SUPERCONDUCTIVITY

► **PHENOMENON FOUND IN SOME MATERIALS:**
- **No resistance to flow of electric current**
- **Requires extremely low temperatures**

► **THE HISTORY:**
- **1911, ONNES (Holland), Hg at 4.2K (liquid He)--Nobel Prize 1913**
- **1933, MEISSNER EFFECT explained: diamagnetism**
- **1957, BCS Theory: Cooper pairs of electrons--Nobel Prize 1972**
- **1986, IBM (Switzerland), $LaBaCuO_x$ at 35K--Nobel Prize 1987**
- **1987, CHU (Univ of Houston), $YBa_2Cu_3O_x$ at 92K (use liquid N_2)**
- **Today, research has achieved 150K (-190F) superconductivity**

► **THE PHYSICS OF TODAY'S DEMO -- MEISSNER EFFECT:**

Electrons pair up (Cooper pairs) if below critical current and critical temperature:

PLACE Nd MAGNET NEAR SUPERCONDUCTOR

INDUCES CURRENT FLOW IN SUPERCONDUCTOR (Faraday)

CREATES MAGNETIC FIELD (Oersted)

OPPOSES THE APPLIED (Nd) MAGNETIC FIELD (diamagnetism)