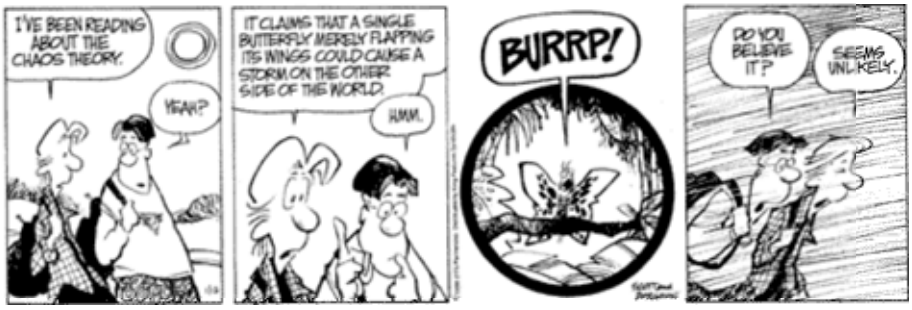
September 24, 2012 Physics 131 Prof. E. F. Redish

■Theme Music: Fleetwood Mac

Silver Springs

■Cartoon: Scott & Borgman

Zits



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Newton's Laws: Version 1.0

- Newton 0:
  - An object responds to the forces it feels when it feels them.
- Newton 1:
  - An object that feels a net force of 0 keeps moving with the same velocity (which may = 0).
- Newton 2:
  - An object that is acted upon by other objects changes its velocity according to the rule $\vec{a}_A = \vec{F}_A^{net} / m_A$
- Newton 3:
  - When two objects interact the forces they exert on each other are equal and opposite. $\vec{F}_{A\to B}^{type} = -\vec{F}_{B\to A}^{type}$

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Kinds of pForces

- pForces are what objects do to each other when they touch.
- If a pForce is a
  - Normal pForce N
  - Tension pForce T
  - Friction pForces f, F^D, F^V
  - Weight pForce W
  - Electric pForce F^E
  - Magnetic pForce F^M
- Notation convention.

$$\vec{F}^{\text{type of force}}_{\text{(object causing force)}\rightarrow\text{(object feeling force)}}$$

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The Newtonian Framework helps us learn to see "hidden" pForces

- Contact forces are often hard to measure directly.
- We infer them from the Newtonian principles.
- Consistency is a good test as to whether our model of invisible forces is good (and sometimes we can actually measure them)

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Tension: The Spring

- Recall what we have learned about a spring.
- A spring changes its length in response to pulls (or pushes) from opposite directions.

$$T = k\,\Delta l$$

Normal Force works like a very stiff spring