Stanford

Agostino Marinelli

Associate Professor of Photon Science and of Particle Physics and Astrophysics

Photon Science Directorate

Bio

BIO

Ago Marinelli is an associate professor of Photon Science and Particle Physics and Astrophysics at the SLAC National Accelerator Laboratory. He received his PhD in physics from the University of California, Los Angeles in 2012 and moved to SLAC shortly after as a post-doctoral research associate. He was a Panofsky Fellow from 2015 to 2019 and joined the SLAC faculty in the fall of 2019.

He is currently the head of the free-electron laser physics department, as well as the leader of the free-electron laser R&D program at SLAC. His research is focused on the physics and applications of X-ray free-electron lasers as well as ultrafast light sources based on advanced particle accelerators.

ACADEMIC APPOINTMENTS

- Associate Professor, Photon Science Directorate
- Associate Professor, Particle Physics and Astrophysics
- Principal Investigator, Stanford PULSE Institute

HONORS AND AWARDS

- Kai Siegbahn Prize, SRI (2024)
- Particle Accelerator Science and Technology Award, IEEE (2024)
- Fellow of the American Physical Society, APS (2023)
- Panofsky Fellowship, SLAC National Accelerator Laboratory (2015-2019)
- Young Investigator Free-Electron Laser Prize, International Free-Electron Laser Conference (2015)
- Outstanding Doctoral Thesis Research in Beam Physics Award, American Physical Society (2015)
- Frank Sacherer Prize, European Physical Society (2014)

PROFESSIONAL EDUCATION

- PhD, University of California, Los Angeles , Physics (2012)
- Laurea Magistrale (M.S.), University of Rome, La Sapienza , Engineering Sciences (2007)
- Laurea, University of Rome, La Sapienza , Electrical Engineering (2005)

LINKS

- Google scholar page: https://scholar.google.com/citations?user=6AJit0sAAAAJ&hl=it

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

My main research interests are the physics and applications of x-ray free-electron lasers. I lead the free-electron laser R&D program at the Linac Coherent Light Source at SLAC, where I employ new accelerator and FEL physics concepts to advance ultrafast X-ray science. Some highlights of my research are the development of attosecond x-ray free-electron lasers, and the use of advanced plasma accelerators for the generation of ultrafast radiation pulses.

Teaching

COURSES

2025-26

- Advanced Topics in Accelerator Physics: APPPHYS 220 (Win)
- Electrons and Photons: APPPHYS 201, PHOTON 201 (Spr)

2024-25

- Advanced Topics in Accelerator Physics: APPPHYS 220 (Win)
- Electrons and Photons: APPPHYS 201, PHOTON 201 (Spr)

2023-24

- Electrons and Photons: APPPHYS 201, PHOTON 201 (Spr)
- Synchrotron Radiation and Free Electron Lasers: Principles and Applications.: APPPHYS 325 (Aut)

2022-23

- Electrons and Photons: APPPHYS 201, PHOTON 201 (Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

David Atri Schuller, Aaron Ghrist, Erik Isele

Doctoral Dissertation Advisor (AC)

Veronica Guo, Rafi Hessami, Sean Littleton, Sean O'Tool, River Robles

Publications

PUBLICATIONS

- **Spectrotemporal Shaping of Attosecond X-Ray Pulses with a Fresh-Slice Free-Electron Laser.** *Physical review letters*
  Robles, R. R., Larsen, K. A., Cesar, D., Driver, T., Duris, J., Franz, P., Garratt, D., Guo, V., Just, G., Lemons, R., Lin, M. F., Obaid, R., Sudar, et al
  2025; 134 (11): 115001
- **Attosecond delays in X-ray molecular ionization.** *Nature*
  Driver, T., Mountney, M., Wang, J., Ortmann, L., Al-Haddad, A., Berrah, N., Bostedt, C., Champenois, E. G., DiMauro, L. F., Duris, J., Garratt, D., Glownia, J. M., Guo, et al
  2024; 632 (8026): 762-767
- **Terawatt-scale attosecond X-ray pulses from a cascaded superradiant free-electron laser** *NATURE PHOTONICS*
  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
  2024
- **Experimental demonstration of attosecond pump-probe spectroscopy with an X-ray free-electron laser** *NATURE PHOTONICS*

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

- **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

  1800: eabj2096

- **Tunable isolated attosecond X-ray pulses with gigawatt peak power from a free-electron laser** *NATURE PHOTONICS*

  Duris, J., Li, S., Driver, T., Champenois, E. G., MacArthur, J. P., Lutman, A. A., Zhang, Z., Rosenberger, P., Aldrich, J. W., Coffee, R., Coslovich, G., Decker, F., Glownia, et al

