

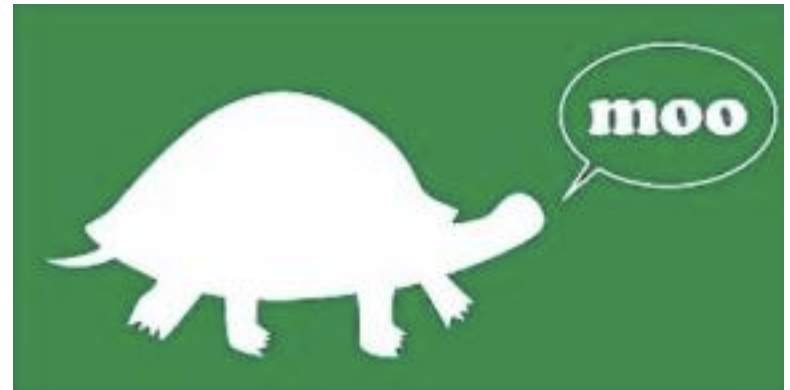
Welcome to 20.109!

Fundamentals of Biological Engineering

2/2/16

An introduction to 20.109

- Meet the team
- Core mission
 - Building a better bioengineer
- Modular structure
 - Module 1: Protein Engineering
 - Module 2: System Engineering
 - Module 3: Biomaterial Engineering
- Logistics



