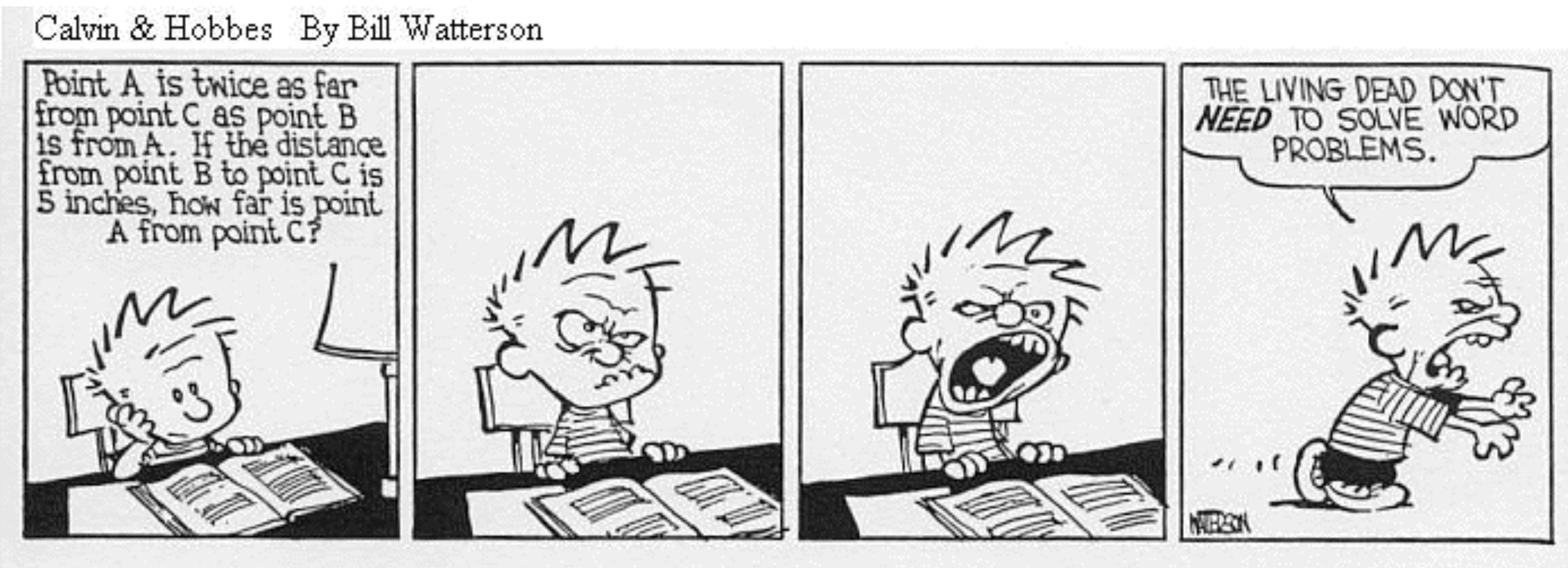
- **<u>Theme Music:</u> Black Eyed Peas**
  ***Let's Get it Started***
- **<u>Cartoon:</u> Bill Watterson**
  ***Calvin & Hobbes***

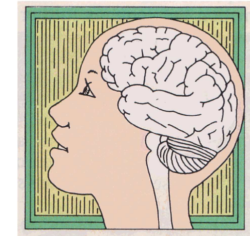


If you don't live in Holmes Hall and want access to the physics help room (5th floor of East Holmes), please come down to the front with your student ID and fill out the access sheet!

# Announcements

- Today (Friday) 11:59 p.m.: Syllabus quiz/ clicker registration deadline (on LON-CAPA)
  - I forgot to upload the "grading policies" sheet so if you've already answered the question about what to bring to exams – full credit
- Next Thursday - Reading questions for Chapter 2 (on LON-CAPA)
- Interested in honors options? Contact me (send me an email) by the end of next week!

# Experiment 1:
# How good is your memory?



| | | | |
|---|---|---|---|
| Thread | Thimble | Bed | Rest |
| Pin | Haystack | Awake | Tired |
| Eye | Knitting | Dream | Snooze |
| Sewing | Cloth | Blanket | Doze |
| Sharp | Injection | Slumber | Snore |
| Point | Syringe | Nap | Yawn |

**Roediger & McDermott J. Exp. Psych: Learning, Memory, & Cognition. 21 (1995) 803-814.**

Write down as many words as you can remember

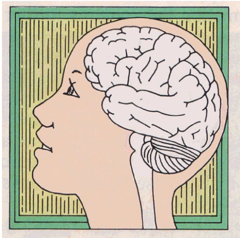
# How many words did you remember?


