ESS 102: Space and Space Travel

"We are explorers. Our curiosity propels us to push the frontiers of human possibility and imagination. This is the core of NASA's mission - We dare to explore."

- Michael D. Griffin
Former NASA Administrator
April, 2008

"Somewhere, something incredible is waiting to be known."

- Carl Sagan
Astronomer

ESS 102 Space and Space Travel

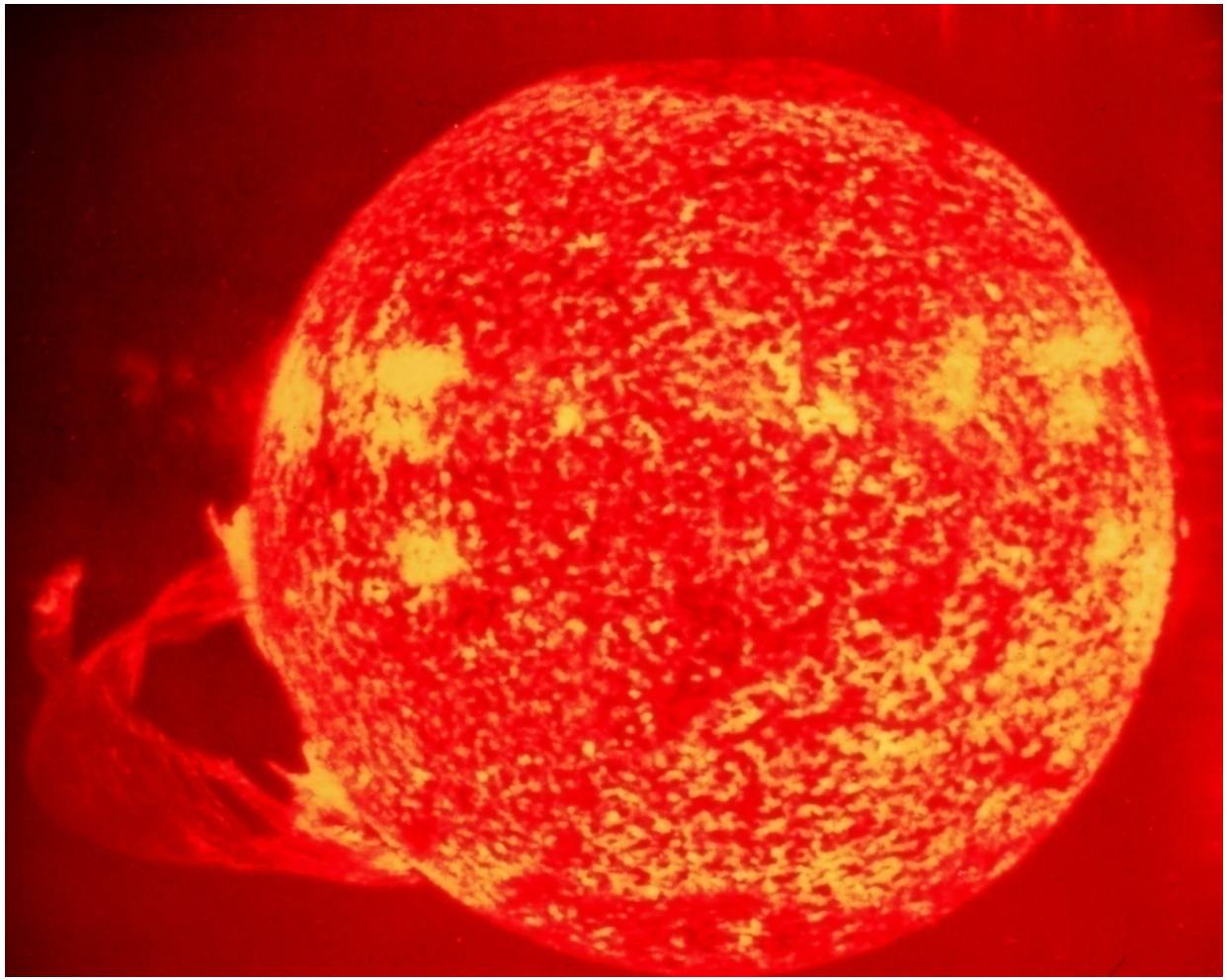
Instructor: Dr. Erika Harnett (eharnett@uw.edu)

Office Hours: Dr. Harnett: W 12:30-1:30 PM or by appt.

