MATTER AS WAVES

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Supplementary Material for
PHY 3305 (Modern Physics)
Harris, Ch. 3.6, 4.1-4.2
TABLE OF CONTENTS

- Review
- Relevant Dimensions
  - Boat on the water
  - Single-slit diffraction of light
- Double-slit experiment
- Sodium: discrete electron energies
Discuss properties of waves and particles

Tried to apply the wave hypothesis of light to
- blackbody problem
- photoelectric effect

Treating light as a particle helped explain these phenomena

Correspondence Principle

So which is it?
- Is light a particle or a wave?
When $\lambda > D$, a wave is detected.

When $\lambda \ll D$, a particle is detected.

$\lambda \ll D$: particle
$\lambda \geq D$: wave
SINGLE-SLIT DIFFRACTION
DOUBLE-SLIT DIFFRACTION (WATER)
DOUBLE-SLIT DIFFRACTION (LASER)

Pattern produced from a single slit.

Pattern produced from a double slit.
DOUBLE-SLIT EXPERIMENT

http://phet.colorado.edu/simulations/sims.php?sim=Quantum_Wave_Interference

http://phet.colorado.edu/sims/quantum-wave-interference/quantum-wave-interference_en.jnlp
SODIUM LAMP LIGHT: DISCRETE ENERGIES

ENERGY
LOUIS DE BROGLIE
NEXT TIME

- Matter waves: what is oscillating?
- Describing quantum behavior - the Schrödinger Wave Equation
- I will send around the reading in e-mail