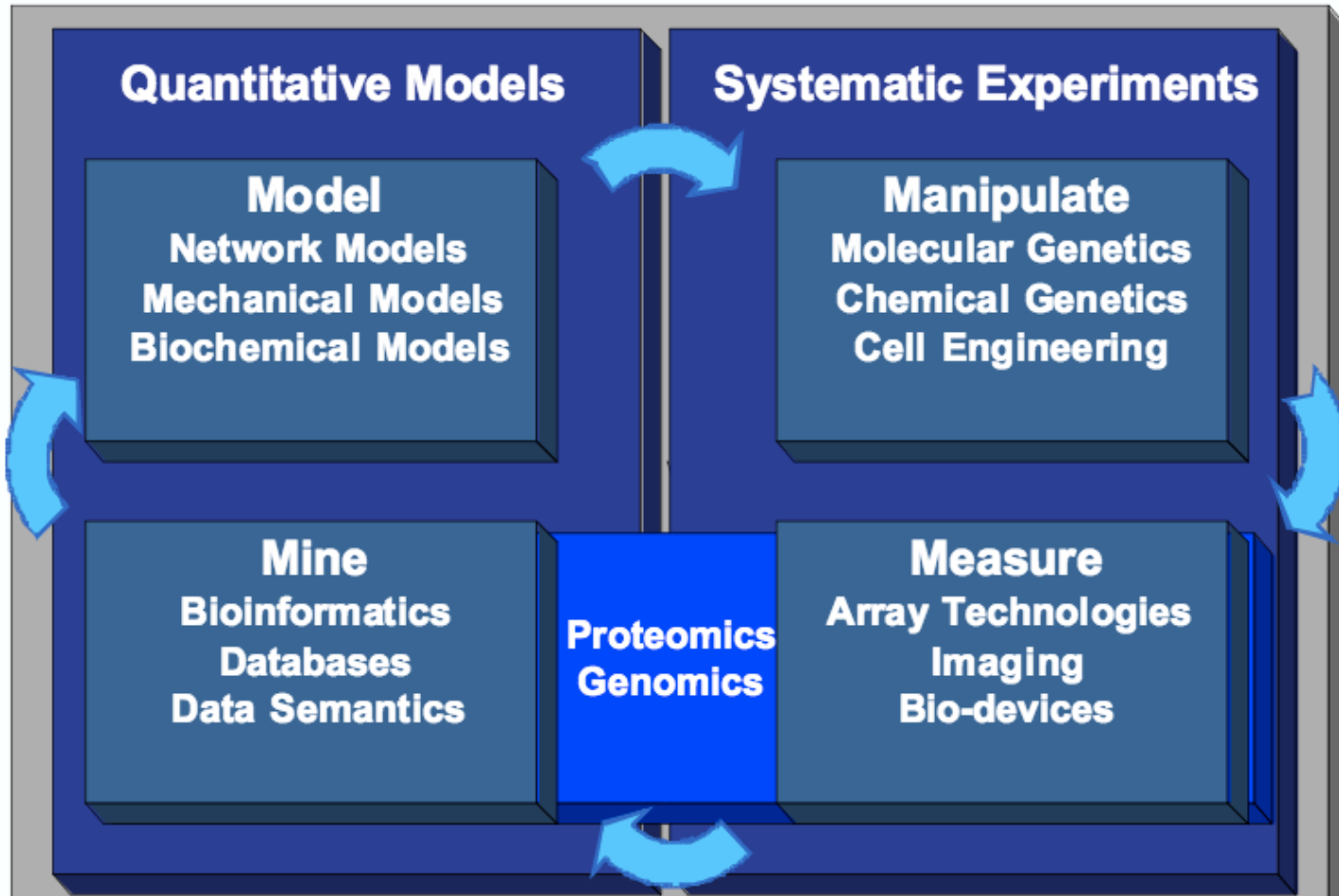
Meet the 20.109 teaching team

- Lecture / laboratory
 - Dr. Noreen Lyell (M1)
 - Prof. Leona Samson (M2)
 - Prof. Angela Belcher (M3)
 - Dr. Leslie McClain (T/R)
 - Dr. Maxine Jonas (W/F)
- Communications
