, K., Marchesini, S., Pandolfi, S., Liu, Y., Barber, J., Li, K., Sakdinawat, A., Galtier, E., Nagler, B., Lee, H., Cunningham, et al
  2024; 32 (26): 46939-46957

- **Structural evolution of liquid silicates under conditions in Super-Earth interiors.** *Nature communications*
  Morard, G., Hernandez, J. A., Pege, C., Nagy, C., Libon, L., Lacquement, A., Sokaras, D., Lee, H. J., Galtier, E., Heimann, P., Cunningham, E., Glenzer, S. H., Vinci, et al

2024; 15 (1): 8483

- **Release dynamics of nanodiamonds created by laser-driven shock-compression of polyethylene terephthalate.** *Scientific reports*
  Heuser, B., Bergermann, A., Stevenson, M. G., Ranjan, D., He, Z., Lütgert, J., Schumacher, S., Bethkenhagen, M., Descamps, A., Galtier, E., Gleason, A. E., Khaghani, D., Glenn, et al
  2024; 14 (1): 12239

- **Radiation and heat transport in divergent shock-bubble interactions** *PHYSICS OF PLASMAS*
  Kurzer-Ogul, K., Haines, B. M., Montgomery, D. S., Pandolfi, S., Sauppe, J. P., Leong, A. T., Hodge, D., Kozlowski, P. M., Marchesini, S., Cunningham, E., Galtier, E., Khaghani, D., Lee, et al
  2024; 31 (3)

- **Evidence for phonon hardening in laser-excited gold using x-ray diffraction at a hard x-ray free electron laser.** *Science advances*
  Descamps, A., Ofori-Okai, B. K., Bistoni, O., Chen, Z., Cunningham, E., Fletcher, L. B., Hartley, N. J., Hastings, J. B., Khaghani, D., Mo, M., Nagler, B., Recoules, V., Redmer, et al
  2024; 10 (6): eadh5272

- **Behavior of soda-lime silicate glass under laser-driven shock compression up to 315 GPa** *JOURNAL OF APPLIED PHYSICS*
  Madhavi, M., Jangid, R., Christiansen-Salameh, J., Cheng, Y., Rao, P., Li, J., Botu, S., Jeppson, S., Mehta, J., Smith, S., Isobe, J. T., Hok, S., Saha, et al
  2023; 133 (17)

- **Multi-frame, ultrafast, x-ray microscope for imaging shockwave dynamics.** *Optics express*
  Hodge, D. S., Leong, A. F., Pandolfi, S., Kurzer-Ogul, K., Montgomery, D. S., Aluie, H., Bolme, C., Carver, T., Cunningham, E., Curry, C. B., Dayton, M., Decker, F., Galtier, et al
  2022; 30 (21): 38405-38422

- **Novel fabrication tools for dynamic compression targets with engineered voids using photolithography methods** *REVIEW OF SCIENTIFIC INSTRUMENTS*
  Pandolfi, S., Carver, T., Hodge, D., Leong, A. F. T., Kurzer-Ogul, K., Hart, P., Galtier, E., Khaghani, D., Cunningham, E., Nagler, B., Lee, H., Bolme, C., Ramos, et al
  2022; 93 (10)

- **Development of slurry targets for high repetition-rate x-ray free electron laser experiments** *JOURNAL OF APPLIED PHYSICS*
  Smith, R. F., Rastogi, V., Lazicki, A. E., Gorman, M. G., Briggs, R., Coleman, A. L., Davis, C., Singh, S., McGonegle, D., Clarke, S. M., Volz, T., Hutchinson, T., McGuire, et al
  2022; 131 (24)

- **Investigation of hard x-ray emissions from terawatt laser-irradiated foils at the Matter in Extreme Conditions instrument of the Linac Coherent Light Source** *JOURNAL OF INSTRUMENTATION*
  Fletcher, L. B., Curry, C. B., Gauthier, M., Glenn, G. D., Chen, Z., Cunningham, E., Descamps, A., Frost, M., Galtier, E. C., Heimann, P., Kim, J. B., Mo, M., Ofori-Okai, et al
  2022; 17 (4)

- **Probing ultrafast laser plasma processes inside solids with resonant small-angle x-ray scattering** *PHYSICAL REVIEW RESEARCH*
  Gaus, L., Bischoff, L., Bussmann, M., Cunningham, E., Curry, C. B., Juncheng, E., Galtier, E., Gauthier, M., Garcia, A., Garten, M., Glenzer, S., Grenzer, J., Gutt, et al
  2021; 3 (4)

- **Measuring the structure and equation of state of polyethylene terephthalate at megabar pressures** *SCIENTIFIC REPORTS*
  Luetgert, J., Vorberger, J., Hartley, N. J., Voigt, K., Roedel, M., Schuster, A. K., Benuzzi-Mounaix, A., Brown, S., Cowan, T. E., Cunningham, E., Doeppner, T., Falcone, R. W., Fletcher, et al
  2021; 11 (1): 12883