A. 1-5
B. 5-8
C. 9-12
D. 13-20
E. More than 20

# Did you remember that the words “needle” and “sleep” were on the list?


A. I didn’t remember either of those.
B. I remembered “needle” but not “sleep”.
C. I remembered “sleep” but not “needle”.
D. I remembered both of them.

# Experiment 1:
# How good is your memory?



| | | | |
|---|---|---|---|
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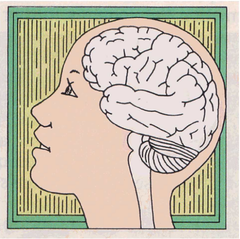
**Roediger & McDermott J. Exp. Psych: Learning, Memory, & Cognition. 21 (1995) 803-814.**

# Experiment 2:
# Count the passes



**Simons & Chabris (1999) Perception. 28:9, 1059-1074.**

# How many passes did you see?


A. 14 or fewer
B. 15
C. 16
D. 17 or more

# How many gorillas did you see?


A. None! (You’re kidding, right?)

B. One

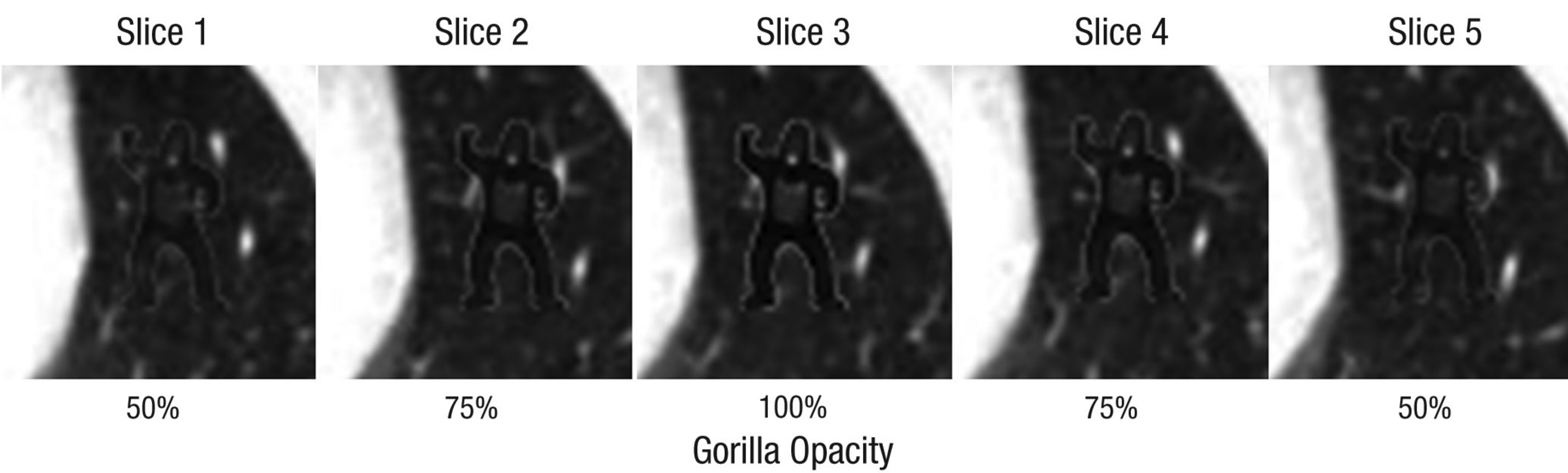
C. More than one

How many players were on the court at the end of the video?


A. More than 6
B. 6
C. 5
D. 4 or fewer

# Is this relevant to anything?

- In a study in *Psychological Science* (2013), Drew, Vo, & Wolfe had 24 radiologists perform a nodule detection task on x-rays that had a large (50X as an average nodule) imbedded gorilla. Only 4 saw it.
  (See *HDT* for a real medical example.)



# Learning to think scientifically

- Sometimes you're fighting your own brain!
  - We often assume an immediate recall ("**one-step thinking**") is right – and the quicker and easier the recall the more we trust it!
  - We often don't pay attention to the right things! ("**selective attention**")
  - We often assume our intuition ("**folk physics**") is correct but don't check that it makes sense with what we see or with other things we know!