 - Dr. Diana Chien
 - Dr. Vivian Siegel



- Teaching assistant
 - Jing Zhang
- Research assistants
 - Dr. Jifa Qi
 - George Sun

Core mission of BE department



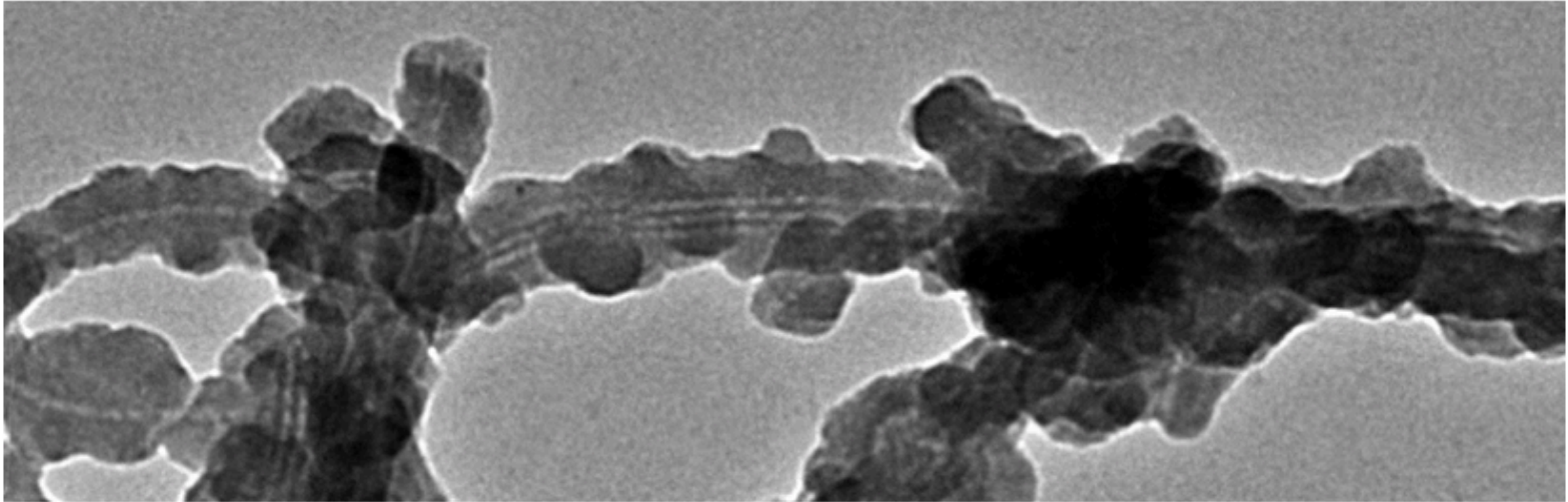
Definition of BE from Prof. Doug Lauffenburger

