

## ■ Theme Music: Miles Davis

*It Never Entered My Mind*

## ■ Cartoon: Brooke McEldowney

*9 Chickweed Lane*



# Remember!

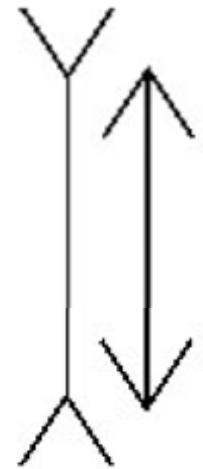
- To go to a discussion this week to do the physics pre-test.
- To go online to do the attitude survey.  
<http://perg-surveys.physics.umd.edu/MPEX2pre.php>
- To purchase MP and do the first assignment.
- To purchase and register your clicker.  
(24 of you still have not done so.)

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

# First icon:

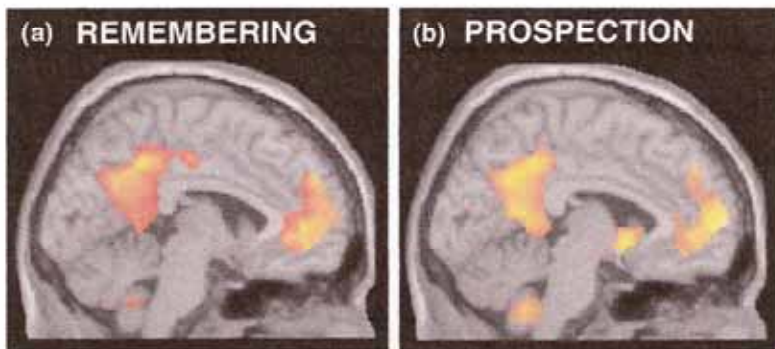
## Refining and reconciling intuition

- 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 intuition and reconcile it with the physics we learn.

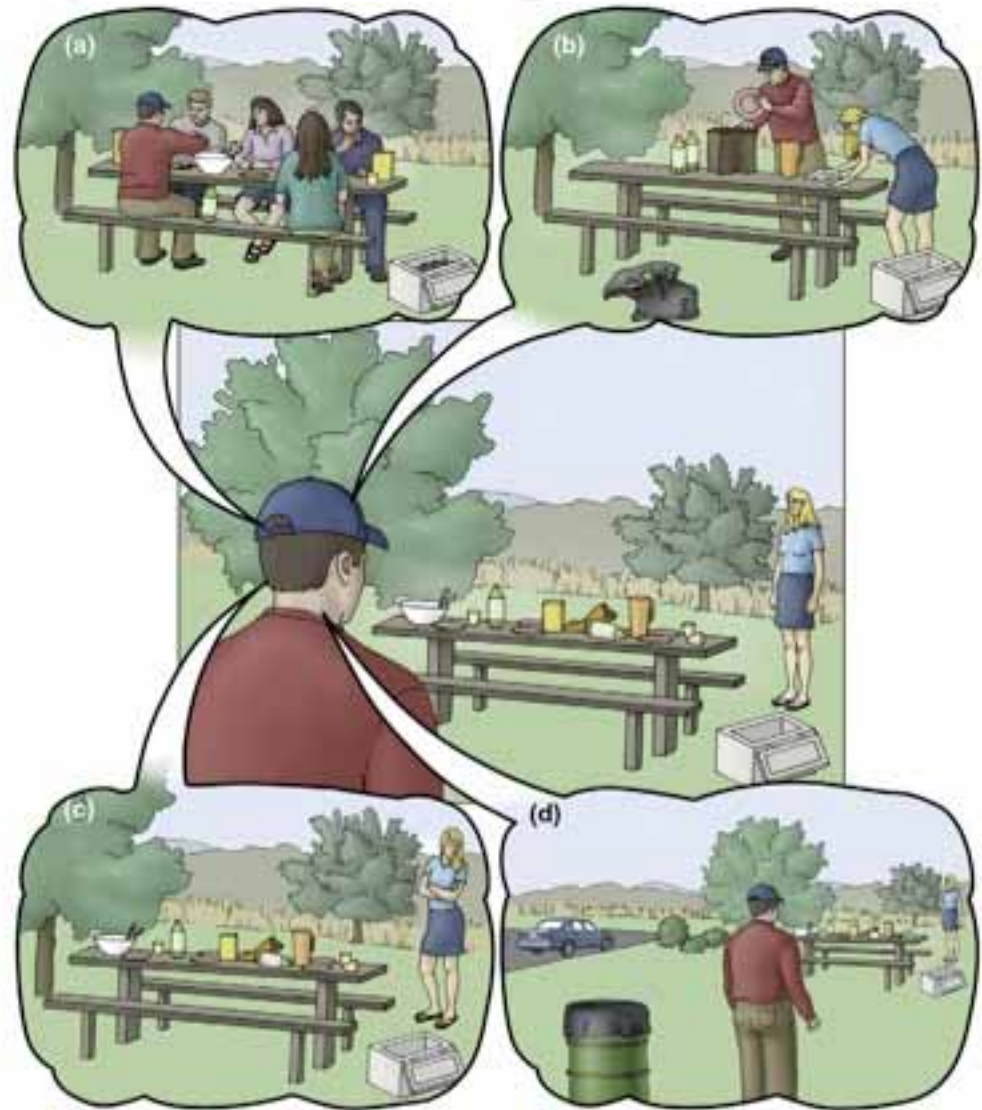


# A model of memory: Predicting the Past

- (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)



