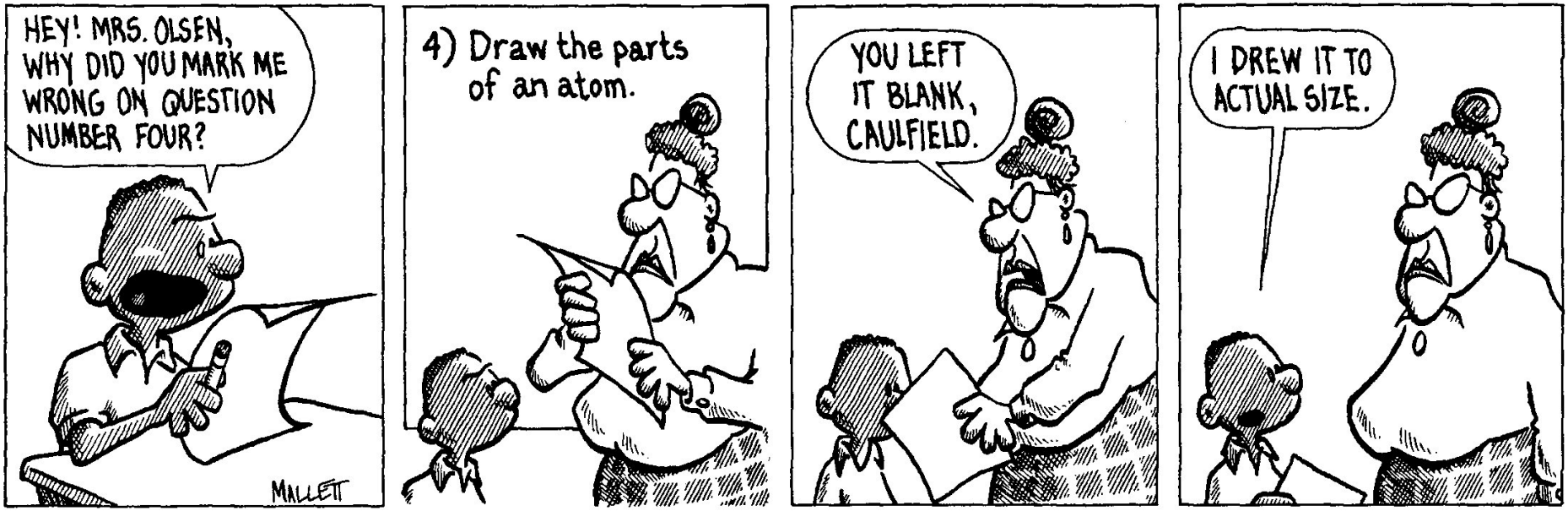
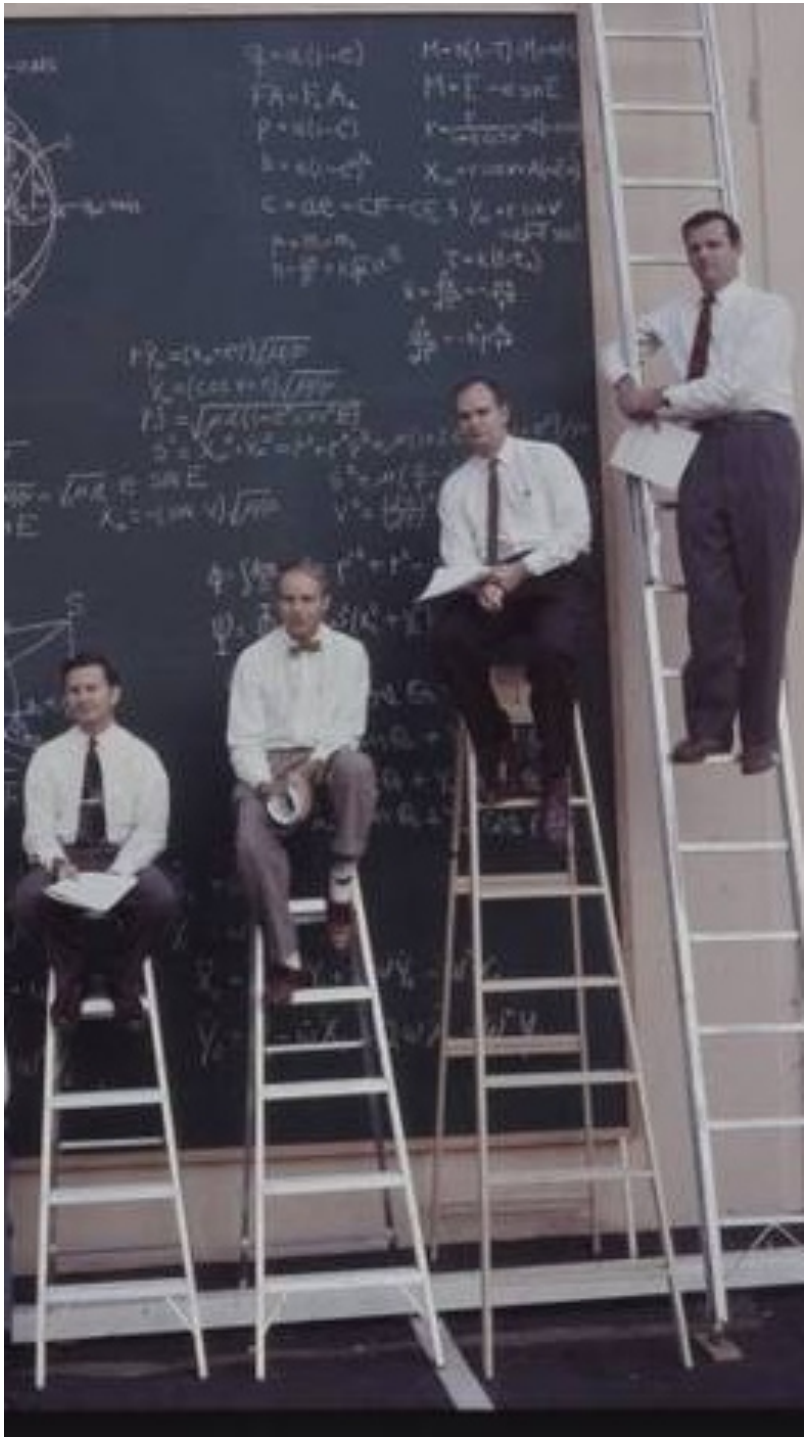
- **Theme Music: Blondie**

