September 1, 2010 Physics 121 Prof. E. F. Redish

- **Theme Music:** **Miles Davis**
  It Never Entered My Mind
- **Cartoon:** **Brooke McEldowney**
  9 Chickweed Lane

9/1/10 1

Remember!

- To go to a discussion this week to do the physics pre-test.
- To go online to do the attitude survey. *http://perg-surveys.physics.umd.edu/MPEX2pre.php*
- To purchase MP and do the first assignment.
- To purchase and register your clicker. (24 of you still have not done so.)

9/1/10 2

In order to learn how to learn, we need to know something about how we think.

9/1/10 3

First icon: Refining and reconciling intuition

- Your physical intuition is often good – you have, after all, had a lot of experience living in the physical world.
- But often we use "one-step reasoning" and miss details that would cause us to reinterpret what we see.
- A major goal of this class is to help you refine your physical intution and reconcile it with the physics we learn.

9/1/10 4

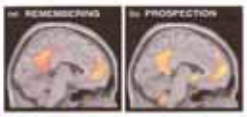
A model of memory: Predicting the Past

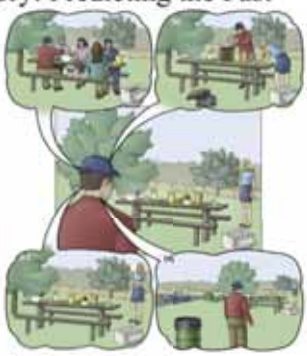
(a) Recalling past events

(b) Imagining future events

(c) Seeing things from someone else's perspective

(d) Navigation



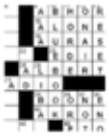


From Buckner & Carroll Trends in Cog. Sci. 11:2 (2006)

9/1/10 11

Second icon: Coherence – Your safety net

- Throughout the class we will be looking to see physical situations in a variety of different ways.
- The consistency among the different views protects us against errors of reconstructed memory.



9/1/10 13

Small barriers

- In this class there can be lots of small barriers that we need to take down.
- Sometimes it's because you're not sure what you're supposed to pay attention to!
- Sometimes previous experience leads to confusion or uncertainties that are hard to remove.
- Most are not a big deal – they can be made sense of and cleared up in a couple of hours of work, thinking, and practice.
- The presence of a lot of these barriers can cause a lot of trouble. Clean up as many as you can!

Don't be afraid to come in and say, "I'm confused about fractions" – or anything else!

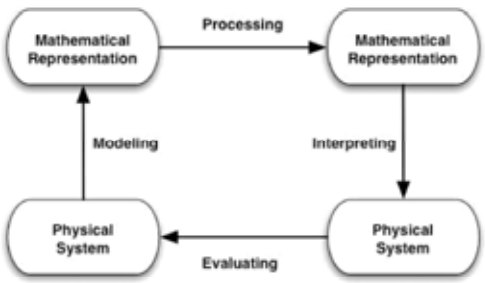
9/1/10 18

We're going to use math

- Math is the study of abstract relationships (mostly quantitative – not all!)
- With math, you don't have to know what you're talking about to make sense.
  - We can interpret $y = 2x$ without knowing what kind of thing x or y is.
- In using math in science we try to choose math that fits the basic character of the phenomenon we are trying to describe.
  - We then inherit from the math tools to solve problems we can't do in our heads.
  - The math is often remarkably good, but it is never a perfect fit! (However…)

19

A model of math in science



20

Quantifying your personal experience: Estimation problems

- The trick is to figure out the numbers you need using what you really know (NOT guessing or just remembering).
- Create a set of useful measures!

See hints to doing estimations on our ELMS site!

9/1/10 21

My personal scales

	inches	centimeters
First digit of thumb		
Open handspan		
Forearm (cubit)		
Full height		

9/5/08 22

Estimation: Some numbers I will expect you to know

- Numbers
  - number of UG students at UMd ~ 25,000 2.5×10^4
  - number of people in MD ~ 4-5 million 4.5×10^6
  - number of people in USA ~ 300 million 3.0×10^8
  - number of people in world ~ 5-6 billion 5×10^9
- Distances
  - distance across DC ~10 miles
  - distance across USA ~3000 miles
  - distance around the world ~24,000 miles
  - radius of the earth $= 2/\pi \times 10^7$ m

24