# Knowing-how-you-know icon: Coherence – Your safety net

- We will be establishing fundamental principles that we can (almost) always trust as "**stakes in the ground**."
- The links among the different views creates a "**safety net**" that protects us against errors of recalled or reconstructed memory.
- We will use our coherence to "**reconcile**" what we know about the world with a coherent physics picture.

# Reading Questions

I am looking forward to how this course will tie in multiple branches of science, which will hopefully make things easier for me to understand-- I do not possess a "physics" brain.

Is this class going to be mostly about physics, with a couple of biology- related examples, or will it be almost completely about the physics of biology?

I would like to go into more detail about evolution and physics and how they relate.

…I would like to know if there is any supplemental material if I am a physical sciences major as opposed to a bio- related field.

What is the meaning of life? Why are we here?

# Reading Questions

Please show the right hand rule, it is hard to conceptualize without a picture.

Still a little confused on the cross product of vectors and breaking them down into components

One topic I would like to go over in class is more information on what a dimension is.

I'm concerned going in looking at all the math involved in chapter one. Math is not my best subject and I got easily confused looking at all the vector math.

I would like to address the Spherical Cow and Modeling topic.

# How we do it – Connections Across the Disciplines

- The book we're using is "Physics for the Life Sciences," but we're still doing physics
- Many of the examples we'll talk about come from chemistry and classical physics
  - We're trying to move this class into a more modern age of physics, might be able to get Prof. O'Shea to do a guest lecture on astrophysics
- We'll revisit the questions of how the Big Ideas in the other science (particularly biology and chemistry) connect to the laws and models of physics throughout the course

# How we do it - Lectures

- Class MWF at 11:30am
- Before class: READ the chapter and ANSWER reading questions on LON-CAPA (deadlines on course calendar)
- When you come in: grab a whiteboard, eraser/ marker bag for every 3 people
- We will use iClickers every day! Make sure to bring yours and register it on LON-CAPA!

# How we do it – Hand-on Sessions

- Attend one three-hour hands-on session per week in E-26A Holmes Hall (the physics lab - downstairs, right next to the Dean's office)
- Please go to the hands-on session in which you are scheduled! (But we can be flexible if you have a conflict.)
- Time will be spent on problem solving, labs, discussion - important to participate!
- Some hands-on assignments will be turned in at the end of your session to be graded, and will be returned the following week.

# How we do it - Homework

- HW on LON-CAPA: http://msu.lon-capa.org (one assignment per week, due Friday at 11:59 p.m.)
- Purpose of HW is to help solidify the concepts and work on your problem-solving skills: multiple choice, T/F, numerical response questions, graphing questions
- I encourage you to work in groups!
- Each problem has an associated discussion board: please make use of it!

**Special note**: Occasionally I may want to check in more quickly or elaborated on how a particular idea is coming along. In this case I might assign a short "Paper" assignment which will be due on Friday at the beginning of class.

# How we do it – Help room

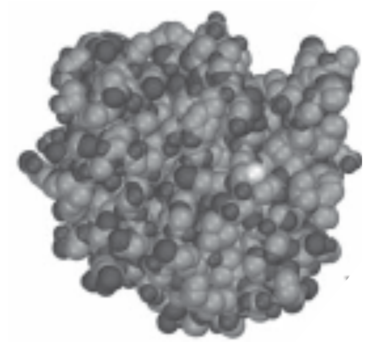
- Help room on Wed/Thurs/Friday in the 5th floor lounge in East Holmes Hall (help room starts Sept. 9)
  - Tues. 2-4pm; 6-8pm
  - Wed. 6- 9 pm
  - Thurs. 10am – noon; 2-6pm
  - Friday 1-3 pm
- Place to get assistance withLON-CAPA, hands-on session problems, exam prep
- Come to the help room prepared with questions about HW, etc. - the LAs will help

# Contact info & Office Hours

- My office: 193-B East Holmes Hall
- My office hours: 9-11am on Wednesdays, by appointment, or whenever my door is open!
- My email: vashtis@msu.edu
- I am usually in Holmes MWF, particularly in the mornings

Enough of me talking!