TAs:

- Marshall Styczinski (Head) mjstyczi@uw.edu
- Leo Zheng leozheng@uw.edu
- Nick Cuozzo ncuozzo@uw.edu

Some things we will discuss:



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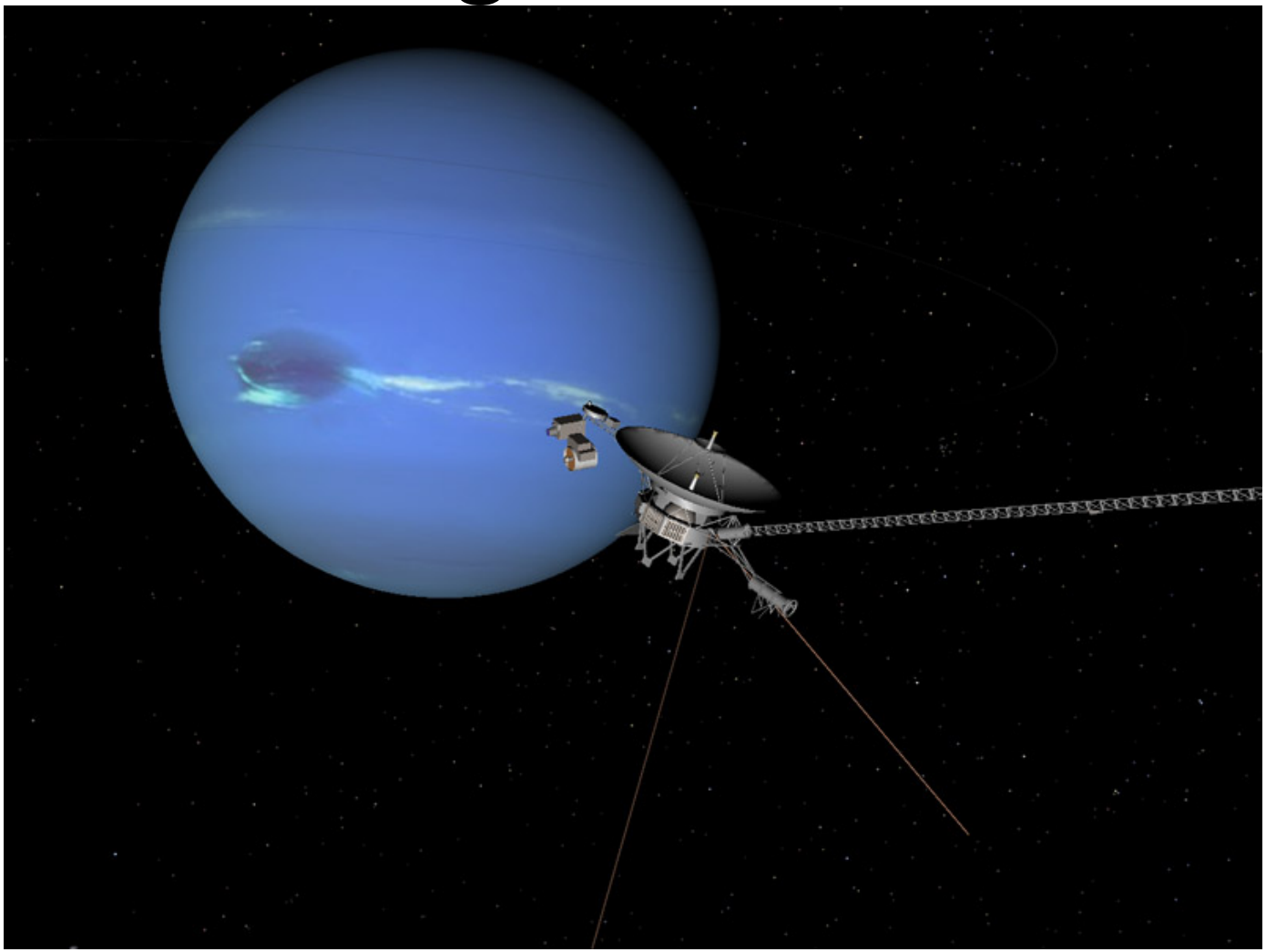

