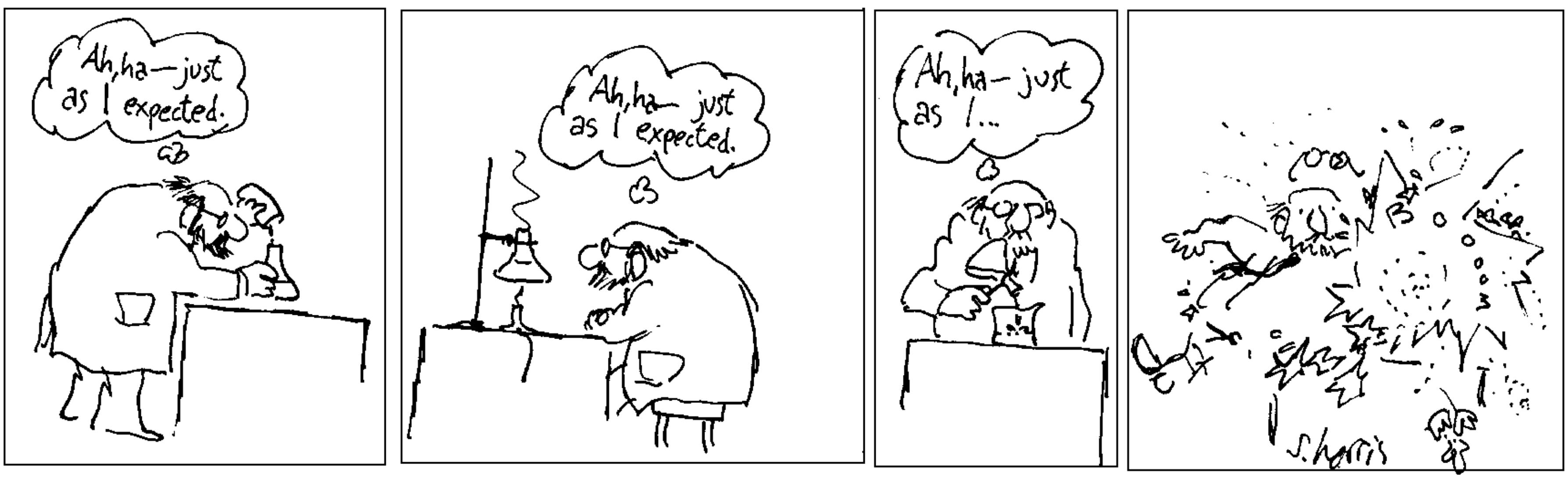
- **Theme Music:** **Simon & Garfunkel**