# Group task: Develop a model of your favorite protein



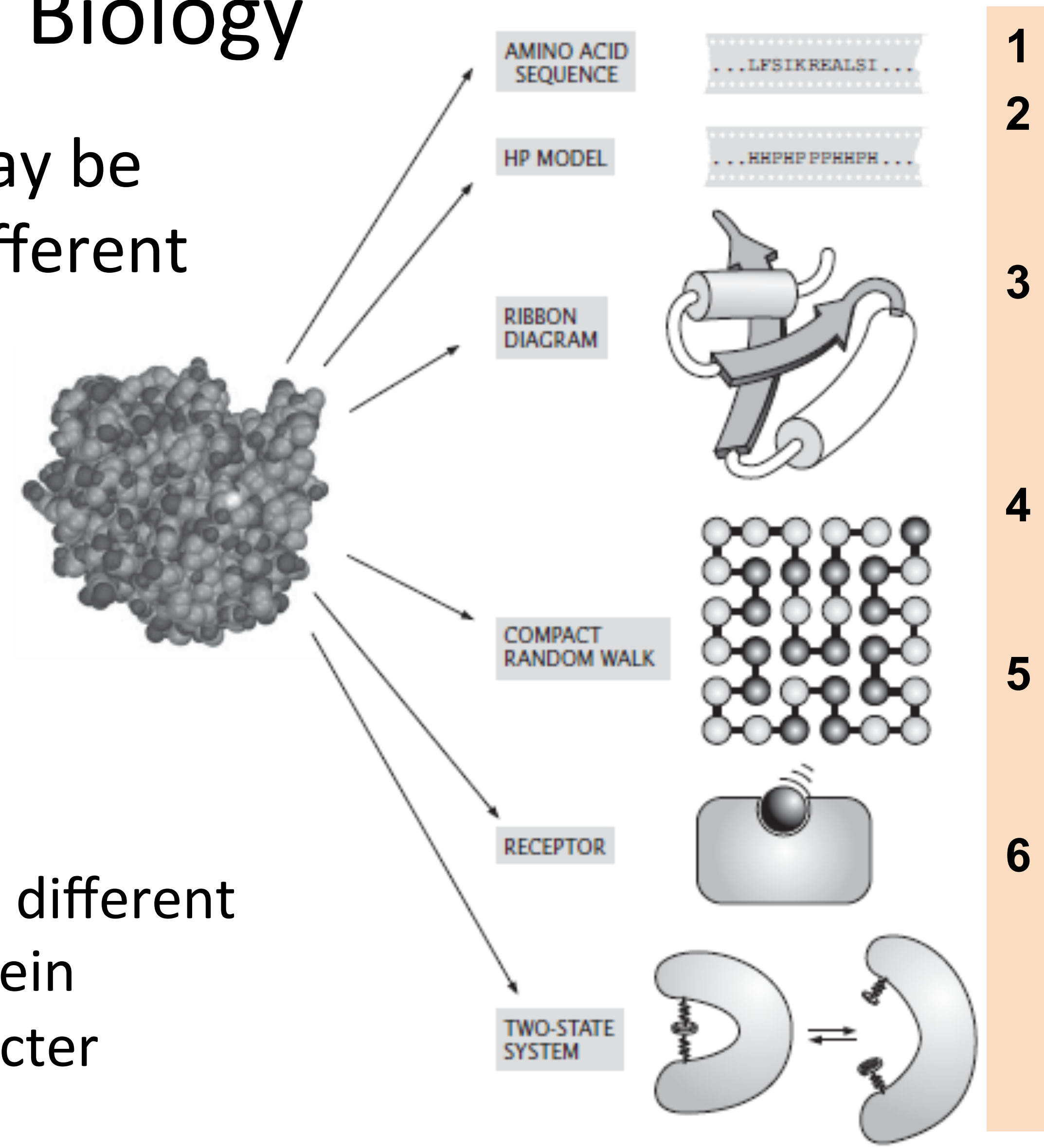
- Work in groups of 3

*Teaching and Learning Assistants will participate*

- A model is something used to represent a system.
- It should have the most important features of the system being represented but leave out less essential details.
- A good model lets you figure out things about the real system that you might have trouble doing
  if you tried to pay attention to everything.