- **2D monochromatic x-ray imaging for beam monitoring of an x-ray free electron laser and a high-power femtosecond laser** *REVIEW OF SCIENTIFIC INSTRUMENTS*
  Sawada, H., Trzaska, J., Curry, C. B., Gauthier, M., Fletcher, L. B., Jiang, S., Lee, H. J., Galtier, E. C., Cunningham, E., Dyer, G., Daykin, T. S., Chen, L., Salinas, et al
  2021; 92 (1): 013510

- **Femtosecond X-Ray Diffraction of Laser-Shocked Forsterite (Mg2SiO4) to 122 GPa** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*

Kim, D., Tracy, S. J., Smith, R. F., Gleason, A. E., Bolme, C. A., Prakapenka, V. B., Appel, K., Speziale, S., Wicks, J. K., Berryman, E. J., Han, S. K., Schoelmerich, M. O., Lee, et al

2021; 126 (1)

- **Development of a Platform at the Matter in Extreme Conditions End Station for Characterization of Matter Heated by Intense Laser-Accelerated Protons** *IEEE TRANSACTIONS ON PLASMA SCIENCE*

  Bhutwala, K., Bailly-Grandvaux, M., Kim, J., Dozieres, M., Galtier, E., Curry, C. B., Gauthier, M., Cunningham, E., Lee, H., Forestier-Colleoni, P., Higginson, A., Aybar, N., Hua, et al

  2020; 48 (8): 2751-2758

- **Evidence of shock-compressed stishovite above 300GPa** *SCIENTIFIC REPORTS*

  Schoelmerich, M. O., Tschentscher, T., Bhat, S., Bolme, C. A., Cunningham, E., Farla, R., Galtier, E., Gleason, A. E., Harmand, M., Inubushi, Y., Katagiri, K., Miyanishi, K., Nagler, et al

  2020; 10 (1): 10197

- **Coordination changes in liquid tin under shock compression determined using in situ femtosecond x-ray diffraction** *APPLIED PHYSICS LETTERS*

  Briggs, R., Gorman, M. G., Zhang, S., McGonegle, D., Coleman, A. L., Coppari, F., Morales-Silva, M. A., Smith, R. F., Wicks, J. K., Bolme, C. A., Gleason, A. E., Cunningham, E., Lee, et al

  2019; 115 (26)

- **Pulse contrast enhancement via non-collinear sum-frequency generation with the signal and idler of an optical parametric amplifier** *APPLIED PHYSICS LETTERS*

  Cunningham, E., Galtier, E., Dyer, G., Robinson, J., Fry, A.

  2019; 114 (22)

- **Evidence for Crystalline Structure in Dynamically-Compressed Polyethylene up to 200 GPa** *SCIENTIFIC REPORTS*

  Hartley, N. J., Brown, S., Cowan, T. E., Cunningham, E., Doppner, T., Falcone, R. W., Fletcher, L. B., Frydrych, S., Galtier, E., Gamboa, E. J., Garcia, A., Gericke, D. O., Glenzer, et al

  2019; 9: 4196

- **Interferometry of dipole phase in high harmonics from solids** *NATURE PHOTONICS*

  Lu, J., Cunningham, E. F., You, Y., Reis, D. A., Ghimire, S.

  2019; 13 (2): 96-+

- **Crystal orientation-dependent polarization state of high-order harmonics** *OPTICS LETTERS*

  You, Y., Lu, J., Cunningham, E. F., Roedel, C., Ghimire, S.

  2019; 44 (3): 530–33

- **Probing periodic potential of crystals via strong-field re-scattering** *JOURNAL OF PHYSICS B-ATOMIC MOLECULAR AND OPTICAL PHYSICS*

  You, Y., Cunningham, E., Reis, D. A., Ghimire, S.

  2018; 51 (11)

- **High-pressure chemistry of hydrocarbons relevant to planetary interiors and inertial confinement fusion**

  Kraus, D., Hartley, N. J., Frydrych, S., Schuster, A. K., Rohatsch, K., Roedel, M., Cowan, T. E., Brown, S., Cunningham, E., van Driel, T., Fletcher, L. B., Galtier, E., Gamboa, et al

  AMER INST PHYSICS.2018

- **Attosecond light sources in the water window** *JOURNAL OF OPTICS*

  Ren, X., Li, J., Yin, Y., Zhao, K., Chew, A., Wang, Y., Hu, S., Cheng, Y., Cunningham, E., Wu, Y., Chini, M., Chang, Z.