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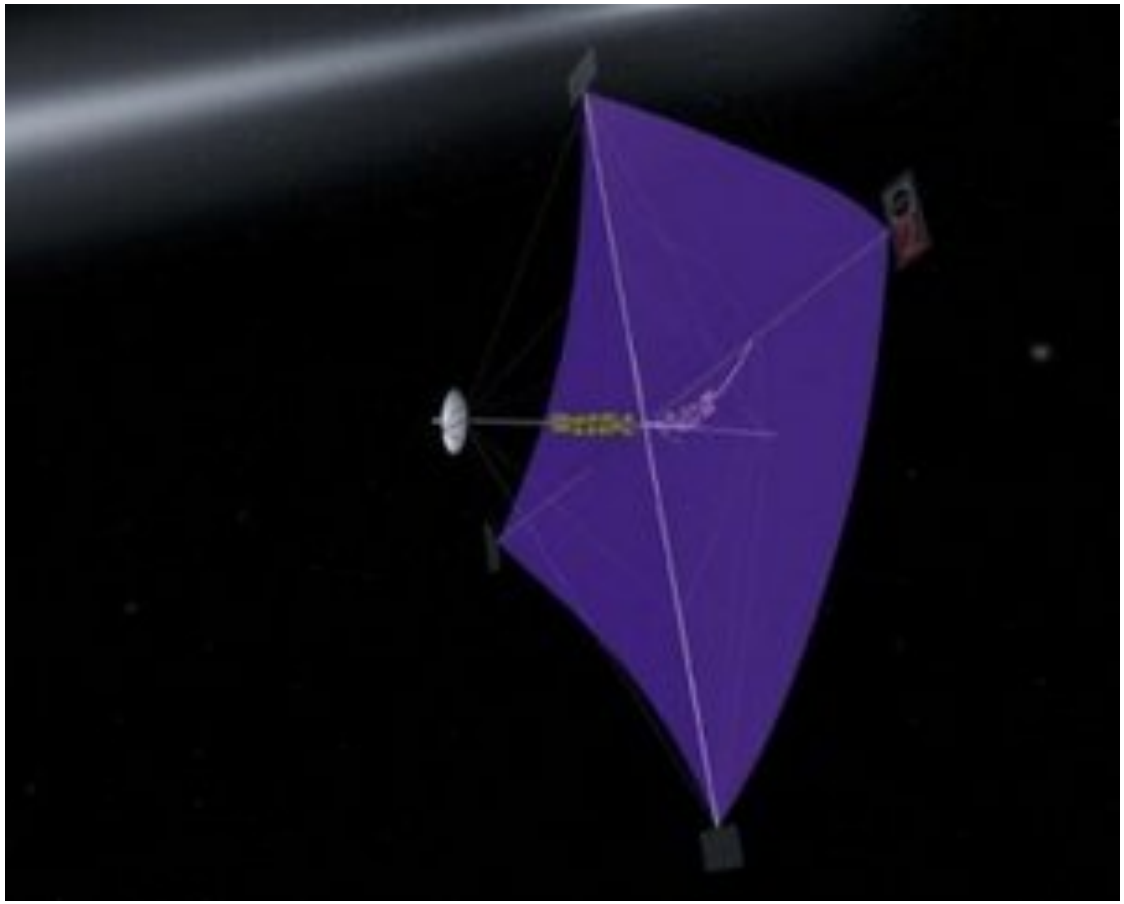


What is this class about?

- **The Tools:** We will introduce and discuss the science and math necessary to understand the rest of the material. We will also talk about how we know things about the Sun, Space Science…
- **The Sun:** We will spend some time talking about the Sun, since it is source of essentially all energy in our solar system.
- **Space Science:** From the surface of the earth to the heliopause (note that heliopause is where the Sun is no longer dominant energy source, well past orbit of Pluto)
- **Human and Robotic Space Exploration**: How we do we explore our solar system?

Tentative Weekly Schedule:

Week	Topic
1	Overview, Math Review, Solar System Scale
2	Earth/Sun, Light and Matter
3	Light and Atmosphere, Powering the Sun, Solar Interior, Fusion vs Fission
4	Solar Atmosphere, Magnetic Features, Active Features
5	Solar Wind, Planetary Magnetospheres (radiation in space)
6	Planetary Science (what is out there?)
7	The Rocket Equation, three main types of propulsion
8	Orbital Mechanics, Advanced Concepts
9	Hazards of Human Space Flight
10	Putting it all together

Course Objectives

- Explore the following topics: basics of light and matter, powering of the Sun, making of space weather conditions, observations from space and from Earth, planetary space environments, radiation hazards, planetary “surface” processes, spacecraft requirements, tooling up for human exploration.
- Learn basic problem solving techniques.
- Learn basic observing and experimental techniques.
- Be able to discuss why and how we explore space.
- Construct a water rocket, and redesign it based on testing the rocket.

Space and Space Travel

Why do we care about the Space Environment?

1) Space is lethal and our changing atmosphere and space environment are our cocoon.
   - *X-Rays and UV radiation are (usually!) stopped in our atmosphere.*
   - *Cosmic Rays (particles, mostly protons from Sun and Space) enter our atmosphere.*
     - *8% of our radiation exposure comes from Cosmic Rays*
     - *A 12 hr airplane flight is equivalent to 1/2 a chest X-Ray*
     - *Cosmic Rays may produce mutations and be important for evolution.*

2) Planetary Hazards:
   - *Space has evolved over billions of years (e.g. impacts)*

Space and Space Travel

Why do we care about the Space Environment?