# Modeling in Biology

The same system may be modeled in many different ways



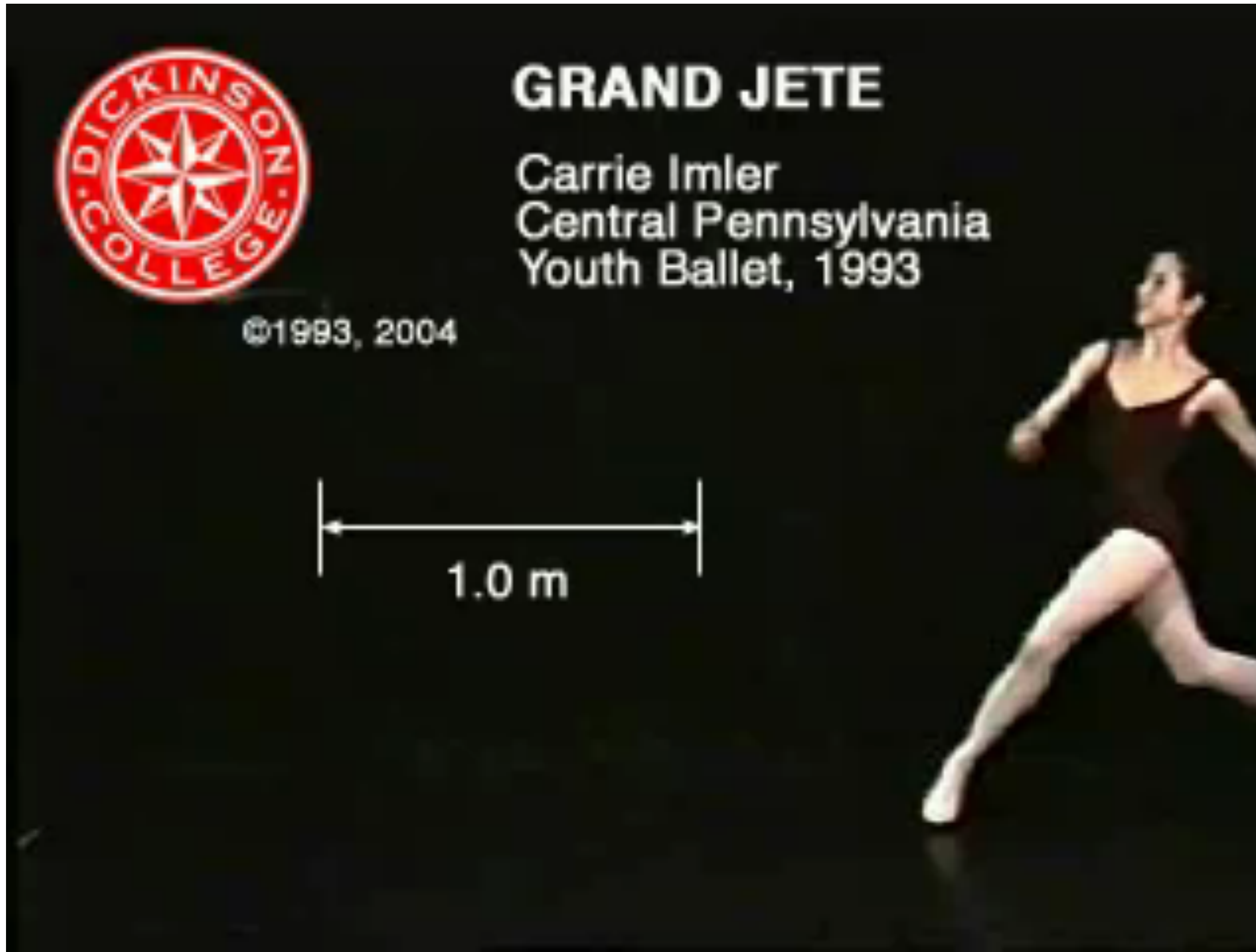

Each model highlights different properties of the protein

- Hydrophobic character
- Folding property

From: Physical Biology of the Cell (Theriot, Kondev, and Phillips)

# Group task: Write down more than one way to model the motion in this video

- Work in groups of 3, *Teaching and Learning Assistants will participate*



# Modeling in Physics

- Many of the models we use in intro physics are highly simplified ("**toy models**") to let us focus on just a few properties.
  - Point masses
  - Rigid bodies
  - Perfect springs
- These models let us first get a clear understanding of the physics. Then, more complex systems can be treated by building around that understanding.

# Dimensions and units

- The simplest mathematical model we use in science is we assign numbers to physical quantities by measurement.
- Each kind involves an arbitrary choice of scale.
  - Different types ↔ **dimensions**
    - Distance, time, mass, …
  - Equations that represent physical relationships must maintain their equality even when we change our arbitrary choice.
- The quantity we create by adding a unit is NOT just a number but a blend.

Consider two mathematical models of real world things:

1. Distance
2. Time

We map positions and times into numbers. What kinds of numbers are we mapping to?


A. All numbers
B. Non-negative numbers only
C. Positive only