Core mission of 20.109

- To prepare students to be the **future** of Biological Engineering
- To teach **cutting edge research skill** and technology through an **authentic research experience**
- To inspire **rigorous data analysis** and its **thoughtful communication**

Modular structure of 20.109

20.109(S16): Laboratory Fundamentals of Biological Engineering



[Home](#) [People](#) [Schedule Spring 2016](#) [Assignments](#) [Homework](#) [Lab Basics](#) [Wiki Basics](#)
[Protein Engineering](#) [System Engineering](#) [Biomaterials Engineering](#)

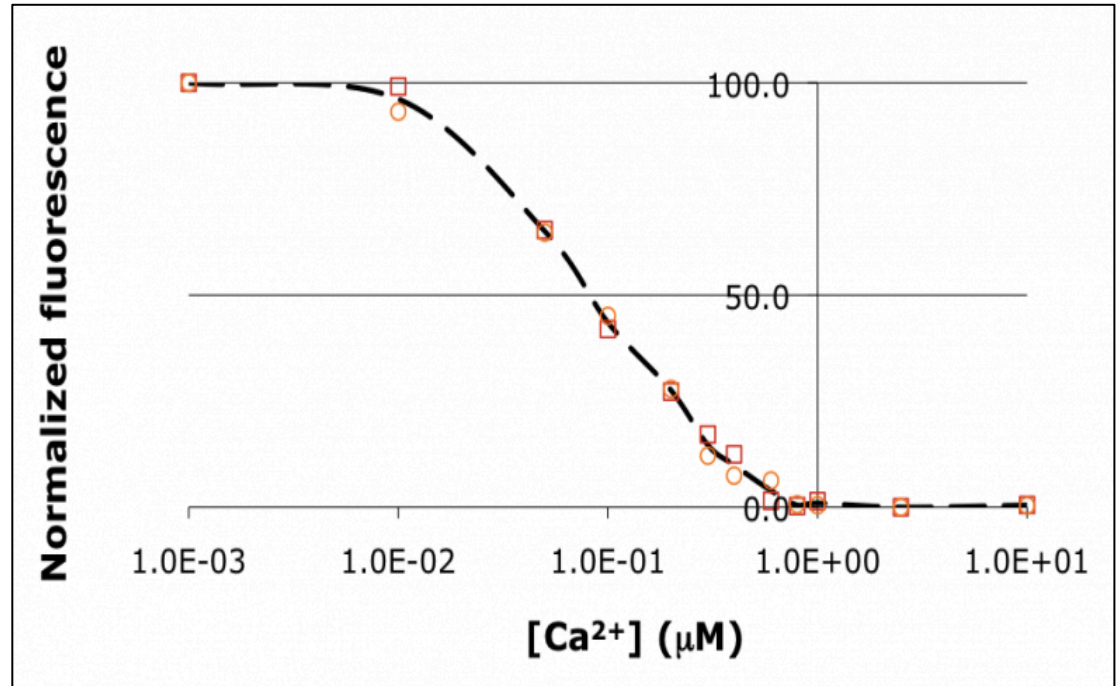
Module 1: Protein Engineering (Dr. Noreen Lyell)

Module 2: System Engineering (Prof. Leona Samson)

Module 3: Biomaterials Engineering (Prof. Angela Belcher)

