

# Carnegie Mellon University

## Materials Science & Engineering

*presents*

### **Progress in X-ray Tomography for the 3D Characterization, Analysis, and Simulation of Multiphase Particulate Systems in the Processing of Mineral Resources**

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The more efficient production and use of mineral resources is a major objective of our sustainability efforts. Resource characterization is a critical component for optimization of the mine-to-mill process, including innovative processing for sustainable growth. Such characterization is now referred to as geometallurgy, with advanced instrumentation including, for example, particle size analysis, XRF, XRD, NIR, automated SEM/EDAX analysis (QEMSCAN, MLA), and high resolution X-ray micro tomography. Geometallurgical information is important for exploration, deposit evaluation, mine planning, design and analysis of separation processes, etc.

Characterization of multiphase particles in 3D is now possible using high-resolution X-ray micro tomography (HRXMT), and such HRXMT systems have been installed at several laboratories around the world. After review of principles, the features of such HRXMT analyses are presented including size/shape, damage state, mineral phase identification, and evaluation/isolation of trace mineral particles. With new algorithms for image analysis quantitative data treatment is possible for construction of liberation-limited grade/recovery curves, for the determination of specific crack surface area, and for complex texture analysis including grain exposure. Finally, new tomographic characterization possibilities are discussed to provide the foundation for the development of advanced, innovative processing strategies in the recovery of mineral/energy resources.

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J.D. Miller is the Ivor Thomas Distinguished Professor of Metallurgical Engineering, College of Mines and Earth Sciences, University of Utah. He received his B.S. degree, graduating with distinction, from the Pennsylvania State University. His graduate degrees (M.S. and Ph.D.) in Metallurgical Engineering were earned at the Colorado School of Mines. Professor Miller is the recipient of numerous awards based on research contributions in mineral processing/hydrometallurgy (over 600 publications) and has served on the faculty at the University of Utah for more than 45 years. From 2002 to 2013 he was the Chair of the Department of Metallurgical Engineering. Professor Miller is a member of the National Academy of Engineering and a Distinguished Member of SME. He has received Honorary Ph.D. Degrees from the University of Pretoria in South Africa and from the Gdansk University of Technology in Poland. In addition, he has Honorary Professorial Appointments from several universities in China and from the Chinese Academy of Sciences.

**Doherty Hall 2210, 11:30AM**  
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