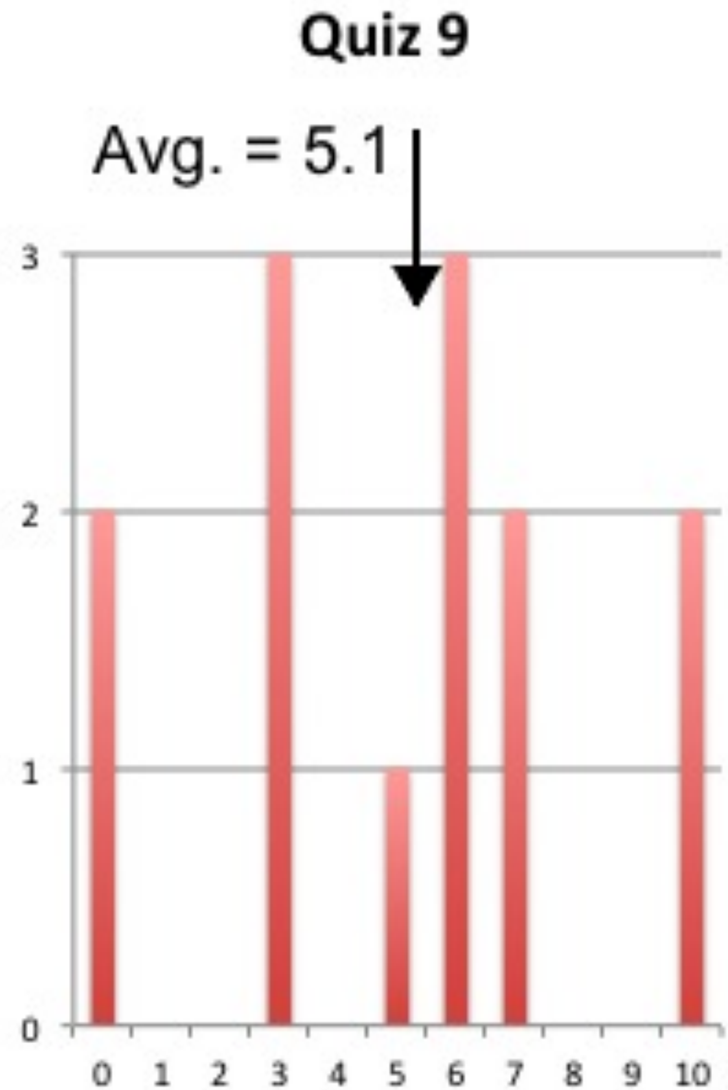
  Homeward Bound

- **Cartoon:** **S. Harris**



Quiz 9

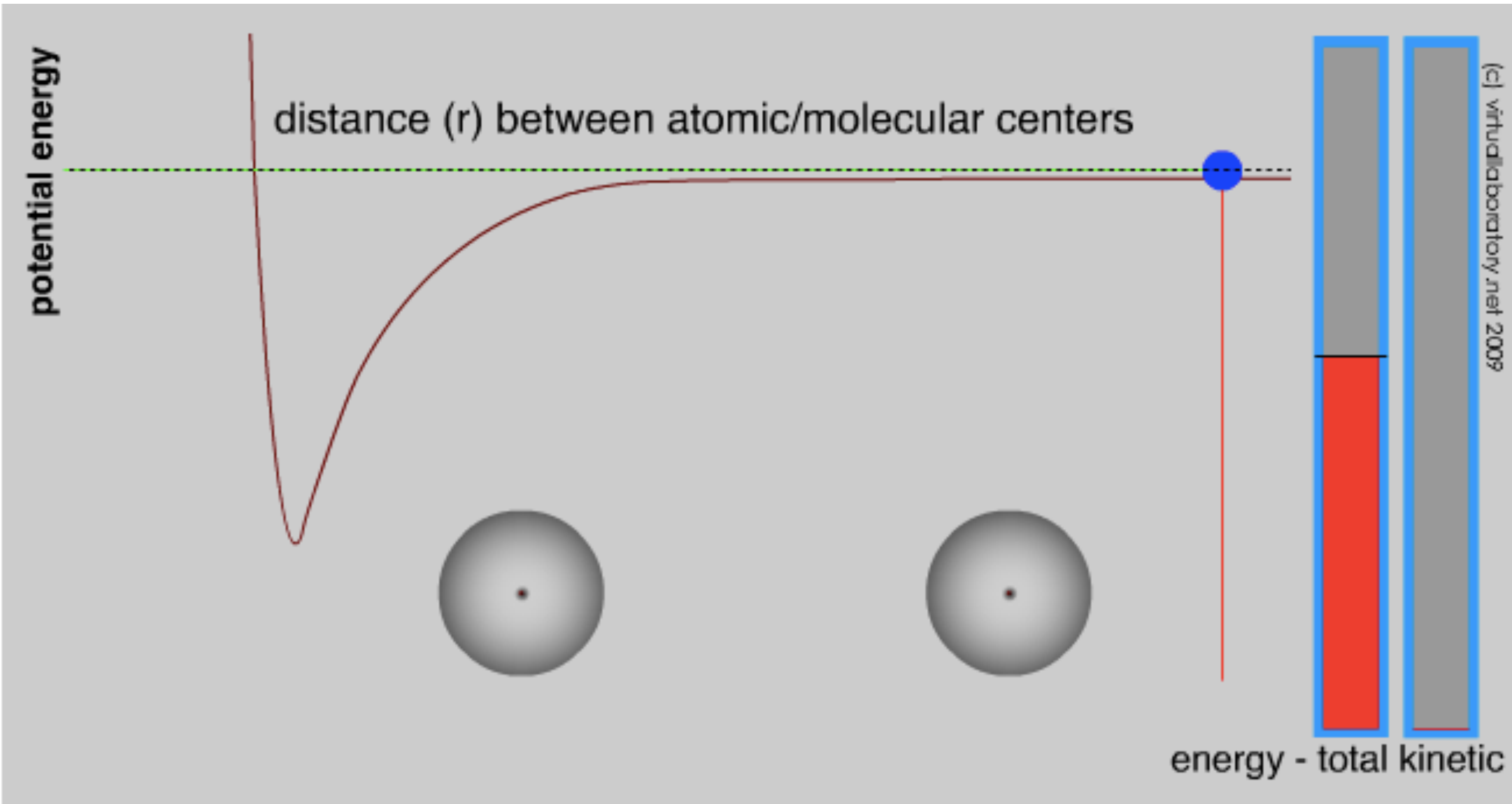
	9.1	9.2	9.3
A	**31%**	**77%**	**38%**
B	8%	15%	**23%**
C	**31%**	0%	8%
D	**31%**	8%	8%
E	**38%**		
A	0%	0%	23%



