MATTER IN MOTION

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(3/2/2010)
Supplementary Material for
PHY 3305 (Modern Physics)
Harris, Ch. 5.8, 6.1-6.3

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- Review of last class
- Barriers
  - Scanning Tunneling Electron Microscope
  - Alpha (Nuclear) Decay
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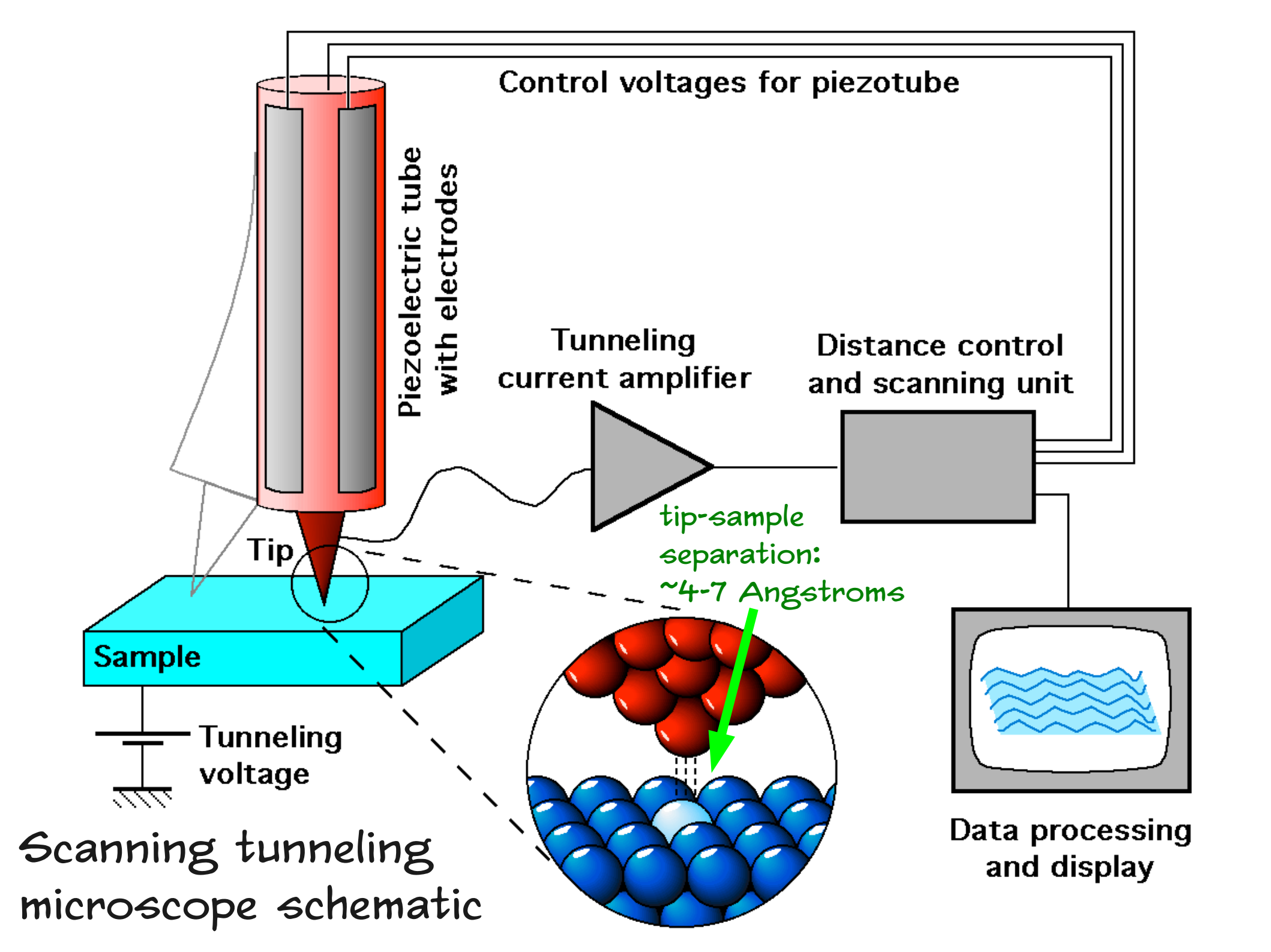
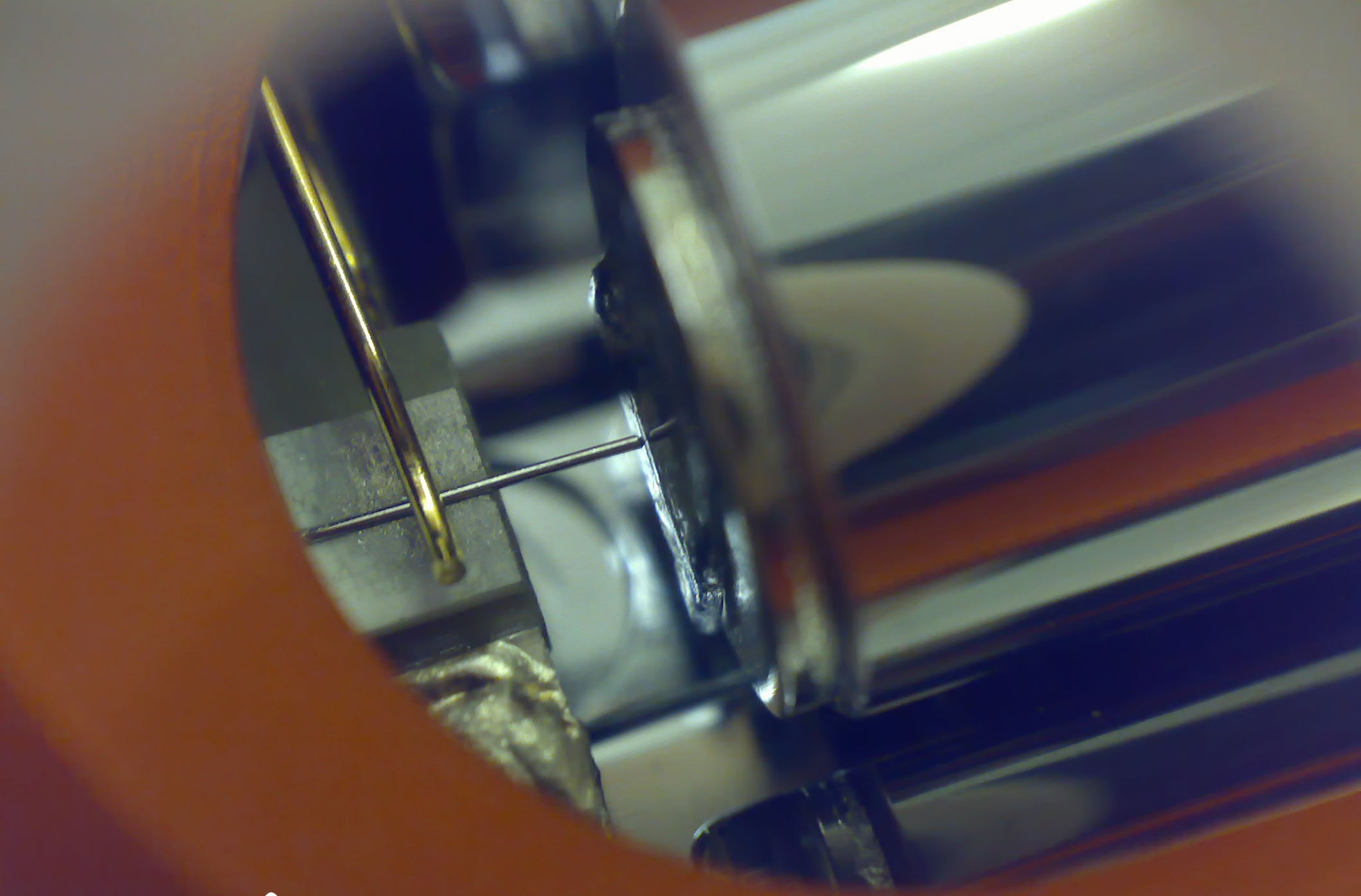
  - The Josephson Junction (SQUIDS)