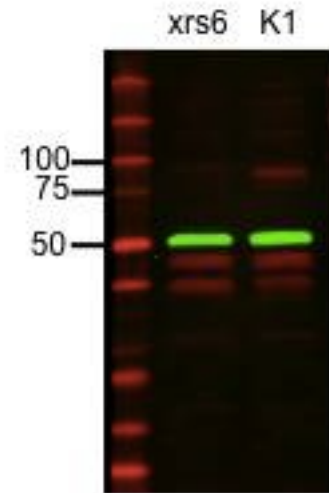
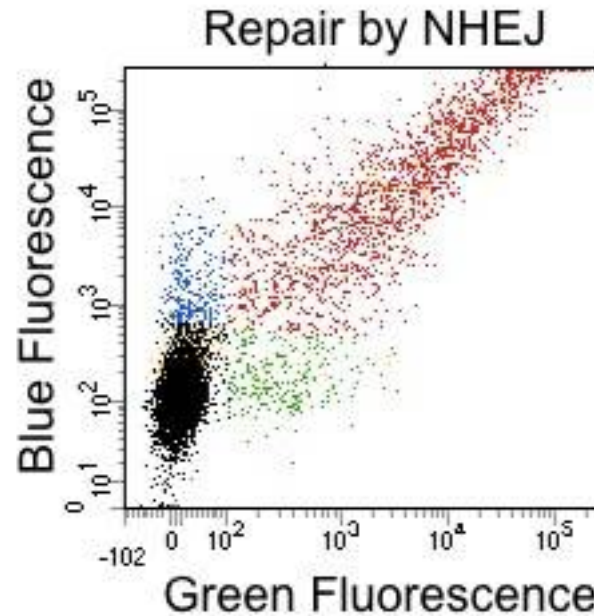
Module 1: Protein Engineering

- Experiments
 - Generate point mutations in calcium binding protein
 - Measure response to calcium
- Lab skills
 - Manipulate protein sequences
 - Protein purification and titration assays



Module 2: System Engineering

- Experiments
 - Measure DNA repair with a genetically engineered sensor
 - Quantify effects of drugs on DNA repair

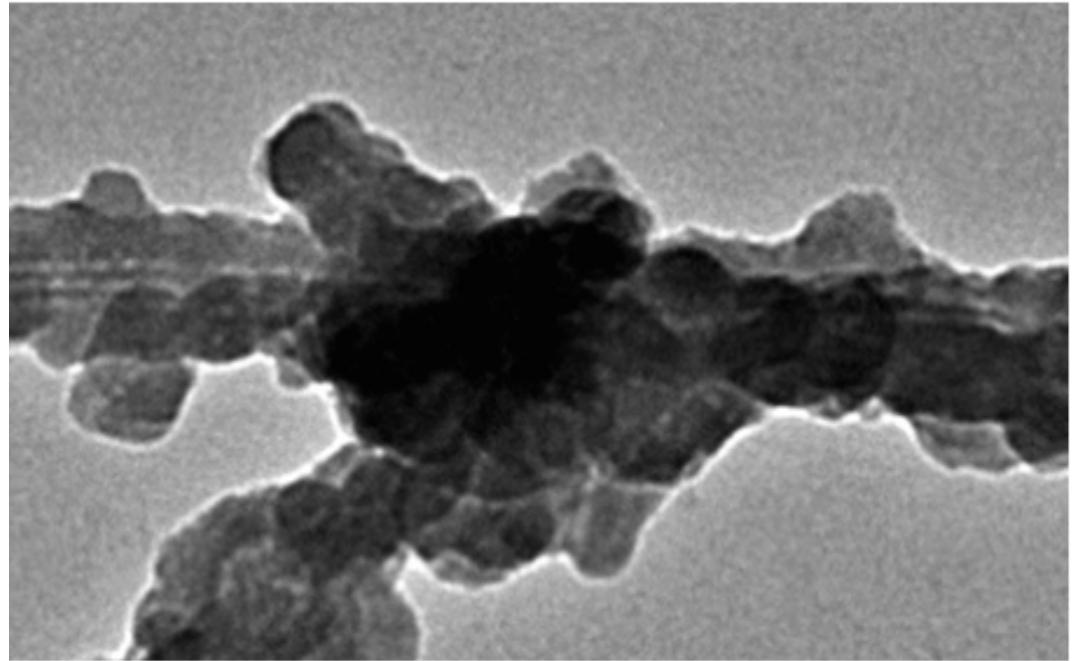


- Lab skills
 - Mammalian tissue culture
 - Experimental design
 - Transfection of mammalian cells and flow cytometry