  Atomic

- **Cartoon: Jef Mallett**

  Frazz





The Equation of the Day

Force from potential energy

$$F = -\frac{dU}{dx}$$

$$\vec{F} = -\vec{\nabla} U$$

Foothold ideas:
Energies between charge clusters

- Atoms and molecules are made up of charges.
- The potential energy between two charges is

$$U_{12}^{elec} = \frac{k_C Q_1 Q_2}{r_{12}}$$

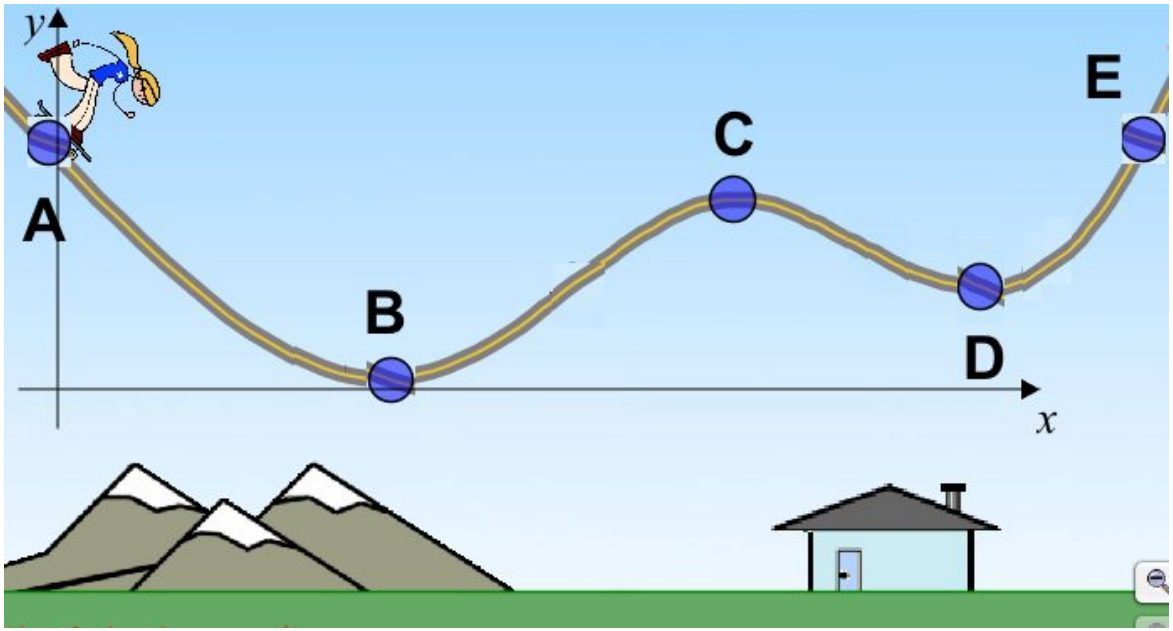
No vectors!

- The potential energy between many charges is

$$U_{12\ldots N}^{elec} = \sum_{i<j=1}^{N} \frac{k_C Q_i Q_j}{r_{ij}}$$

Just add up all pairs!

If we have a complicated potential energy – and a mass at rest in it – can we tell where it will go when released?



How do you know?

What are the conditions under which this works?