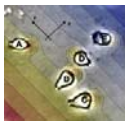
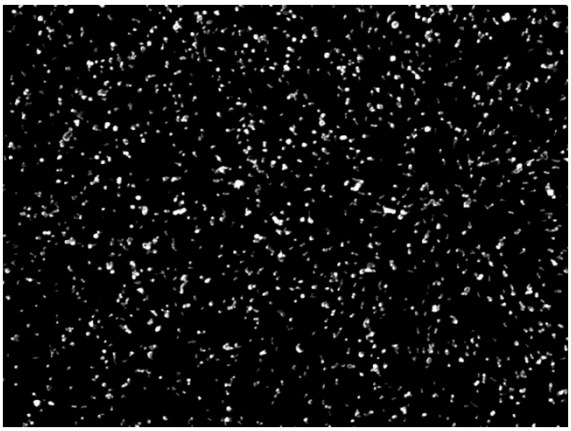
Physics 131- Fundamentals of Physics for Biologists I

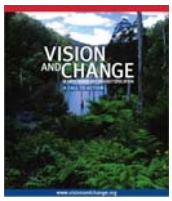


Professor: Wolfgang Losert **wlosert@umd.edu**



Movie of the Day
Collective Motion of Slime Mold cells

- Over the past decade there have been increasing calls to make the education of biology and pre-med students more quantitative.
- This class is part of a national project sponsored by the **Howard Hughes Medical Institute** and the National Science Foundation to respond to the *Scientific Foundations for Future Physicians Report* (2009)
- This report calls for multi-disciplinary competency-based science education to better prepare students for medical, pharmacy, and veterinary schools and also to better educate students who are studying the basic biological sciences.



HHMI Project NEXUS

- The goal of this course is to provide you with the understanding of physics that you will need to help you understand advanced biology and (perhaps) medical school classes.
- It is in development so we will be seeking feedback from you to make sure that it works for you.
- Surveys
  (one online, one in recitation this week)

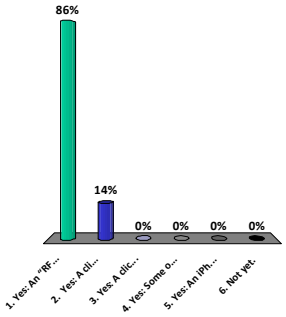
Test the clickers!

Channel 41!
Responseware ID 689790

channel 41!

Do you have a clicker?

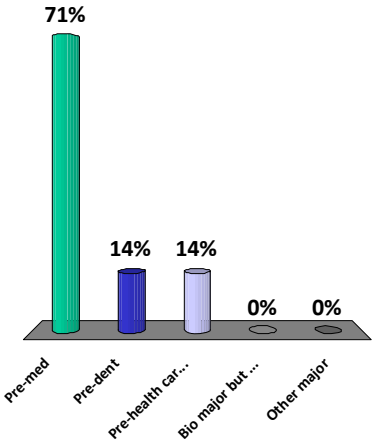
1. Yes: An “RF-LCD” clicker 
2. Yes: A clicker that says “XR” 
3. Yes: A clicker that says “RF” 
4. Yes: Some other clicker.
5. Yes: An iPhone that is setup to click. 
6. Not yet.



channel 41!

Who are you? (Major)

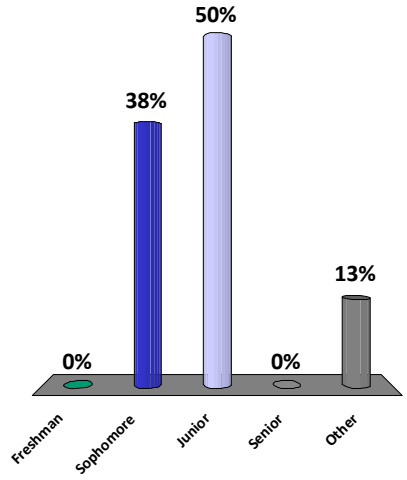
1. Pre-med
2. Pre-dent
3. Pre-health care not med or dent
4. Bio major but not one of the above
5. Other major



channel 41!

Who are you? (Year)

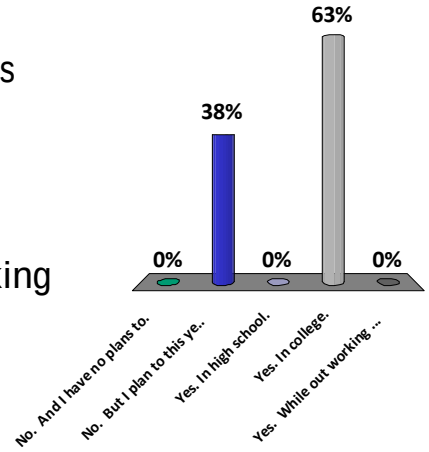
1. Freshman
2. Sophomore
3. Junior
4. Senior
5. Other



channel 41!

Have you ever worked in a research lab?

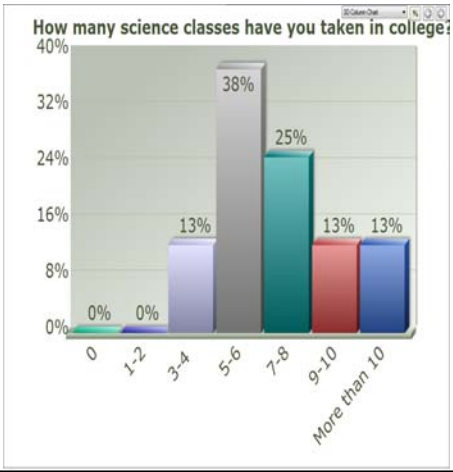
1. No. And I have no plans to.
2. No. But I plan to this year or next.
3. Yes. In high school.
4. Yes. In college.
5. Yes. While out working after high school.



channel 41!