Module 3: Biomaterials Engineering

- Experiments

- Mineralize phage surface with nanoparticles
- Use TEM to visualize structure
- Assemble and test batteries

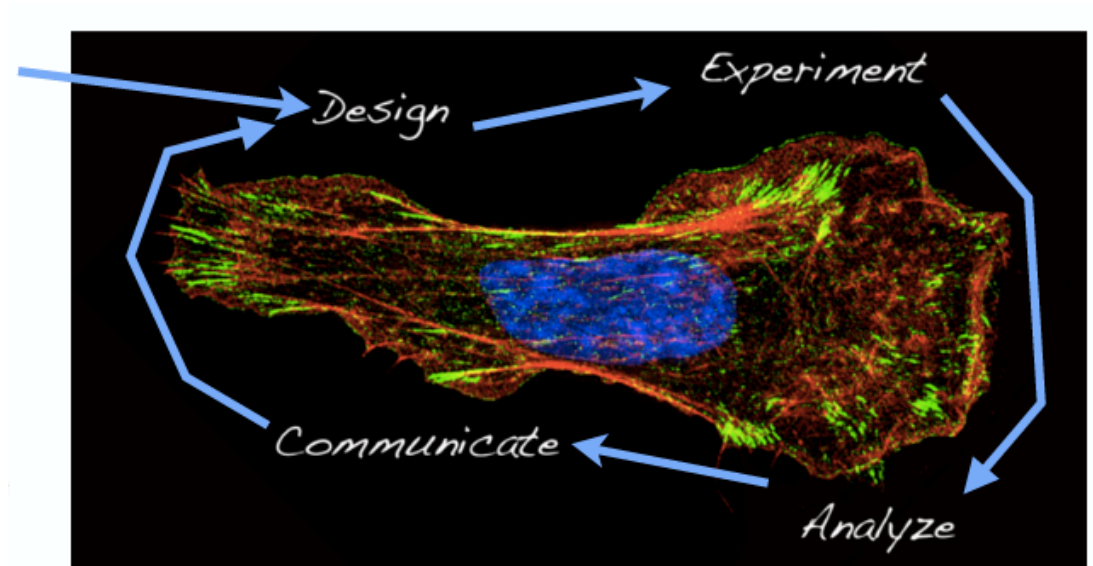


- Lab skills

- Bacteriophage M13 material production
- Fabrication of bio-based devices

Workflow in 20.109

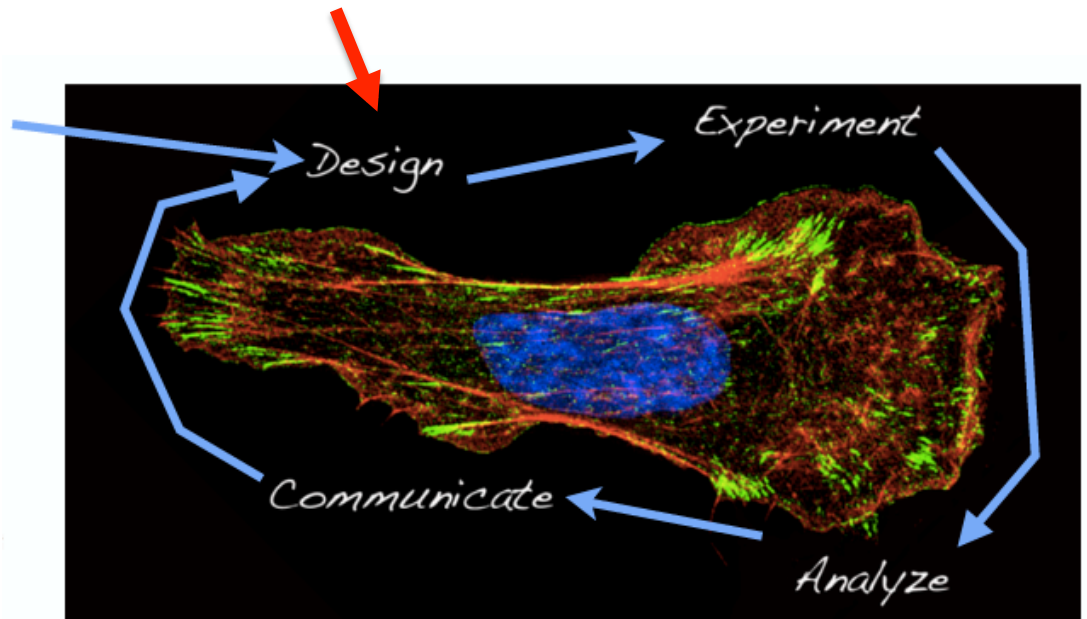
- We start here...
- But, you can't design an experiment without analyzing some data!



