

Plenary Talk PLV II Mon 14:00 HSZ/AUDI
Towards Intelligent Matter: Energy-Efficient In-Materio Computing — ●KARIN EVERSCHOR-SITTE — Faculty of Physics and Center for Nanointegration Duisburg-Essen, University of Duisburg-Essen, Duisburg, Germany

The rapid expansion of artificial intelligence has driven computational demands to unprecedented levels, making power consumption a central bottleneck for state-of-the-art hardware architectures. This presentation addresses how functional materials, including magnetic, ferroelectric, optical, and plasmonic systems, offer a path beyond this limitation

by leveraging their intrinsic physical properties to compute and process information directly within matter. Our research centers on magnetic materials, whose nonlinear, complex hysteretic responses make them particularly well-suited for low-energy, efficient unconventional computing paradigms like reservoir computing. Advances in harnessing magnetic and ferroelectric textures for in-materio computation will be presented. These developments outline how coordinated integration of material properties, algorithmic design, and device engineering can enable high-performance, energy-efficient computing technologies and ultimately pave the way toward intelligent matter.