PHYSICAL MATHEMATICS SEMINAR

Identifying quantum features of the Kapitza-Dirac, Aharanov-Bohm, Stern-Gerlach, and double-slit physical systems

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ABSTRACT:

Attempts to realize macroscopic physical systems that exhibit quantum-like features are important not only for their educational value, but also for the question: "How quantum is it, really?" Is it possible to realize all phenomenological features at the macroscopic level? If so, then what is fundamental about quantum in the first place? If not, an understanding that most physicists adhere to, then which ones are truly quantum features. This underlines the title of this talk.

We first demonstrated the Kapitza-Dirac effect [1], first demonstrated the absence of force for the Aharonov-Bohm effect [2], found a mistake in the Pauli's argument against electron-Stern-Gerlach magnets [3], and demonstrated electron build-up from a nanoscale double-slit [4]. It is thus natural for the speaker to attempt to identify the detailed quantum features for these systems, and to ponder if macroscopic analogues, such as the bouncing oil droplet system, could exhibit any of these types of behavior.

[1] Observation of the Kapitza-Dirac effect. D. L. Freimund, K. Aflatooni, and H. Batelaan, Nature 413, 142-143 (2001)
[2] Macroscopic Test of the Aharonov-Bohm Effect. A. Caprez, B. Barwick, and H. Batelaan, Phys. Rev. Lett. 99, 210401 (2007)
[3] Stern-Gerlach effect for electron beams. H. Batelaan, T. J. Gay, and J. J. Schwendiman, Phys. Rev. Lett. 79, 4517 (1997)
[4] Controlled double-slit electron diffraction. R. Bach, D. Pope, S. H. Liou, H. Batelaan, New.J.Phys. 15 033018 (2013)

TUESDAY, MARCH 7, 2017
2:30 PM
Building 2, Room 147

Reception following in Building 2, Room 290
(Math Dept. Common Room)

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