Quantum entanglement at all distances: from quantum materials to black holes liquids

Entanglement is the strangest feature of quantum theory, often dubbed "spooky action at a distance". Quantum entanglement can occur on a macroscopic scale with trillions of electrons, leading to "strange metals" and novel superconductors which can conduct electricity without resistance even at relatively high temperatures. Remarkably, related entanglement structures arise across the horizon of a black hole, and give rise to Hawking’s quantum paradox. This lecture will be designed to introduce these forefront topics in current physics research to a general audience.