Moving to molecules

- Apply our Newtonian framework and results to atoms and molecules.
- See what goes over directly, what we have to add.
- Can we integrate what we know about atoms and molecules from chemistry with the physics we have learned?

Molecular forces



http://besocratic.colorado.edu/CLUE-Chemistry/activities/LondonDispersionForce/1.2-interactions-0.html

Foothold ideas: Bound states

- When two objects attract, they may form a *bound state* – that is, they may stick together.
- If you have to do positive work to pull them apart in order to get to a separated state with KE = 0, then the original state was in a state with negative energy.

Foothold ideas: Forces from PE

- For conservative forces, PE can be defined by

$$\vec{F} \cdot \Delta\vec{r} = -\Delta U$$

- If you know *U*, the force can be gotten from it via

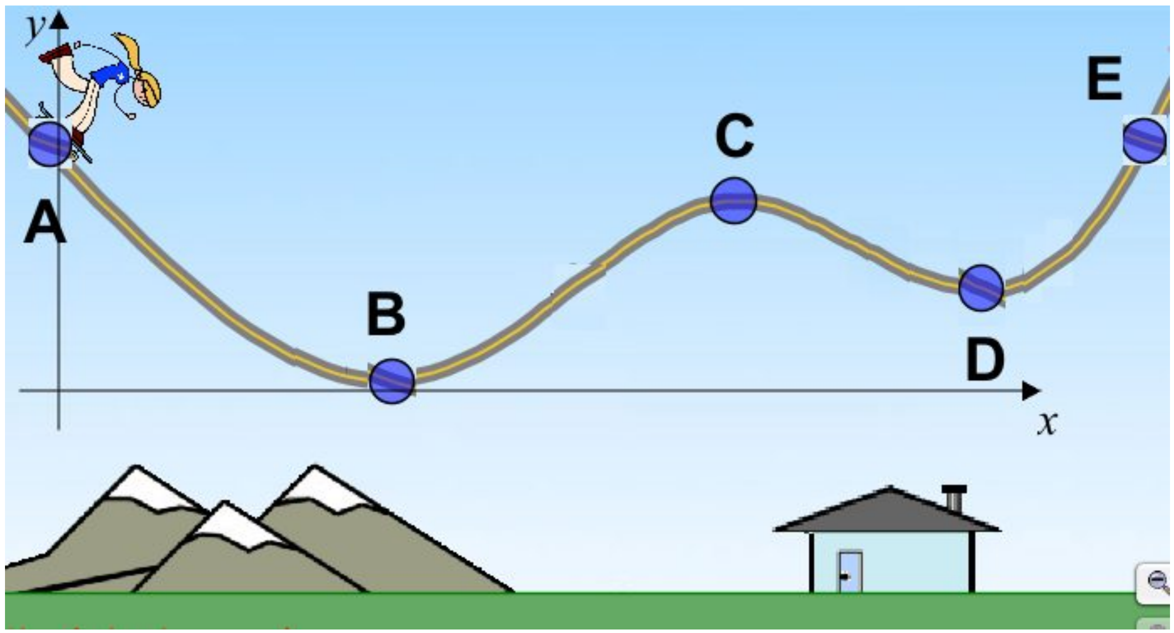
$$F_{\parallel}^{type} = -\frac{\Delta U_{type}}{\Delta r} = -\frac{dU_{type}}{dr}$$

- In more than 1D need to use the *gradient*

$$\vec{F}^{type} = -\vec{\nabla} U_{type}$$

- The force always points <u>down</u> the PE hill.

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?