

Abstract Submitted
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Teaching Quantum Physics: What Is An Electron? ART HOBSON,
University of Arkansas — Quantum field theorists have understood for decades that electrons and other material “particles” are quanta of the electron-positron field and other fields, just as photons are quanta of the electromagnetic field, and that a field quantum is a discrete and irreducible portion (or “chunk,” or “bundle”) of a field, occupying an extended spatial region. But this understanding has not seeped through to most teachers and textbook writers at the introductory or undergraduate levels. Hence, there is still much discussion, and perplexity, about the supposed wave-particle paradox. But there is no paradox. Electrons are field quanta, extending spatially throughout the Δx of the uncertainty principle, not particles. I will present a simple experiment-based method of teaching these quantum fundamentals. The experiments are the double-slit experiment for light and for electrons using intense beams (demonstrating interference) and dim beams (demonstrating discrete interactions).

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