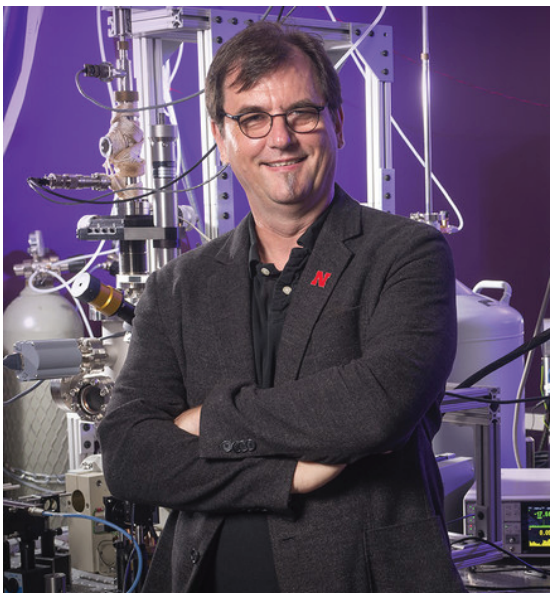
SIGMA XI
THE SCIENTIFIC RESEARCH HONOR SOCIETY

SCIENCE CAFE
SCIENCE CAFE
SCIENCE CAFE

Emergent Quantum Materials and Technologies: What are they and why should I care?

Dr. Christian Binek

Charles Bessey Professor
Department of Physics and Astronomy
at the University of Nebraska-Lincoln



Dr. Binek received his Ph.D. in Germany at the University of Duisburg-Essen in 1995, followed by a Habilitation in 2001. In 2003 he accepted a position as Assistant Professor at UNL; he was named Charles Bessey Chaired Professor in 2021. Since 2019 Dr. Binek serves as Director of the Nebraska Center for Materials and Nanoscience and Director of the Nebraska Nanoscale Facility, a NSF-funded regional center of excellence in nanoscience and nanotechnology and part of 16 sites which constitute the National Nanotechnology Coordinated Infrastructure. Dr. Binek is the Scientific Director of Nebraska's NSF funded $20M center on Emergent Quantum Materials and Technologies. He holds 6 patents and is author of more than 120 peer-reviewed papers. He is an NSF CAREER and 2007 Sigma Xi Outstanding Young Scientist awardee.

Quantum materials are a new class of materials that exhibit macroscopic quantum effects associated with phenomena such as strong electron correlation, quantum superposition and entanglement. These quantum phenomena give rise to the second quantum revolution leaving their fingerprints in specific and potentially useful materials properties such as superconductivity, magnetoelectricity and new topological states of matter to name just a few examples. Their utilization enables new quantum technologies which are expected to disrupt the technological landscape in the fields of quantum sensing, quantum communication, and quantum information technologies including quantum emulation, quantum computing and quantum cryptography. To prepare Nebraska for this transition, a statewide effort has been launched in the form of a $20 M research and education cluster on Emergent Quantum Materials and Technologies (EQUATE). My presentation introduces and highlights the peculiarities of the second quantum revolution by contrasting it with the more familiar first quantum revolution which gave rise to much of today's high-technology. I will provide examples for the theory guided search, fabrication, and characterization of emergent quantum materials and show how they enable quantum technologies with applications in sensing, communication, medicine, banking and national security. I will point out the specific role which Nebraska's EQUATE center plays in this global megatrend which includes the race for quantum supremacy of future quantum computers.

LOCATION LOCATION LOCATION

Discovery Hall

Room 212/213

Monday, Jan. 31st

5:30 pm

Masks required and Social Distancing practiced

QUANTUM

Sigma Xi welcomes anyone who would like to participate in a Science Cafe. If you need information about accessibility or need reasonable accommodations such as interpreters or Braille materials contact Kim Carlson (carlsonka1@unk.edu) or Evan Hill (hillem@unk.edu) as soon as possible so suitable arrangements can be made.

For further information, please contact one of the following:
Dr. Evan Hill, Department of Psychology
Dr. Allen A. Thomas, Department of Chemistry