### **The Einstein-Bohr debate**





Einstein objected to quantum randomness "God does not play dice" Attacked either Heisenberg uncertainty, or complementarity

## The Einstein-Bohr debate

### Einstein would challenge Bohr at conferences

Front: Bohr, Heisenberg, Pauli, Stern, Meitner, Ladenburg For example...

## Gedanken experiment (to disprove complementarity)

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•Detect which slit the electron

went through with light beam

•If interference pattern appears,

•Complementarity says it must

then we have both wave and

(particle behaviour)

particle behaviour

be either

Electron beam

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## **Bohr would take a walk**

#### E. Fermi, N. Bohr

# **Bohr's reply**

#### Electron beam



•No interference •The light that detected the electron would change its momentum •To have interference, electrons must be monochromatic  $\cdot \lambda = h/p$ •Complementarity is intact

## **Quantum mechanics**

#### Bohr always prevailed

(God apparently does play dice)

Three "types" of physics

- Newtonian/classical big stuff
- Relativity speeds close to c
- Quantum mechanics physics of the atom
  - Correspondence principle