  2018; 20 (2)

- **Polarimetry of High Harmonics in Bulk Crystals**

  You, Y., Cunningham, E., Rodel, C., Reis, D. A., Ghimire, S., IEEE

  IEEE.2018

- **Phase-coherence of high-order harmonics from bulk crystals using homodyne detection**

  Cunningham, E., You, Y., Reis, D. A., Ghimire, S., IEEE

  IEEE.2017

- **Erratum: 53-attosecond X-ray pulses reach the carbon K-edge.** *Nature communications*
  Li, J. n., Ren, X. n., Yin, Y. n., Zhao, K. n., Chew, A. n., Cheng, Y. n., Cunningham, E. n., Wang, Y. n., Hu, S. n., Wu, Y. n., Chini, M. n., Chang, Z. n.
  2017; 8 (1): 794
- **53-attosecond X-ray pulses reach the carbon K-edge.** *Nature communications*
  Li, J. n., Ren, X. n., Yin, Y. n., Zhao, K. n., Chew, A. n., Cheng, Y. n., Cunningham, E. n., Wang, Y. n., Hu, S. n., Wu, Y. n., Chini, M. n., Chang, Z. n.
  2017; 8 (1): 186
- **Attosecond pulse generation isolated with an asymmetric polarization gating** *JOURNAL OF MODERN OPTICS*
  Chen, G., Cunningham, E., Chang, Z.
  2017; 64 (10-11): 952-959
- **Polarization gating of high harmonic generation in the water window** *APPLIED PHYSICS LETTERS*
  Li, J., Ren, X., Yin, Y., Cheng, Y., Cunningham, E., Wu, Y., Chang, Z.
  2016; 108 (23)
- **High-efficiency optical parametric chirped-pulse amplifier in BiB3O6 for generation of 3 mJ, two-cycle, carrier-envelope-phase-stable pulses at 1.7 mu m** *OPTICS LETTERS*
  Yin, Y., Li, J., Ren, X., Zhao, K., Wu, Y., Cunningham, E., Chang, Z.
  2016; 41 (6): 1142-1145
- **Measured photoemission from electron wave packets in a strong laser field** *OPTICS LETTERS*
  Ware, M., Cunningham, E., Coburn, C., Peatross, J.
  2016; 41 (4): 689-692
- **Carrier-envelope phase control of a 10 Hz, 25 TW laser for high-flux extreme ultraviolet quasi-continuum generation** *APPLIED PHYSICS LETTERS*
  Cunningham, E., Wu, Y., Chang, Z.
  2015; 107 (20)
- **Optical Gating With Asymmetric Field Ratios for Isolated Attosecond Pulse Generation** *IEEE JOURNAL OF SELECTED TOPICS IN QUANTUM ELECTRONICS*
  Cunningham, E., Chang, Z.
  2015; 21 (5)
- **Radiation from free electrons in a laser focus at 10(18) W/cm(2): modeling of photon yields and required focal conditions** *JOURNAL OF THE OPTICAL SOCIETY OF AMERICA B-OPTICAL PHYSICS*
  Tarbox, G., Cunningham, E., Sandberg, R., Peatross, J., Ware, M.
  2015; 32 (5): 743-750
- **Quantum Beats in Attosecond Transient Absorption of Krypton Autoionizing States**
  Cheng, Y., Chini, M., Tong, X., Chew, A., Biedermann, J., Wu, Y., Cunningham, E., Chang, Z., IEEE
  IEEE.2015
- **Suppression of driving laser in high harmonic generation with a microchannel plate** *OPTICS LETTERS*
  Zhang, Q., Zhao, K., Li, J., Chini, M., Cheng, Y., Wu, Y., Cunningham, E., Chang, Z.
  2014; 39 (12): 3670-3673
- **Coherent phase-matched VUV generation by field-controlled bound states** *NATURE PHOTONICS*
  Chini, M., Wang, X., Cheng, Y., Wang, H., Wu, Y., Cunningham, E., Li, P., Heslar, J., Telnov, D. A., Chu, S., Chang, Z.
  2014; 8 (6): 437-441
- **Carrier-Envelope Phase Stabilization of a 10 Hz, 20 TW Laser for High-Flux Attosecond Pulse Generation**
  Wu, Y., Cunningham, E., Li, J., Chini, M., Chang, Z., IEEE
  IEEE.2014
- **Coherent VUV Emission from Field-Controlled Bound States**
  Chini, M., Wang, X., Cheng, Y., Wang, H., Wu, Y., Cunningham, E., Peng-Cheng-Li, Heslar, J., Telnov, D. A., Chu, S., Chang, Z., IEEE
  IEEE.2014

- **Generation of high-flux attosecond extreme ultraviolet continuum with a 10 TW laser** *APPLIED PHYSICS LETTERS*
  Wu, Y., Cunningham, E., Zang, H., Li, J., Chini, M., Wang, X., Wang, Y., Zhao, K., Chang, Z.
  2013; 102 (20)
- **Generation of High-Flux Attosecond XUV Continuum with a 10 TW Driving Laser**
  Wu, Y., Cunningham, E., Li, J., Zang, H., Chini, M., Wang, X., Wang, Y., Zhao, K., Chang, Z., IEEE
  IEEE.2013
- **Probing attosecond electron dynamics in atoms**
  Chini, M., Wang, X., Cheng, Y., Wu, Y., Zhao, K., Zhang, Q., Cunningham, E., Wang, Y., Zang, H., Chang, Z., IEEE
  IEEE.2012: 622-+

PRESENTATIONS

- Introduction to Optical Lasers: Part 1 -- Optics and Optical Components - LCLS Engineering department