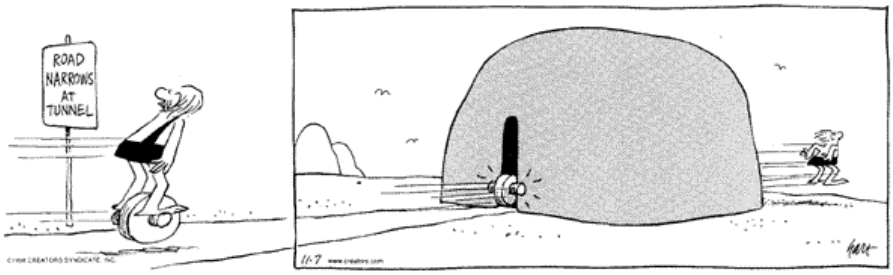
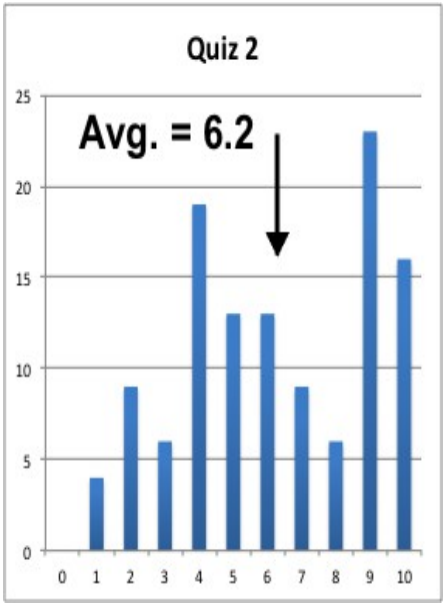
September 19, 2013 Physics 131 Prof. E. F. Redish

- **Theme Music: Run Like an Antelope**
  Phish
- **Cartoon: Johnny Hart**
  BC



Quiz 2

	1.1	*1.2*		*2.1*	*2.2*
Chose A	58%	92%	**A**	6%	11%
Chose B	6%	0%	**B**	21%	18%
Chose C	73%	9%	**C**	15%	58%
Chose D	11%	13%	**D**	46%	5%
Chose N	3%	3%	**E**	11%	8%



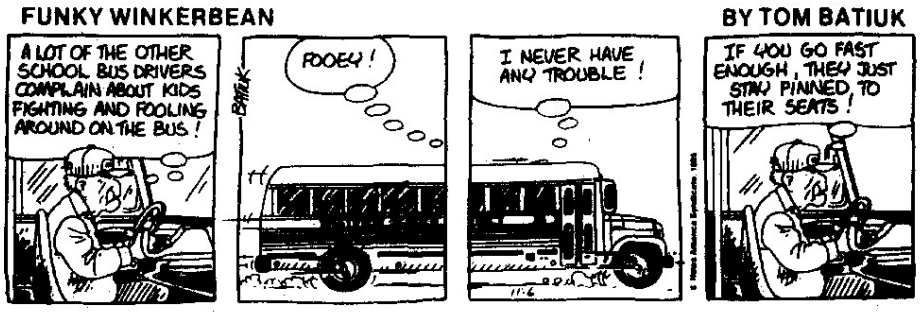
One more icon: Shopping for Ideas

- What we need to do here is consider some different possibilities and evaluate them to see how well they work for us.

What Causes Motion? Drawing experience

- What do the following motions feel like?
  - No motion (at rest).
  - Constant velocity.
  - Constant acceleration.
  - Changing acceleration (jerk)

What's wrong with this?



What causes motion?

- Do you need an outside influence to cause motion or to maintain it?

