

# **Time-resolved studies on Biomolecules with X-ray Free Electron lasers and development of compact X-ray Free Electron Lasers at Arizona State University**

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In the Biodesign Center for Applied Structural Discovery at Arizona State University we aim to develop new revolutionary techniques that reveal the structure and dynamics of biomolecules towards new visionary discoveries in Medicine and Energy Conversion. Serial Femtosecond crystallography (SFX) provides a novel concept for structure determination, where X-ray diffraction “snapshots” are collected from a fully hydrated stream of nanocrystals, using femtosecond pulses at high energy X-ray free-electron lasers. As femtosecond pulses are shorter than the time-scale of most damage processes, femtosecond crystallography overcomes the problem of X-ray damage in crystallography. The proof of principle for time resolved serial femtosecond crystallography paved the way for the determination of molecular movies of the dynamics of proteins "at work". In my talk I will give an overview of highlights of recent structural discoveries with X-ray Free Electron lasers and report on the new development of compact X-ray Free Electron Lasers at Arizona State University.