Poster

From Protein Dynamics to Biological Function: The Impact of LCLS-II and the Center for Structural Dynamics in Biology

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Biological function is intimately tied to dynamic changes in protein conformations and interactions with other molecules. The recent upgrade to the Linac Coherent Light Source (LCLS-II) marks a transformative leap for structural biology by providing unprecedented opportunities to study these dynamic processes. The high repetition rate of LCLS-II enables real-time observation of macromolecular dynamics in their native environments, making it possible to follow conformational changes as they occur and reveal critical aspects of how biological functions are regulated. Additionally, LCLS-II's capability to generate two-color X-ray pulses spanning 0.25 to 25 keV facilitates multidimensional X-ray spectroscopy experiments, enabling the simultaneous observation of nuclear motions and electron dynamics in essential non-metal atoms such as sulfur, offering insights into the mechanisms of biological processes at the atomic level. To further maximize the potential of these advancements, LCLS has partnered with the National Institutes of Health to establish the Center for Structural Dynamics in Biology (SDB). The SDB is dedicated to improving user-friendliness for biological experiments by developing innovative tools and technologies, promoting collaborative applications, and ensuring these advancements are widely accessible to the research community. This summary will review the advancements made possible by LCLS-II and the SDB, highlighting the implications for future cutting-edge biology experiments and the potential to advance our understanding of biological dynamics and function.