

MAR16-2015-002074

Abstract for an Invited Paper
for the MAR16 Meeting of
the American Physical Society

Julius Edgar Lilienfeld Prize: Lilienfeld Prize Lecture: Emergent Behavior in Quantum Matter

DAVID PINES, Physics Dept., U C Davis and UIUC, Santa Fe Institute

We live in an *emergent universe* in which interactions between the basic building blocks of matter and their environment give rise to unpredicted and unexpected *emergent* behavior at every scale. As physicists we seek to identify the organizing principles responsible for that behavior, construct soluble models that incorporate these, and explain experiment. In this lecture, I illustrate this approach to understanding emergent behavior in quantum matter through three examples: collective modes in electron, helium, and nuclear liquids; the emergence of superconductivity in conventional and unconventional superconductors, nuclei, and neutron stars; and the emergence of heavy electrons in Kondo lattice materials.