REVIEW

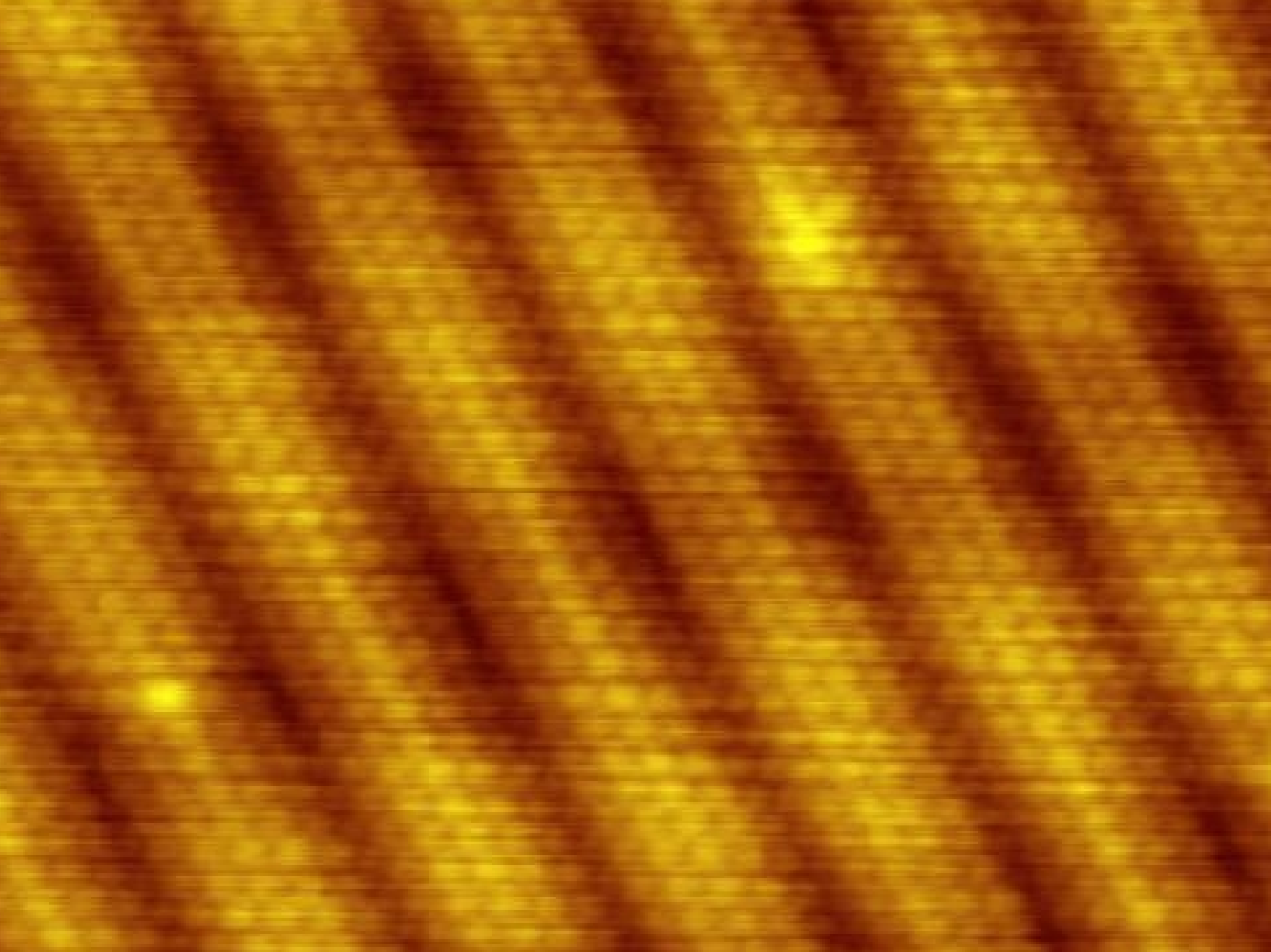
- We attacked more realistic problems
  - the finite square well
  - the harmonic oscillator
- We learned that particles in bound states can have non-zero lowest-allowed energies
  - zero temperature does NOT mean zero energy
  - heat capacities cannot be fully explained by classical theories involving continuous energies