  2020; 14 (1): 30-+

- **Surface structure of water from soft X-ray second harmonic generation.** *Nature communications*

  Hoffman, D. J., Devlin, S. W., Garratt, D., Jamnuch, S., Spies, J. A., Nebgen, B. R., Schacher, D., Do, A., Bernal, F., Riffe, E. J., Kunnus, K., Hampton, C. Y., Duris, et al

  2025; 16 (1): 10522

- **Attosecond X-Ray Core-Level Chronoscopy of Aromatic Molecules** *PHYSICAL REVIEW X*

  Ji, J., Guo, Z., Driver, T., Trevisan, C. S., Cesar, D., Cheng, X., Duris, J., Franz, P. L., Glownia, J., Gong, X., Hammerland, D., Han, M., Heck, et al

  2025; 15 (4)

- **Attosecond X-ray sources, methods, and applications at present and future free-electron lasers: tutorial** *ADVANCES IN OPTICS AND PHOTONICS*

  Berrah, N., Cryan, J., Robles, R., Driver, T., Marinelli, A., Bucksbaum, P.

  2025; 17 (3): 623-725

- **The time-resolved atomic, molecular and optical science instrument at the Linac Coherent Light Source. Corrigendum.** *Journal of synchrotron radiation*

  Walter, P., Osipov, T., Lin, M. F., Cryan, J., Driver, T., Kamalov, A., Marinelli, A., Robinson, J., Seaberg, M. H., Wolf, T. J., Aldrich, J., Brown, N., Champenois, et al

  2025

- **Attosecond inner-shell lasing at ångström wavelengths.** *Nature*

  Linker, T. M., Halavanau, A., Kroll, T., Benediktovitch, A., Zhang, Y., Michine, Y., Chuchurka, S., Abhari, Z., Ronchetti, D., Fransson, T., Weninger, C., Fuller, F. D., Aquila, et al

  2025

- **Nanofocused attosecond hard x-ray free-electron laser with intensity exceeding 1019 W/cm2** *OPTICA*

  Inoue, I., Sato, T., Robles, R., Seaberg, M. H., Sun, Y., Zhu, D., Cesar, D., Ding, Y., Esposito, V., Franz, P., Guo, V., Halavanau, A., Sudar, et al

  2025; 12 (3): 309-310

- **Non-linear enhancement of ultrafast X-ray diffraction through transient resonances.** *Nature communications*

  Kuschel, S., Ho, P. J., Al Haddad, A., Zimmermann, F. F., Flueckiger, L., Ware, M. R., Duris, J., MacArthur, J. P., Lutman, A., Lin, M. F., Li, X., Nakahara, K., Aldrich, et al

  2025; 16 (1): 847

- **Probing Electronic Coherence between Core-Level Vacancies at Different Atomic Sites** *PHYSICAL REVIEW X*

  Wang, J., Driver, T.

  2025; 15: 011008

- **Design and performance of a magnetic bottle electron spectrometer for high-energy photoelectron spectroscopy.** *The Review of scientific instruments*

  Borne, K., O'Neal, J. T., Wang, J., Isele, E., Obaid, R., Berrah, N., Cheng, X., Bucksbaum, P. H., James, J., Kamalov, A., Larsen, K. A., Li, X., Lin, et al

  2024; 95 (12)

- **"Beam à la carte": Laser heater shaping for attosecond pulses in a multiplexed x-ray free-electron laser** *APPLIED PHYSICS LETTERS*

  Li, S., Zhang, Z., Alverson, S., Cesar, D., Driver, T., Franz, P., Isele, E., Duris, J. P., Larsen, K., Lin, M., Obaid, R., O'Neal, J. T., Robles, et al

  2024; 125 (19)

- **Attosecond impulsive stimulated X-ray Raman scattering in liquid water.** *Science advances*
  Alexander, O., Egun, F., Rego, L., Gutierrez, A. M., Garratt, D., Cardenes, G. A., Nogueira, J. J., Lee, J. P., Zhao, K., Wang, R. P., Ayuso, D., Barnard, J. C., Beauvarlet, et al
  2024; 10 (39): eadp0841

- **Three-dimensional theory of superradiant free-electron lasers** *PHYSICAL REVIEW RESEARCH*
  Robles, R. R., Giannessi, L., Marinelli, A.
  2024; 6 (3)

- **Wavelength scaling and multicolor operation of a plasma-driven attosecond x-ray source via harmonic generation** *PHYSICAL REVIEW ACCELERATORS AND BEAMS*
  Hessami, R., Morgan, J., Robles, R., Larsen, K. A., Marinelli, A., Emma, C.
  2024; 27 (7)

