ASU Department of Physics
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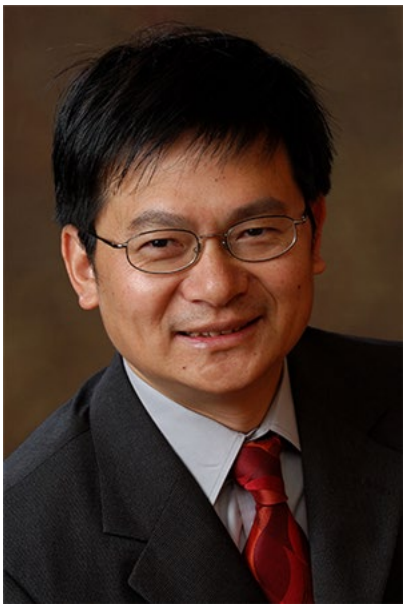
COLLOQUIUM



Thursday, January 20th, 2022

4:00 PM – 5:00 PM, Virtual

https://asu.zoom.us/j/86960690591

The Enigma of High Entropy Alloys

Professor Jian-Min Zuo
University of Illinois

Abstract:

The emerging multiple principal components alloys, popularly known as high entropy alloys (HEAs), offer the vast central region of phase space for the design of new strong and yet tough alloys, including high temperature alloys. However, the determination of their structure-property relationship, which is a corner stone of modern materials science, so far has been a challenge. In a HEA, where every element is a principal component and atomic misfits lead to large lattice distortion, the traditional conception of structure based on crystals with minute impurities no longer works. How we determine and describe such enigmatic structure then becomes the central challenge in establishing the science of HEAs. This talk first provides a basic introduction to HEAs and the state of art in their characterization. We will then focus on the coherent electron diffraction, which was pioneered at ASU in 1980s, and show how speckles formed by interference of electron diffuse scattering can be analyzed, and how such analysis can be applied to determine the distortive part of electron scattering potential with the assistance of modern data science. We then apply such analysis to the short-range order problem in the alloy of CrCoNi and provide the first experimental evidence of theory predicted and magnetically driven short-range ordering.

Biography:

Prof. Zuo received his Ph.D. in Physics from Arizona State University in 1989 under the guidance of Prof. John Spence. He is currently the Racheff Professor in the Department of Materials Science and Engineering, University of Illinois, Affiliated Professor of Materials Research Laboratory and Electrical and Computer Engineering, University of Illinois. The research in Prof. Zuo's group involves the development of advanced electron microscopy for the study of structure-property relationships for novel materials characterization. He is a Fellow of American Physical Society and Microscopy Society of America. He co-authored two books with John on Advanced Transmission Electron Microscopy, Springer 2017, and Electron microdiffraction, Plenum, 1992. Prof. Zuo is current spending his sabbatical leave in Physics Dept, ASU.

Host: Prof. David Smith

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