Workflow in 20.109

Research

- We start here...
- But, you can't design an experiment without analyzing some data!



Experiments in 20.109

We aim to prevent 'just follow the protocol' syndrome



Experiments in 20.109

We do relevant and cutting edge science...



and we do it safely!!

Experiments in 20.109

We analyze real and novel data

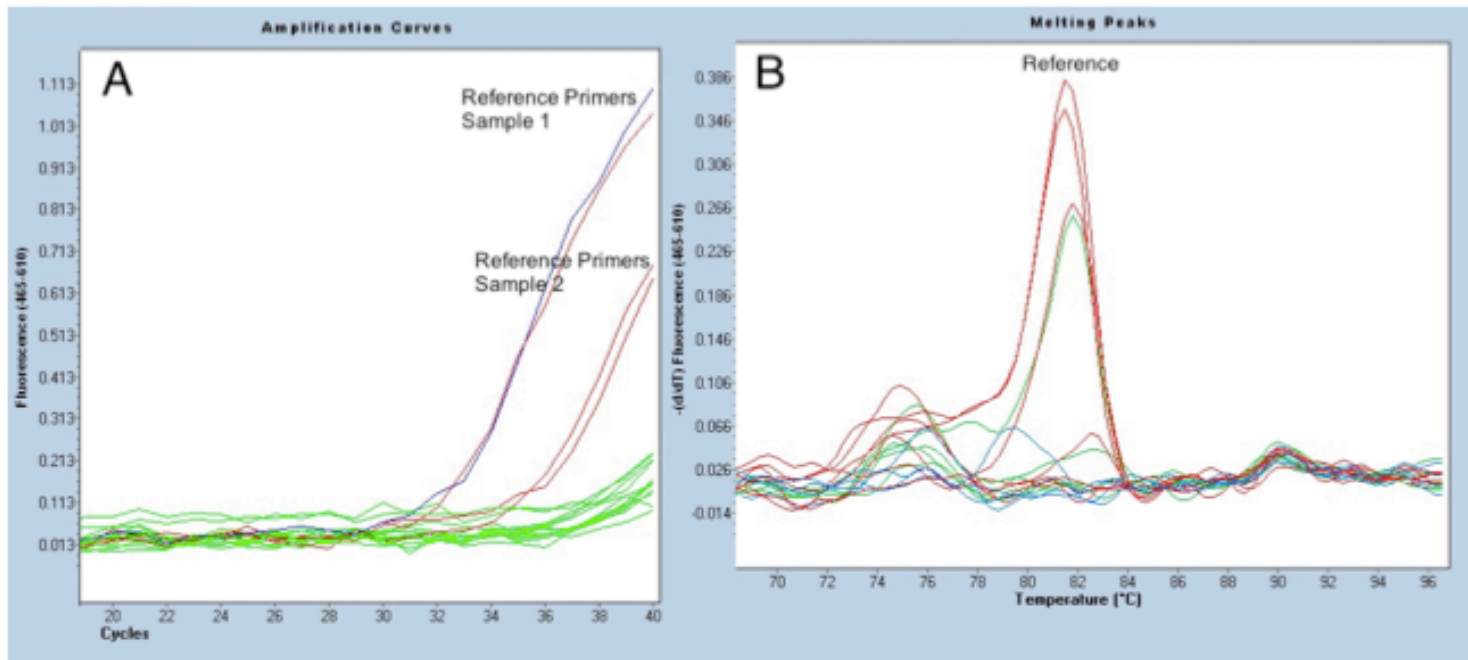


Figure 1: Amplification and Melting curves for qPCR assay. Primer pair absolute sensitivity was evaluated via qPCR against known AIV-containing samples. Samples 1 and 2 correspond to AIV-containing samples, sample 3 is a negative control. (A) Amplification curves for qPCR assay. Curves that resulted in successful amplification are labeled with primer pair and sample ID. Experiments were run in duplicate. (B) Melting curves for same assay. Melting peak corresponding to reference primer amplicon is labeled.

Written and oral communication

MODULE	TOPIC	ASSIGNMENT	WEIGHT
1	Protein Engineering	Summary	15%
		Mini-presentation	5%
2	System Engineering	Research article	25%
		Journal club presentation	10%
3	Biomaterial Engineering	Research proposal presentation	20%
		Mini-report	5%

- Written communication assignments = 45%
- Oral communication assignments = 35%
- Daily work and participation = 20%

Why communicate your science?



EcoPress is a website highlighting the science and scientists of the Natural Resource Ecology Laboratory at Colorado State University

why scientists should tell more stories

RECENT PUBLICATIONS

ARTICLES

INTERVIEWS

OPINIONS

EDUCATION

THIS IS HOW I DID IT...

FROM THE FIELD

ECOPICS

EVENTS

NREL NEWS

LINKS

CITATION SUBMISSION

PODCAST



Credit: jvoves (via Flickr, <http://bit.ly/190MCCw>)

<http://nrelscience.org/2013/09/26/why-scientists-should-tell-more-stories/>

Why scientists should tell more stories

“Story is the number one way we learn from past experiences, to be better people, and share in experiences. Yet as scientists we feel the need to separate ourselves from this proven method of communication...

...encourage the use of narrative in science, but with caution. I would argue that narrative is imperative for science communication. Data already incorporates a narrative; we just need to find ways to bring it to light.”

We are here to help

- BE Communications Lab
 - Instructors
 - Dr. Diana Chien
 - Dr. Vivian Siegel
 - Writing fellows
- 20.109 Teaching faculty



Course logistics

- Lectures
 - Tuesday and Thursday 11-12p in 16-220
 - Dr. Lyell → Prof. Samson → Prof. Belcher
- Laboratory sections
 - Tuesday and Thursday 1-5p in 56-322
 - Wednesday and Friday 1-5p in 56-322
- Details
 - You will work in pairs throughout the semester
 - Collaboration with integrity is key

Expectations

- Your expectations of us...
 - We will come to class and laboratory prepared
 - We will be clear and reasonable in all assignments
 - We will treat every 109er with respect
 - We will give everyone equal chance at success

Expectations

- Our expectations of you...
 - You will come to class
 - You will be prepared for lecture and laboratory
 - You will not interfere with each other's learning
 - You will invest the very best of yourself
 - You will be honest with your peers and the teaching faculty

Our goals for you

- Organize a constructive laboratory notebook
- Implement laboratory protocols and troubleshoot
- Interpret and analyze data
- Recognize the utility of models and assays
- Critically examine scientific literature
- Communicate your science
- Work as a team
- Provide constructive and helpful feedback

Final notes

- Please arrive to laboratory today and tomorrow on time
 - Damon from EHS will be delivering a training presentation
- Please wear/bring pants and closed toed shoes
 - We will be working in the lab