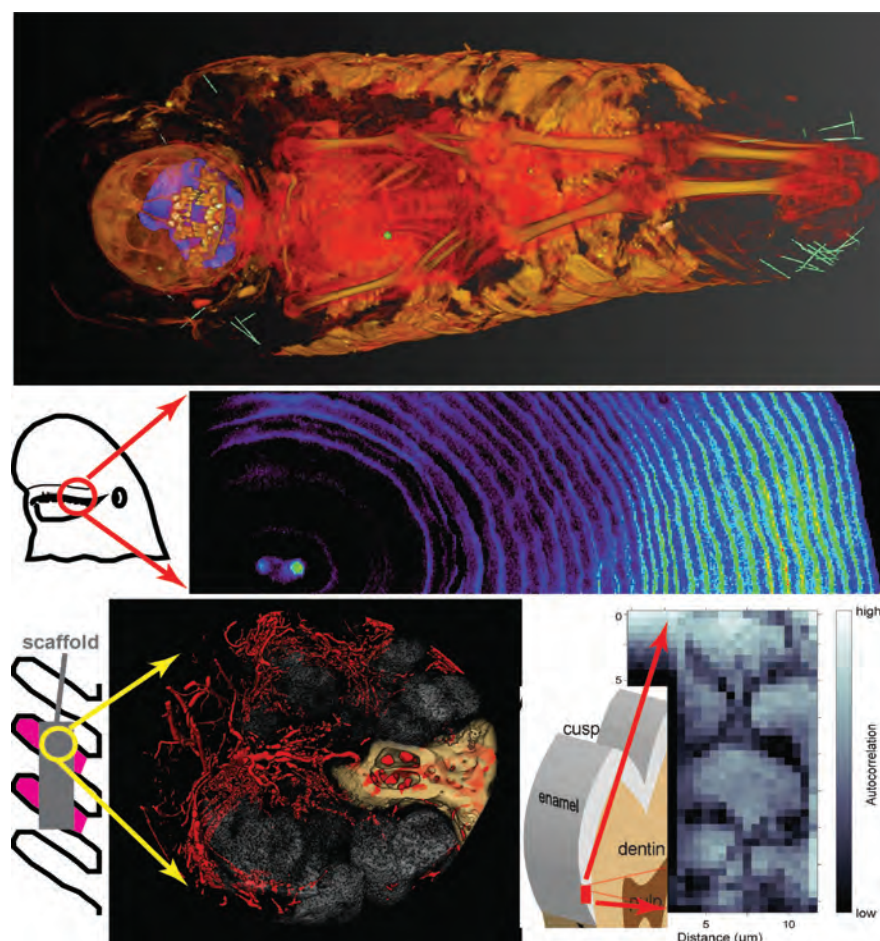


Stuart R. Stock

Meters to Micrometers: Studies of Different Hierarchical Scales of Biomineralized Tissue

Biomineralized tissues range from the shells of invertebrates to the bones and teeth of vertebrates such as humans. Increasingly, synchrotron x-radiation-based techniques are being applied to study these tissues, and important new insights are being gained into structure-function relationships in healthy as well as defective mineralized tissues. This talk focuses on current APS studies in this area conducted by the author and his collaborators, and these studies span sample size scales from greater than one meter to less than one micrometer and make use of two or more x-ray modalities. This synergistic application of different x-ray probes opens windows to new understanding of how various mineralized tissues develop and function. The applications are (from largest to smallest): a Roman-era Egyptian human mummy, human metacarpal bones from Roman-era and from medieval cemeteries, Beluga whale teeth, 3D printed scaffolds used for spine fusion in a rat model and the structure of rods in human enamel. The techniques employed include: clinical Computed Tomography (CT), microCT, position-resolved x-ray diffraction, diffraction tomography and position-resolved x-ray fluorescence.



Stuart R. Stock did his B.S. and M.S. in Materials Science and Engineering at Northwestern University. Following his Ph.D. at the University of Illinois at Urbana-Champaign, he returned to Northwestern University for as a post-doc. During the next sixteen years, he taught on the materials faculty at Georgia Institute of Technology. Since 2001 he has been on the faculty of Northwestern's Feinberg School of Medicine. He has been using position-resolved x-ray scattering for over 40 years and x-ray microComputed Tomography for nearly 35 years. He has been fortunate enough to be able to use synchrotron radiation since the early 1980s, and most of his work since 2001 has been at the Advanced Photon Source. Before his move to Northwestern, these studies were on inorganic materials; since the move, he has concentrated on biomineralized tissues and on developing novel approaches for studying these materials. He is an author of "Elements of X-ray Diffraction," third edition), and wrote "MicroComputed Tomography: Methodology and Applications;" the second edition of which is currently in production.

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