Estimates, Analogies, Storytelling and Handwaving for Physicists

Prof. Raymond Chiao demonstrates the Berry phase. Berkeley, circa 1999

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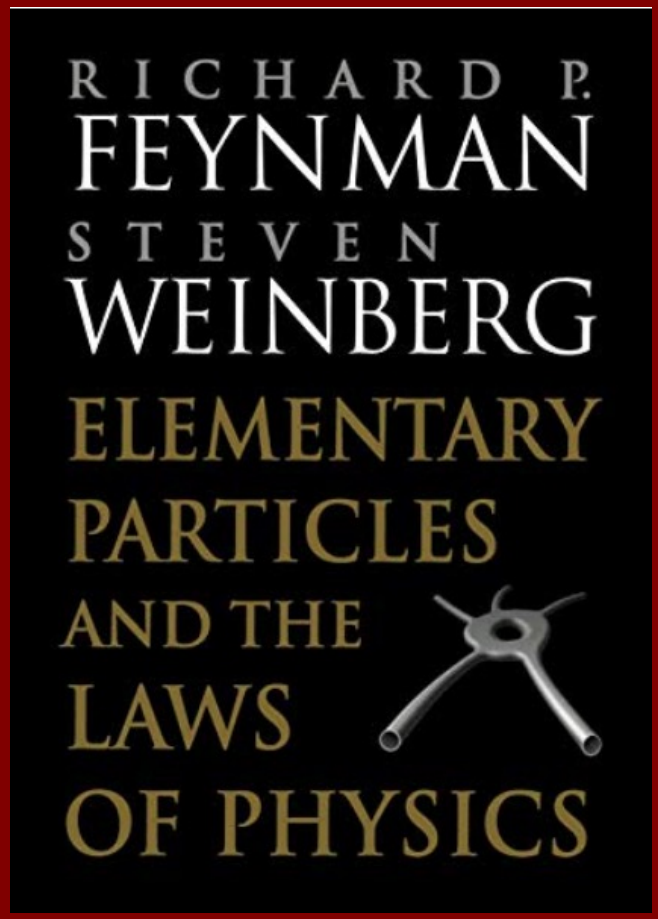
Handwaving

- Berry's Phase
- 2π *vs.* 2π rotations (with a cup)



Estimates

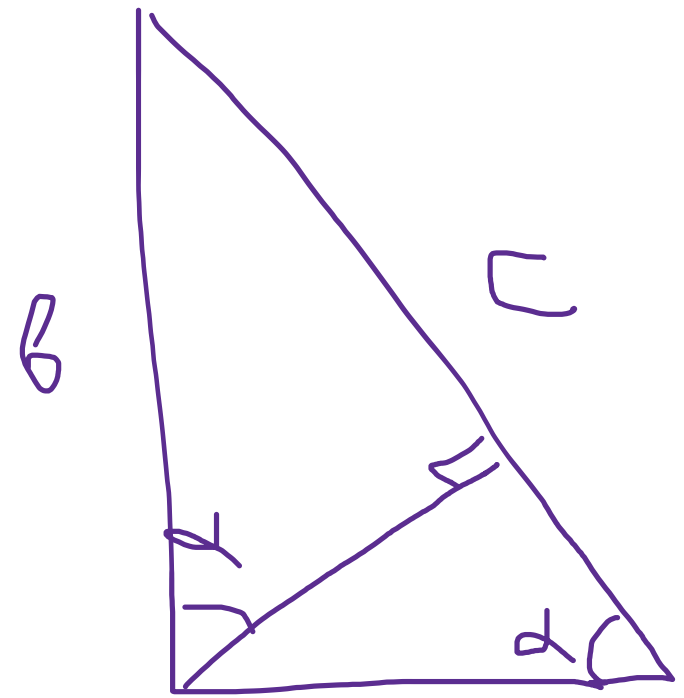
- Pythagoras' Theorem
- Electric polarizability of the neutron

$$c^2 = a^2 + b^2$$

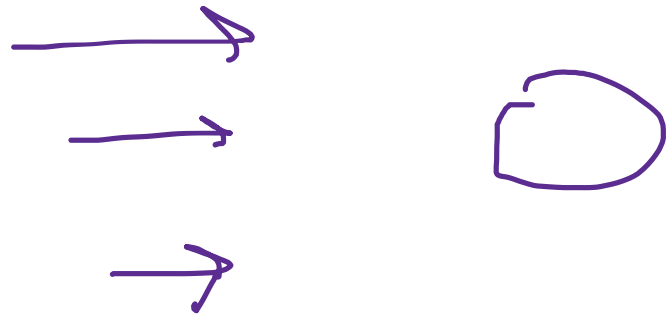
$$A = c^2 f(\alpha)$$

big

$$c^2 f(\alpha) = b^2 f(\alpha) + a^2 f(\alpha)$$



Atom



$$d_{ind} = \alpha \vec{E}$$

$$\alpha = e a_0 \cdot \frac{e a_0}{e^2/a_0} = a_0^3$$

Neutron

$$e r_0 \cdot \frac{e r_0}{\Delta E} = \frac{p^2}{m} \cdot r_0^3 = \frac{1}{137} r_0^3$$

Analogies

- Zel'dovich Pendulum
  - Eigenmodes and superpositions
  - Adiabatic vs. nonadiabatic processes
  - Waveplates
  - Foucault pendulum
  - Parametric resonance, harmonic gen.
  - …

B. Ya. Zel'dovich demonstrates bifrequency pendulum.
Berkeley, circa 1999

Storytelling

- Avoiding fiasco…