## 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.



# 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!

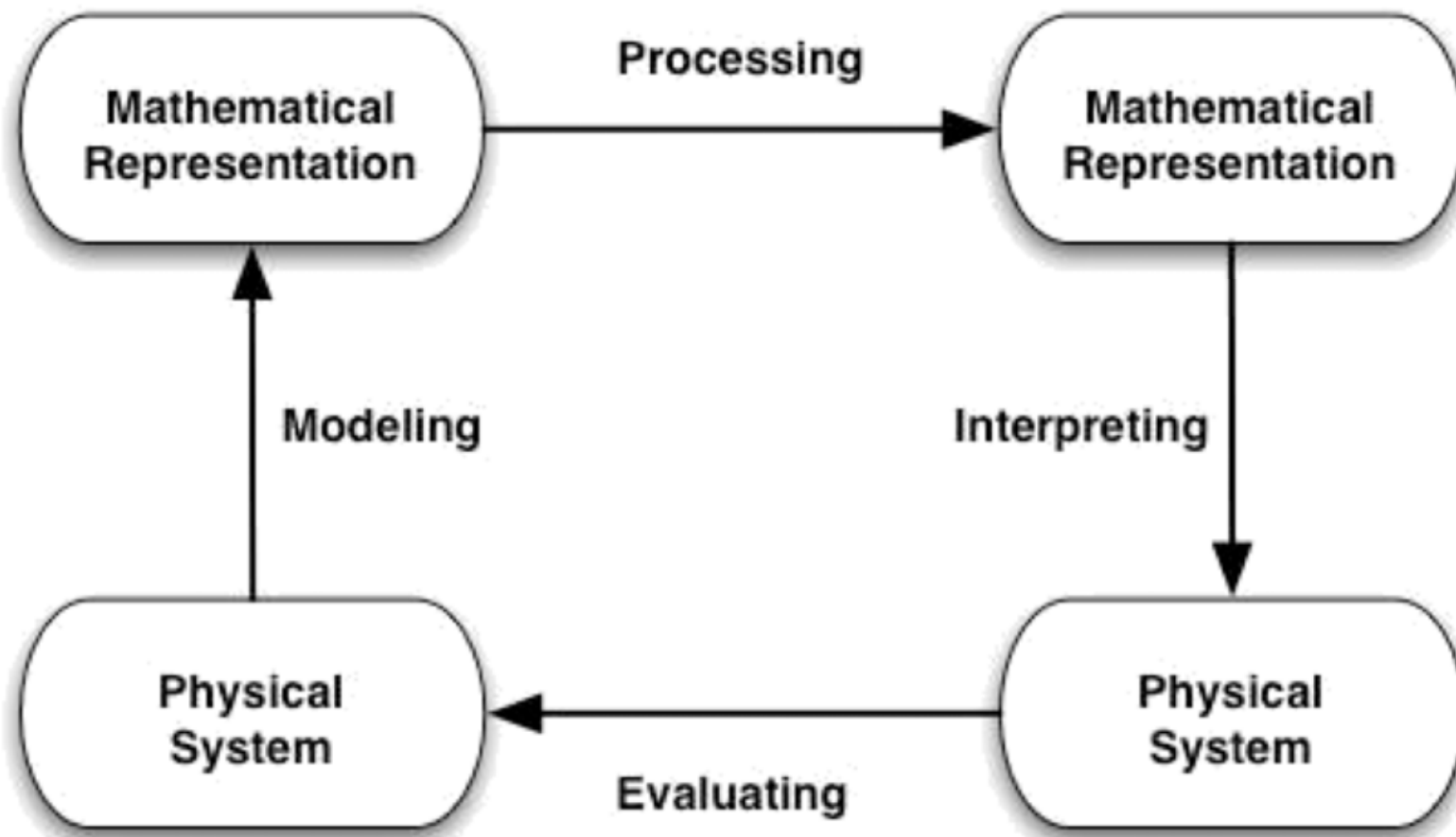
*Don't be afraid to come in and say,  
"I'm confused about fractions" –  
or anything else!*

# 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...)

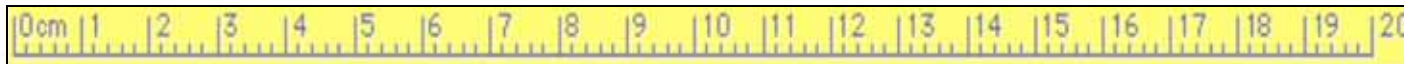


# A model of math in science



# Quantifying your personal experience: Estimation problems

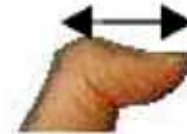
- The trick is to figure out the numbers you need using what you really know (NOT guessing or just remembering).
- Create a set of useful measures!



*See hints to doing estimations on our ELMS site!*

# My personal scales

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



# Estimation:

## Some numbers I will expect you to know

### ■ Numbers

- |                                |               |                   |
|--------------------------------|---------------|-------------------|
| – number of UG students at UMd | ~ 25,000      | $2.5 \times 10^4$ |
| – number of people in MD       | ~ 4-5 million | $4.5 \times 10^6$ |
| – number of people in USA      | ~ 300 million | $3.0 \times 10^8$ |
| – number of people in world    | ~ 5-6 billion | $5 \times 10^9$   |

### ■ Distances

- |                             |                                 |
|-----------------------------|---------------------------------|
| – distance across DC        | ~10 miles                       |
| – distance across USA       | ~3000 miles                     |
| – distance around the world | ~24,000 miles                   |
| – radius of the earth       | $= 2/\pi \times 10^7 \text{ m}$ |