- **The Linac Coherent Light Source II photoinjector laser infrastructure** *HIGH POWER LASER SCIENCE AND ENGINEERING*
  Zhang, H., Gilevich, S., Miahnahri, A., Alverson, S., Brachmann, A., Duris, J., Franz, P., Fry, A., Hirschman, J., Larsen, K., Lemons, R., Li, S., Lu, et al
  2024; 12

- **Efficient prediction of attosecond two-colour pulses from an X-ray free-electron laser with machine learning.** *Scientific reports*
  Alaa El-Din, K. K., Alexander, O. G., Frasinski, L. J., Mintert, F., Guo, Z., Duris, J., Zhang, Z., Cesar, D. B., Franz, P., Driver, T., Walter, P., Cryan, J. P., Marinelli, et al
  2024; 14 (1): 7267

- **Effect of the shot-to-shot variation on charge migration induced by sub-fs x-ray free-electron laser pulses** *PHYSICAL REVIEW RESEARCH*
  Grell, G., Guo, Z., Driver, T., Decleva, P., Plesiat, E., Picon, A., Gonzalez-Vazquez, J., Walter, P., Marangos, J. P., Cryan, J. P., Marinelli, A., Palacios, A., Martin, et al
  2023; 5 (2)

- **Observation of site-selective chemical bond changes via ultrafast chemical shifts.** *Nature communications*
  Al-Haddad, A., Oberli, S., Gonzalez-Vazquez, J., Bucher, M., Doumy, G., Ho, P., Krzywinski, J., Lane, T. J., Lutman, A., Marinelli, A., Maxwell, T. J., Moeller, S., Pratt, et al
  2022; 13 (1): 7170

- **The time-resolved atomic, molecular and optical science instrument at the Linac Coherent Light Source.** *Journal of synchrotron radiation*
  Walter, P., Osipov, T., Lin, M. F., Cryan, J., Driver, T., Kamalov, A., Marinelli, A., Robinson, J., Seaberg, M. H., Wolf, T. J., Aldrich, J., Brown, N., Champenois, et al
  2022; 29 (Pt 4): 957-968

- **Tunable x-ray free electron laser multi-pulses with nanosecond separation.** *Scientific reports*
  Decker, F., Bane, K. L., Colocho, W., Gilevich, S., Marinelli, A., Sheppard, J. C., Turner, J. L., Turner, J. J., Vetter, S. L., Halavanau, A., Pellegrini, C., Lutman, A. A.
  2022; 12 (1): 3253

- **Characterization of single-shot attosecond pulses with angular streaking photoelectron spectra** *PHYSICAL REVIEW A*
  Zhao, X., Li, S., Driver, T., Van-Hung Hoang, Anh-Thu Le, Cryan, J. P., Marinelli, A., Lin, C. D.
  2022; 105 (1)

- **Temporal shaping of narrow-band picosecond pulses via noncolinear sum-frequency mixing of dispersion-controlled pulses** *PHYSICAL REVIEW ACCELERATORS AND BEAMS*
  Lemons, R., Neveu, N., Duris, J., Marinelli, A., Durfee, C., Carbajo, S.
  2022; 25 (1)

- **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.
  edited by DiMauro, L. F., Perrin, H., Yelin, S. F.
  2022; 71: 1-64

- **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
2021; 126 (10): 104802

- **Generation of Terawatt Attosecond Pulses from Relativistic Transition Radiation** *PHYSICAL REVIEW LETTERS*
  Xu, X., Cesar, D. B., Corde, S., Yakimenko, V., Hogan, M. J., Joshi, C., Marinelli, A., Mori, W. B.
  2021; 126 (9): 094801

- **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

- **Inner Valence Hole Migration in Isopropanol**
  Alexander, O., Barillot, T., Cooper, B., Driver, T., Garratt, D., Li, S., Marinelli, A., Cryan, J. P., Marangos, J. P., LR25 Collaboration, IEEE
  IEEE.2021

- **Electronic Population Transfer via Impulsive Stimulated X-Ray Raman Scattering with Attosecond Soft-X-Ray Pulses.** *Physical review letters*
  O'Neal, J. T., Champenois, E. G., Oberli, S., Obaid, R., Al-Haddad, A., Barnard, J., Berrah, N., Coffee, R., Duris, J., Galinis, G., Garratt, D., Glownia, J. M., Haxton, et al
  2020; 125 (7): 073203

- **Electronic Population Transfer via Impulsive Stimulated X-Ray Raman Scattering with Attosecond Soft-X-Ray Pulses** *PHYSICAL REVIEW LETTERS*
  O'Neal, J. T., Champenois, E. G., Oberli, S., Obaid, R., Al-Haddad, A., Barnard, J., Berrah, N., Coffee, R., Duris, J., Galinis, G., Garratt, D., Glownia, J. M., Haxton, et al
  2020; 125 (7)

