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Adventures in Biomedical Research Through Synchrotron Science

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With each decade of my research in synchrotron science that began in the mid 1990's came multiple new developments in beamline technologies that made experiments in biomedical research possible that could only be dreamed about a short time beforehand. This, in turn, opened up many new possibilities in groundbreaking biomedical research that have placed synchrotron science at the forefront of providing previously inaccessible information on mechanisms of both disease processes and drug treatments.

In this lecture, I will discuss key developments and applications of synchrotron science in areas such as: (i) the use of multiple scattering analysis of EXAFS for 3D structural information on unstable proteins and species related to understanding protein structure, and mechanisms of disease processes; (ii) XANES for probing metallodrug speciation under biologically relevant conditions; (iii) XFM and micro-XANES for understanding the biodistributions and speciation of elements in cells and tissues related to the roles of metals in diseases and the development of new metallodrugs; and (iv) the use of infrared microscopy to understand changes in the biochemistry of cells and tissues to provide information on the mechanisms of disease processes (brain, cardiovascular, etc.) and their treatments.

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