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# TCSUH Bi-Weekly Seminar

## Particle/Wave Duality, and Mott/Rutherford Scattering; In Search of Classical/Quantum Boundary



### Prof. Wei-Kan Chu

Cullen Professor of Physics, Department of Physics; Elected Fellow of the American Physical Society TcUH PI

**Friday, March 8, 2019**

Room 102, Houston Science Center

12:00 p.m. – 1:00 p.m.

**ABSTRACT:** The Boundary between classical and quantum mechanics is a fuzzy region which is not explored. The behavior of a two body collision such as Rutherford scattering is often broadly classified correctly as classical, mechanical, and elastic. In the context of this work, we associate classical mechanics with particle behavior characterized by momentum exchanges in collision. Quantum mechanical behavior is associated with wave interference phenomena. In practice, the de-Broglie wavelengths of electrons, and momentum of photons are frequently chosen to have their particle or wave duality properties manifest. With more massive particles such as atoms or ions, their energies must be adjusted to very low values (meV) in order to observe their wave properties. This leads to the conclusion that the behavior of high energy (MeV) massive particles can be completely described by classical mechanics. Here, we show experimentally that this is not true in the case of the scattering of a nucleus from another identical nucleus (Mott Scattering). This opens up a different route for studies of the transition regime between the quantum and classical mechanics, based on how closely 'identical' one could get two particles to be in order to manifest quantum interference. In this talk, I will describe our earlier experiments and our rational to probe the boundary region between classic mechanics and Quantum Mechanics. This can be performed on a same experimental platform, namely MeV ions scattered from carbon foil.

**BIO:** Wei Kan Chu, Cullen Professor of Physics at UH and an APS fellow, is one of the world's preeminent physicists in the field of particle-solid interactions. He is the leading author of the famous book, 'Backscattering Spectrometry', while being the editor of four other books, and has authored and co-authored over 400 journal publications. He holds 29 US patents. In 2018, Chu was honored as a Festschrift recipient at the '10th International Meeting on Recent Developments in the Study of Radiation Effect in Matter'. His primary research fields are ion-beam characterization and ion-beam modification of materials. He is also a renowned scientist in the areas of thin film studies of high temperature superconductors, superconductor-magnetic bearings and levitation flywheels. Currently, Wei-Kan Chu is the Principal Investigator of the Ion Beam Research Laboratory at Texas Center for Superconductivity at the University of Houston.

**RSVP** by Wednesday at Noon to [bdherndo@central.uh.edu](mailto:bdherndo@central.uh.edu) for Vietnamese sandwiches.

*Persons with disabilities who require special accommodations to attend this lecture should call (713) 743-8213.*

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