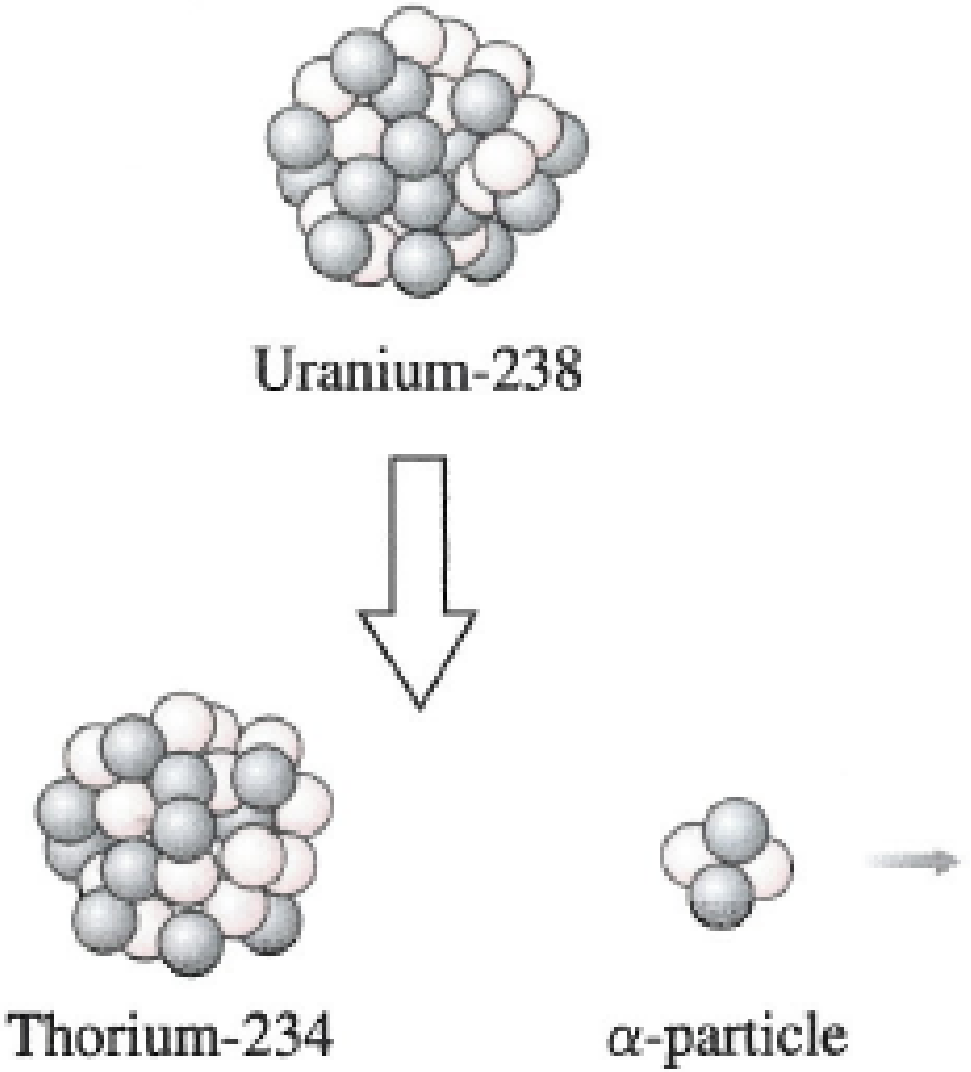
Scanning tunneling microscope schematic



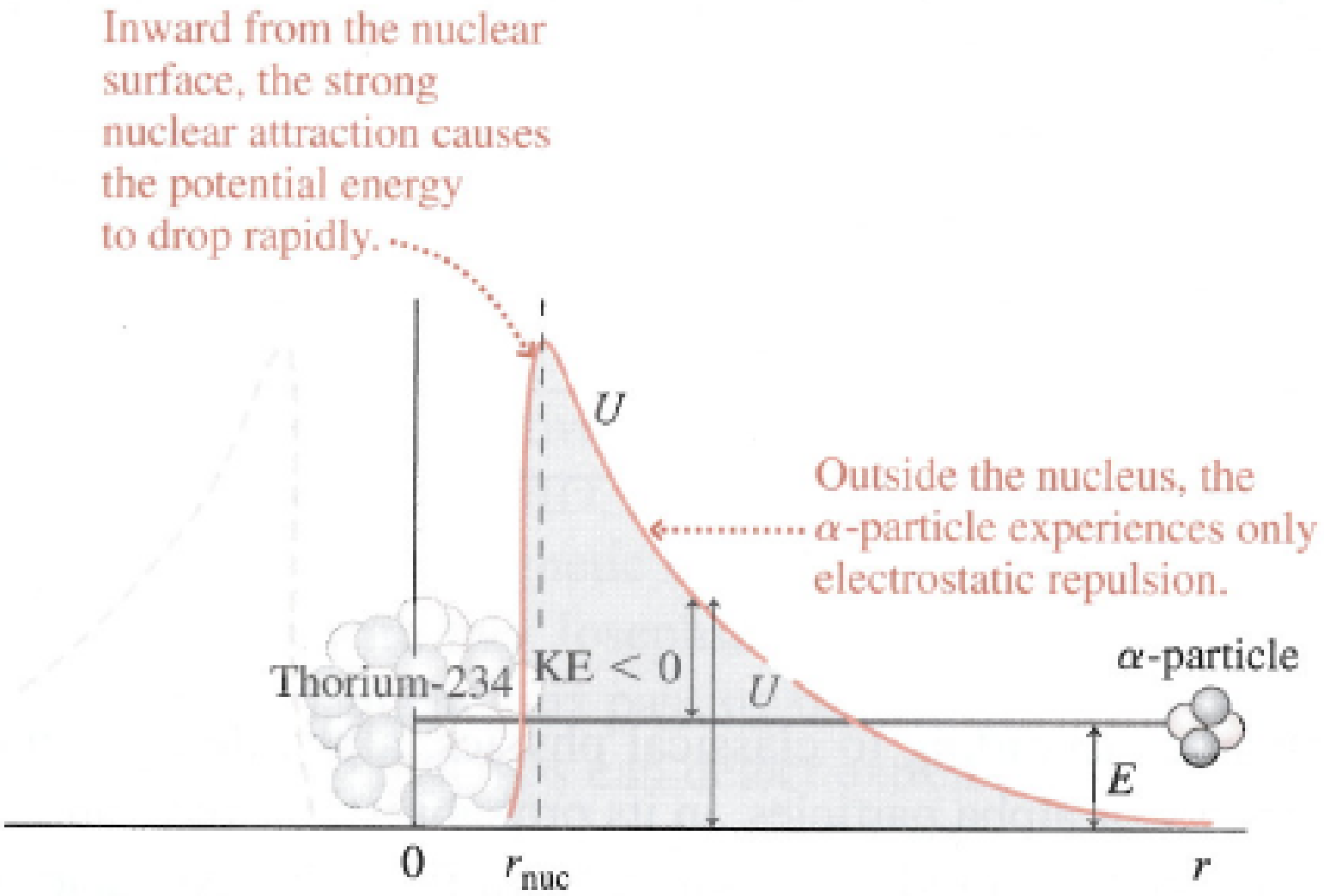
Close-up of a simple scanning-tunneling microscope head using a platinum-iridium stylus

