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Bioimaging Using Micro-Ct, Dei-Ct and X-Ray Microprobe with Synchrotron X-Rays

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The author focus on research topics related to synchrotron-based tomography, mainly on medical, biomedical, biological, and environmental science imaging with synchrotron X-rays. Also highlight on nanoscience by utilizing the nanosized high energy photon beam with light source / accelerator facilities to investigate the properties of novel biomaterials and nanomaterials and imaging tools for medical, biomedical, and environmental science imaging research. New and Improved Tools: Light source / accelerator facilities will provide unprecedented capabilities for coherence-sensitive approaches, including scanning microscopes and microprobes. This will reshape the technical choices one would make compared to other facilities, so that whole-cell tomography would be done with a tenfold reduction in radiation dose, and chemical state mapping and trace element mapping would be done with improved sensitivity, spatial resolution, and speed. Extensive and innovative investigations related to biomaterials and nanomaterials with nanosized high energy photon beam are valuable. Multi-Technique Integration: Because scientific questions are often not completely answered by just one technique, an integrated suite of beamlines ranging from infrared, to soft and hard X-ray, should be developed with common sample preparation facilities and maximum compatibility of sample handling and mounting schemes. Cross-Disciplinary Approaches: A significant part of environmental science today addresses questions of the role of bacterial exudates and organic coatings on metal and radionuclide transport and reactivity in hydrated systems, as well as the health effects of contaminants. The overlap between this area of environmental science and bioimaging involves both scientific insight and technical approaches, so that this overlap should be embraced.