

## Physics and Astrophysics Special Seminar

Monday, March 1, 2021

2:00 p.m.

### Emerging Frontiers at the Intersection between Photon Sciences, Molecular Dynamics, and Light-Matter Interactions

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Photon and particle sources are powerful tools with extremely high societal impact because they underpin myriad groundbreaking scientific, technological, and medical advancements. Topological and structured photonics can probe, excite, and manipulate matter with unparalleled spatio-temporal accuracy to study new functional materials. They can also carry quantum-level information with many degrees of freedom without suffering decoherence, and thus render new technologies in quantum materials, information sciences, and (bio)chemical physics, among others. In the X-ray regime, ultrafast photon and electron sources, such as X-ray free-electron lasers (XFEL), have demonstrated the capacity to make molecular movies that reveal conformational dynamics in biomolecules and ultrafast chemistry at atomic-level spatial and femtosecond temporal resolutions. Motivated by their overarching relevance, we will review some of the most recent scientific and technological advances in photon and particle sources and some of their most important breakthroughs in life, chemistry, and energy sciences. We also discuss the potential impact of emerging technologies to tackle global challenges in environmental and chemical engineering, biotechnology, and other applications in broader scientific and commercial applications.

Dr. Sergio Carbajo is a principal investigator at Stanford University and department head at the Linac Coherent Light Source (LCLS), SLAC National Accelerator Laboratory, and joint faculty at the Colorado School of Mines. He graduated with a BS in Telecom Engineering from Universidad de Navarra in 2009 and received a M.Sc. in Electrical and Computer Engineering from Colorado State University at the National Science Foundation Engineering Research Center in 2012. He continued his joint doctoral program simultaneously at the Research Laboratory of Electronics, Massachusetts Institute of Technology and the Center for Free Electron Laser Science, Deutsches Elektronen Synchrotron, and obtained his Ph.D. in Physics in 2015. He has received several awards recognizing his contributions to the development of novel ultrafast photon and particle sources, and their application in ultrafast phenomena for life and energy sciences.