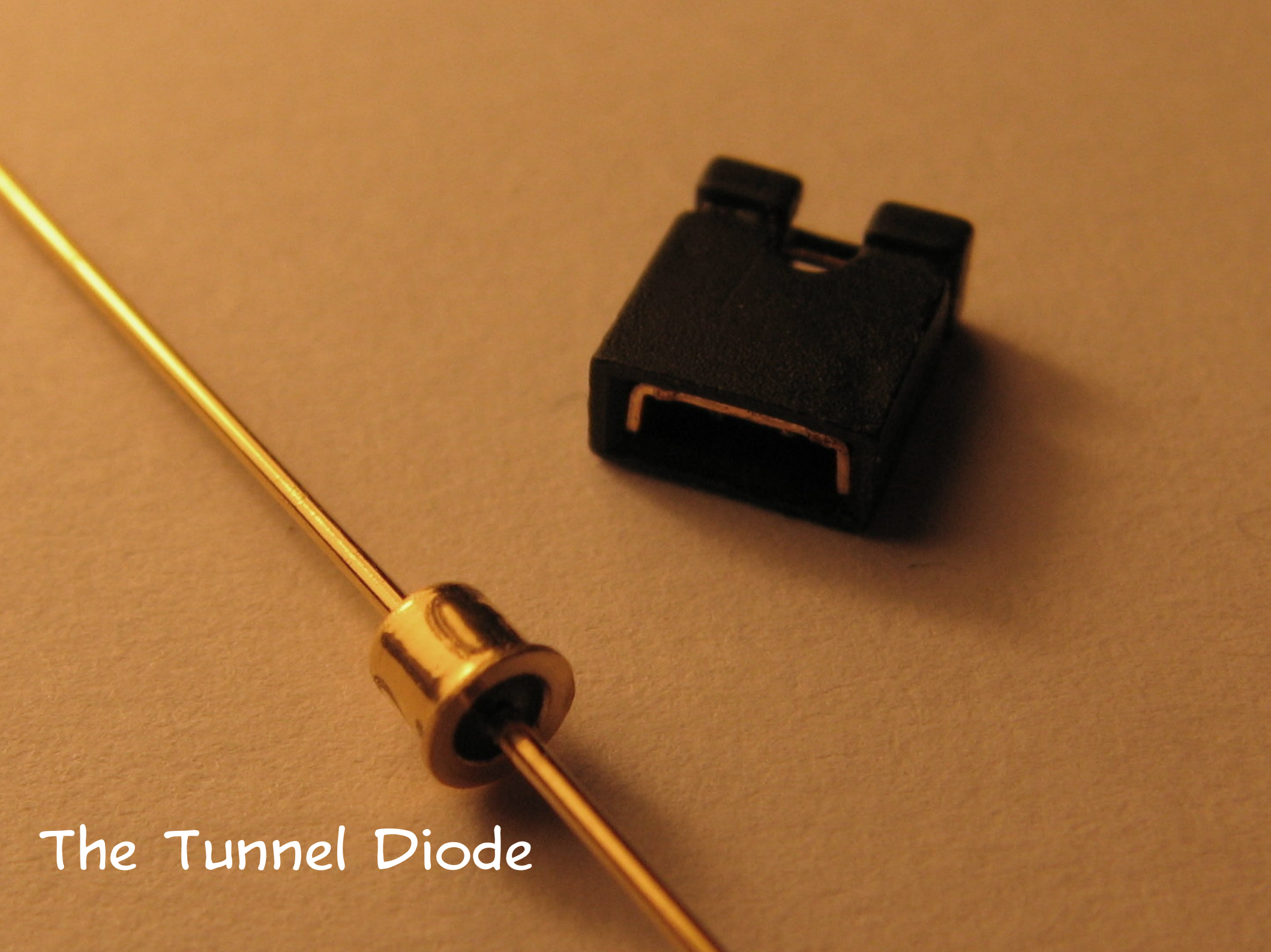


ALPHA DECAY



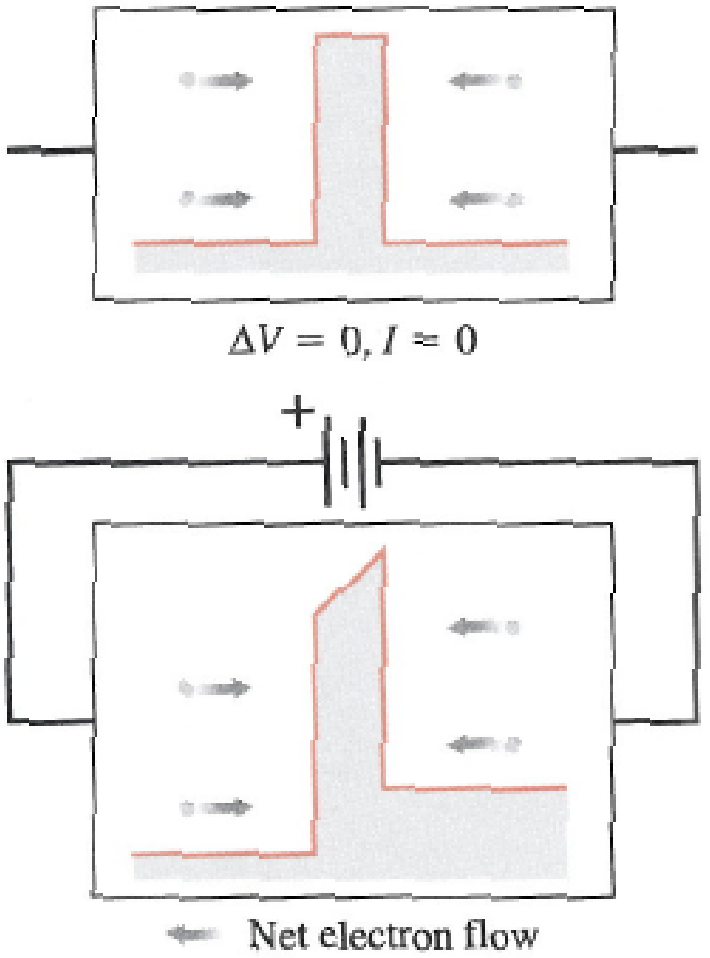
NUCLEAR POTENTIAL



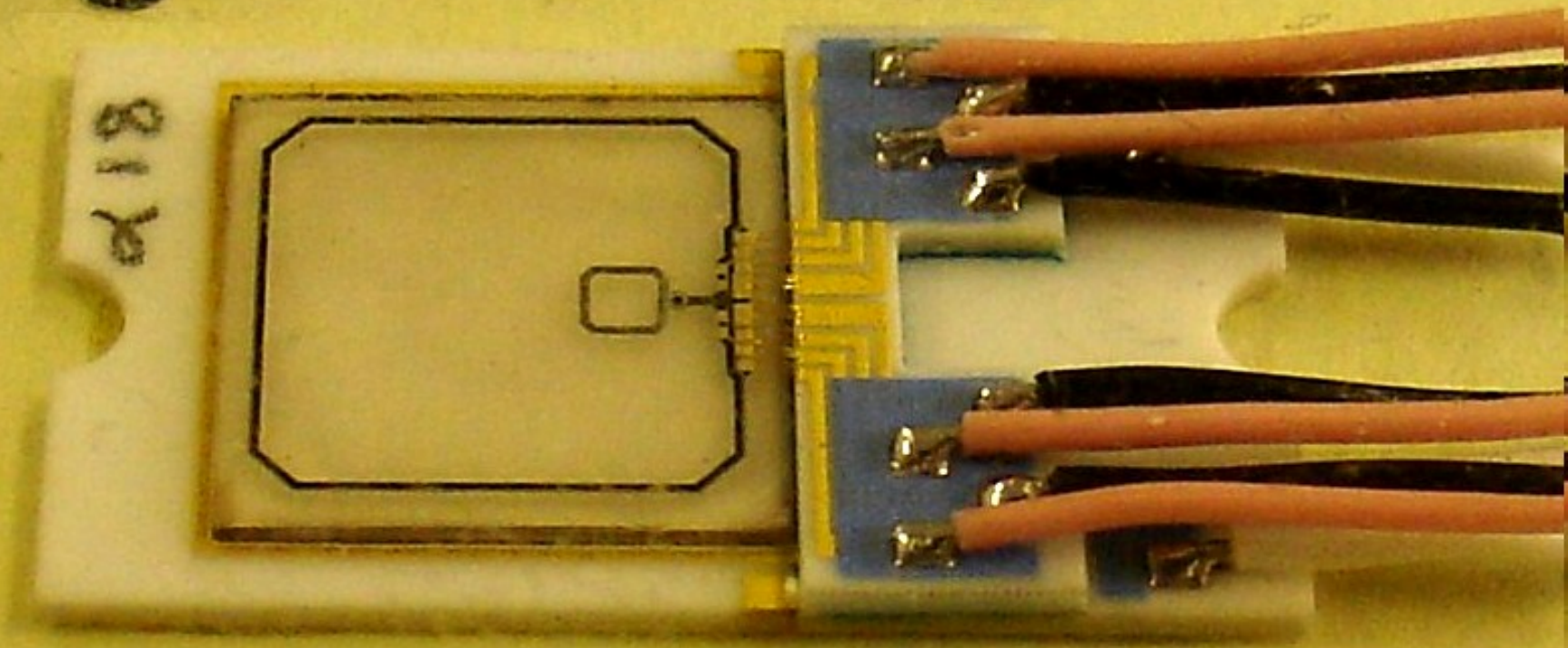

The Tunnel Diode

TUNNEL DIODE

Figure 6.13 Tunnel diode.



H.T.S. SQUID Magnetometer



High Temperature Superconductivity

ROADMAP

- One-particle Questions
  - high speed or very small (but not both)
  - we've been doing this
- Statistical Mechanics
  - or, "what happens when a bunch of particles do stuff"
- Solid-state physics
  - quantum mechanics and the structure of atomic matter
- Nuclear physics
  - quantum mechanics and the structure of the atomic nucleus
- Particle physics
  - quantum mechanics, relativity, and the fundamental structure of the universe

NEXT TIME

- The discovery of spin
- A very special Spring Break edition of "the homework"
- The presentation!
  - guidelines and target dates
- Remember: homework set #5 due!
- Reading: Harris Ch. 8.1-8.4