- **Observation of Seeded Mn K beta Stimulated X-Ray Emission Using Two-Color X-Ray Free-Electron Laser Pulses** *PHYSICAL REVIEW LETTERS*
  Kroll, T., Weninger, C., Fuller, F. D., Guetg, M. W., Benediktovitch, A., Zhang, Y., Marinelli, A., Alonso-Mori, R., Aquila, A., Liang, M., Koglin, J. E., Koralek, J., Sokaras, et al
  2020; 125 (3)

- **Observation of Seeded Mn Kβ Stimulated X-Ray Emission Using Two-Color X-Ray Free-Electron Laser Pulses.** *Physical review letters*
  Kroll, T., Weninger, C., Fuller, F. D., Guetg, M. W., Benediktovitch, A., Zhang, Y., Marinelli, A., Alonso-Mori, R., Aquila, A., Liang, M., Koglin, J. E., Koralek, J., Sokaras, et al
  2020; 125 (3): 037404

- **Structural dynamics in proteins induced by and probed with X-ray free-electron laser pulses.** *Nature communications*
  Nass, K., Gorel, A., Abdullah, M. M., V Martin, A., Kloos, M., Marinelli, A., Aquila, A., Barends, T. R., Decker, F., Bruce Doak, R., Foucar, L., Hartmann, E., Hilpert, et al
  2020; 11 (1): 1814

- **Simulation analysis and optimization of fresh-slice multistage free-electron lasers** *PHYSICAL REVIEW ACCELERATORS AND BEAMS*
  Guo, T., Guetg, M. W., Ding, Y., Marinelli, A., Wu, J., Huang, Z., Lutman, A. A.
  2020; 23 (3)

- **Attosecond transient absorption spooktroscopy: a ghost imaging approach to ultrafast absorption spectroscopy.** *Physical chemistry chemical physics : PCCP*
  Driver, T., Li, S., Champenois, E. G., Duris, J., Ratner, D., Lane, T. J., Rosenberger, P., Al-Haddad, A., Averbukh, V., Barnard, T., Berrah, N., Bostedt, C., Bucksbaum, et al
  2019

- **Phase-Stable Self-Modulation of an Electron Beam in a Magnetic Wiggler.** *Physical review letters*
  MacArthur, J. P., Duris, J., Zhang, Z., Lutman, A., Zholents, A., Xu, X., Huang, Z., Marinelli, A.
  2019; 123 (21): 214801

- **Development of ultrafast capabilities for X-ray free-electron lasers at the linac coherent light source.** *Philosophical transactions. Series A, Mathematical, physical, and engineering sciences*
  Coffee, R. N., Cryan, J. P., Duris, J., Helml, W., Li, S., Marinelli, A.
  2019; 377 (2145): 20180386

- **High-Power Femtosecond Soft X Rays from Fresh-Slice Multistage Free-Electron Lasers** *PHYSICAL REVIEW LETTERS*
  Lutman, A. A., Guetg, M. W., Maxwell, T. J., MacArthur, J. P., Ding, Y., Emma, C., Krzywinski, J., Marinelli, A., Huang, Z.
  2018; 120 (26): 264801

- **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
  2018; 120 (13): 133203

- **Characterizing isolated attosecond pulses with angular streaking** *OPTICS EXPRESS*
  Li, S., Guo, Z., Coffee, R. N., Hegazy, K., Huang, Z., Natan, A., Osipov, T., Ray, D., Marinelli, A., Cryan, J. P.
  2018; 26 (4): 4531–47

- **Fresh-slice multicolour X-ray free-electron lasers** *NATURE PHOTONICS*
  Lutman, A. A., Maxwell, T. J., MacArthur, J. P., Guetg, M. W., Berrah, N., Coffee, R. N., Ding, Y., Huang, Z., Marinelli, A., Moeller, S., Zemella, J. C.
  2016; 10 (11): 745-750

- **Polarization control in an X-ray free-electron laser** *NATURE PHOTONICS*
  Lutman, A. A., MacArthur, J. P., Ilchen, M., Lindahl, A. O., Buck, J., Coffee, R. N., Dakovski, G. L., Dammann, L., Ding, Y., Durr, H. A., Glaser, L., Grunert, J., Hartmann, et al
  2016; 10 (7): 468-472

- **Transient lattice contraction in the solid-to-plasma transition.** *Science advances*
  Ferguson, K. R., Bucher, M., Gorkhover, T., Boutet, S., Fukuzawa, H., Koglin, J. E., Kumagai, Y., Lutman, A., Marinelli, A., Messerschmidt, M., Nagaya, K., Turner, J., Ueda, et al
  2016; 2 (1)