Systems

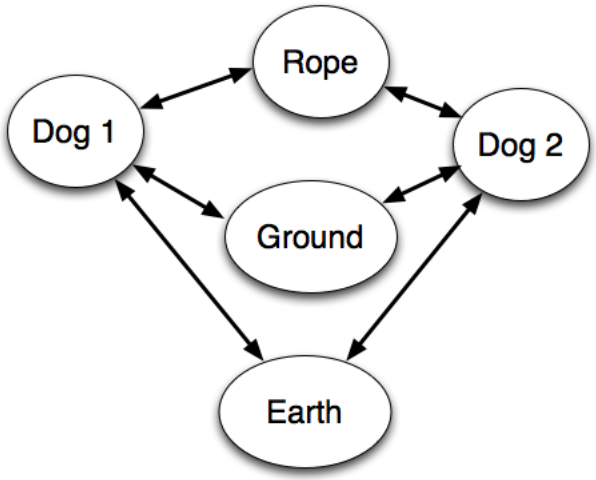
- We will be considering situations in which many things acting on each other.
- In order to make sense of what's going on, we will focus on a few at a time and create models of what we think is happening.
- Sometimes we will focus on a set of things as our "system" and consider the influence of everything else as "external".
- Some times we will consider something's internal structure; other times we will consider it as a "black box".

System schemas

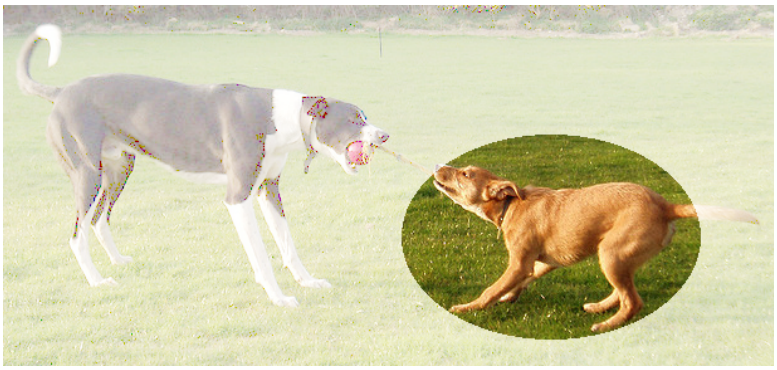
What "things" should be considered when thinking about what influences the motion – or non-motion – of the dogs?

How do they act on each other?

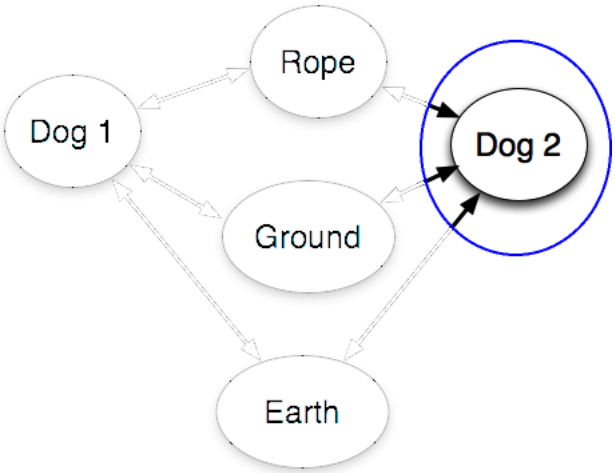
The System Schema for the two-dog tug-of-war



What if we only want to consider the motion of dog 2?



The System Schema for the dog2 in the tug-of-war



What if we want to consider the motion of both dogs?

A plan for moving forward

- Specify "objects" – things we want to pay attention to and that we will "black box" by ignoring (for now) their structure.
- Identify "interactions" – other objects that have effects on the things we are paying attention to that tend to cause or inhibit their motions.
- Classify these interaction ("forces") and study their properties.

Conceptual ideas underlying Newton's Laws

- Objects respond only to influences acting upon them at the instant that those influences act. (Object egotism)
- All outside effects on an object being equal, the object maintains its velocity (including direction). The velocity could be zero, which would mean the object is at rest. (Inertia)
- Every change in velocity an object experiences is caused by the object interacting with some other object – **forces**. (Interactions)
- If there are a lot of different objects that are interacting with the object we are considering, the overall result is the same as if we add up all the forces as vectors and produce a single effective force -- the **net force**. (Superposition)
- When one object exerts a force on another, that force is shared over all parts of the structure of the object. (Mass)
- Whenever two objects interact, they exert forces on each other. (Reciprocity)