How many science classes have you taken in college?

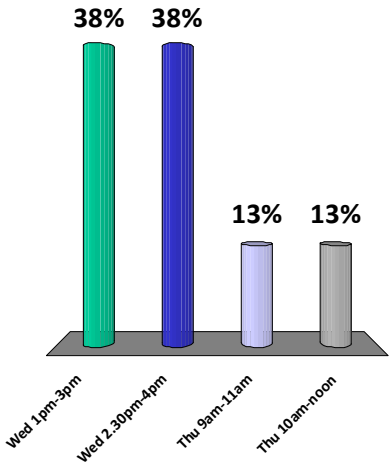
1. 0
2. 1-2
3. 3-4
4. 5-6
5. 7-8
6. 9-10
7. More than 10



channel 41!

Unavailable for office hours

1. Wed 1pm-3pm
2. Wed 2.30pm-4pm
3. Thu 9am-11am
4. Thu 10am-noon



Physics 131- Fundamentals of Physics for Biologists I

Course Logistics

Website: www.physics.umd.edu/courses/Phys131/fall2012/

- No book
- Pre Class Reading
- Clickers
- Homework
- Lab (with pre-reading and in lab report) and Recitation
- Quizzes and Exams

Lab/Recitation

- Go to your recitation and lab section next week to
  - do a pre-test survey
  - get your picture taken
  - MasteringPhysics
  - ImageJ
- Do the online survey.
- Labs begin on 9/11.

This is not your parent's physics
(a.k.a the physics taught in Phys121 and 141)

Major differences to Phys121 and Phys141 are:

- Topics - what physics we teach
- Course "Mechanics" – how we teach it

Physics 131- Fundamentals of Physics for Biologists I

What is Physics?

Physics provides a framework for understanding basic principles of nature from motion to forces to light

Physics uses models and Math to describe basic principles of nature

Using experiments, models and math, physicists often find new ways to control natural processes

Light -> Laser

Electrons -> Transistor

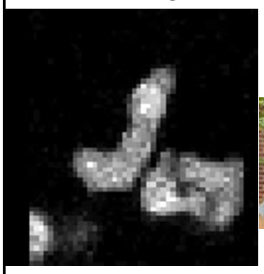
Physics, Chemistry, and Biology – where do they connect?

Before I give you examples from my own work I would like everyone to think about examples

- You can sketch things on the provided Whiteboards
- Discuss examples in groups of 3
- Pick one example to share with the class in a few minutes

An example of physical biology: Cell Migration

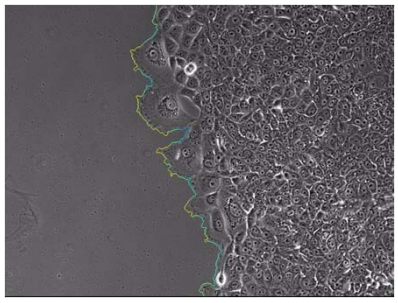
Motion toward a chemical signal

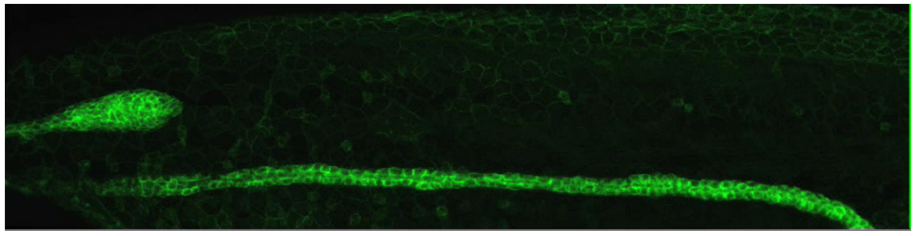


Meghan Driscoll

Rachel Lee

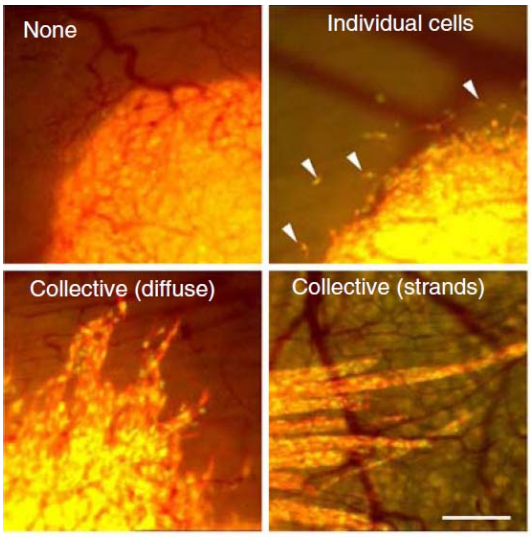
Closure of a Wound





Haas and Gilmour (2006)

Cancer: Cell Migration gone bad



HT1080 cells, 6 days Post-injection
Scale: 250 μm

Alexander et al, "Dynamic imaging of cancer growth and invasion: a modified skin-fold chamber model." Histochem Cell Biol (2008) 130:1147

Be aware of how you learn!

Three hands on exercises