President Skorton

- Cornell helps to feed millions by agricultural initiatives and the application of science in many places in the world.
- The presence of such superb engineering and other science expertise on this campus, in everything from energy systems to **water systems**, will be able to solve another major set of problems contributing to numbing poverty around the world.
- Cornell can transform the world by affecting hunger, poverty, energy use, **water systems**

http://www.news.cornell.edu/stories/Oct08/skorton.campaign.aj.html

Grand Challenges in Water?

- Engineers, inventors, and students are busy creating lots of POU widgets to clean water for the base of the pyramid (for users who earn less than $2/day)
- Many of the technologies cost more per liter of water than what we pay in the Global North!
- We need cost effective solutions
  - Production costs of a few cents per 1000L
  - Capital costs of less than $10/person
- Municipal systems have economies of scale

AguaClara Challenge

- Build a Potential Energy powered water treatment plant based exclusively on Flocculation/Sedimentation that consistently produces water with a turbidity less than 1 NTU
- The AguaClara technology can currently produce water with turbidity less than 5 NTU
- The CUWTP meets the NTU challenge and then filters anyway as is required by law

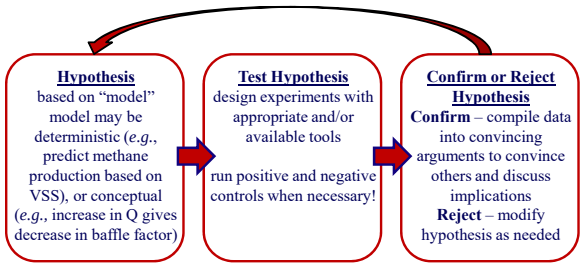
Why no filters? No electricity!

https://confluence.cornell.edu/display/AGUACLARA/Ojojona+Photos

What makes a good final project?

- Good research question/testable hypothesis
- Tractable experiments
- Collect LOTS of data!
- Link experimental data with theoretical model OR conceptual expectation
- Things we can measure:
  - pH, temperature, turbidity, red dye, other absorbing chemicals, dissolved oxygen
  - UV-vis (sipper cell!), TOC, GCs
  - Free chlorine, conductivity
  - Nutrients – colorimetric methods (UV-Vis)

The iterative process of research



Proposals – what to include

- Intro/context – What is the problem? Why is it important?
- Objectives – What is the hypothesis? What will you do?
- Experimental plan including – How will you do it?
  - Key design parameters
  - Timeline of tasks/experiments
  - Possible hurdles/challenges
  - Refs to primary, review, and other literature and possibly to previous years' projects
- Resources needed to conduct experiments – What tools will you use?
- Expectations/Anticipated results
- References/Bibiliography

Project Expectations

- Build your primary project apparatus in the week following Spring Break
- 4 weeks of data collection
- 4 hours per week outside of class (approx. 8 hours per week in total)
- Data collection and data analysis used for plant control (evidence of good engineering)
- Maintain good records of what you did and what you learned
- Collaboration between teams is fine and encouraged
- What is success?

Next steps

- Come prepared to discuss
  - What seems interesting to you?
  - Is there anything that can help with other projects (research)?
  - Anything that is relevant to potential grad school research?
  - Anything relevant to potential internships/jobs?
- BRAINSTORM and discuss with your groups.

Class Activity

- Write the question you are trying to answer
- List what is required to make the project successful
- What parameters will you vary?
- What parameters will you measure?
- List expected challenges
- Check Research Proposal due date