3) Technology depends on space:

- *Communications Satellites*
- *Weather Prediction (Galveston-1900, Inauguration Day - 1993)*
- *Global Location with GPS*
- *Global Remote Sensing (deforestation, fires, pollution, ozone)*
- *Connected world (Sirius, DirectTV, etc.)*

4) Exploration

Course Expectations

- High School Science and Math Skills
  - Basic Understanding of Physics (*Atoms, Molecules & their Parts, Energy, Waves, and Momentum*)
  - Ability to use Basic Mathematical Techniques: (*Algebra, Geometry, and Scientific Notation, Unit Conversion*)
- Basic writing (*referencing, researching, word processing…*)
- Computer Literacy: (*Web resources)*

Course Expectations

- **Textbook:** *Space and Space Travel,* by Erika Harnett and Robert Winglee.
- **Class Room "Clickers" (*required*):** Poll Everywhere
- **Class Web Site:**

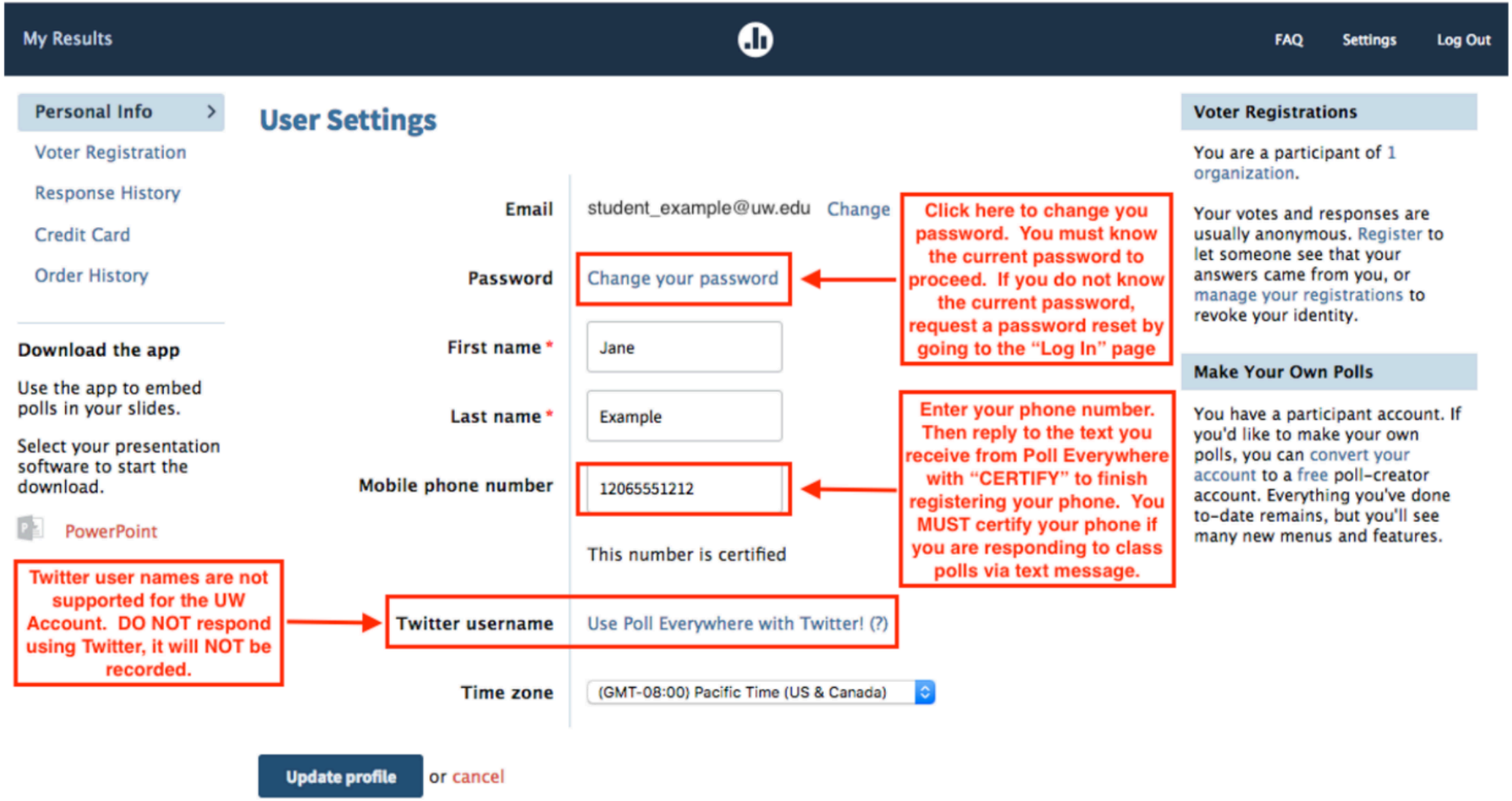
http://earthweb.ess.washington.edu/ess-102/

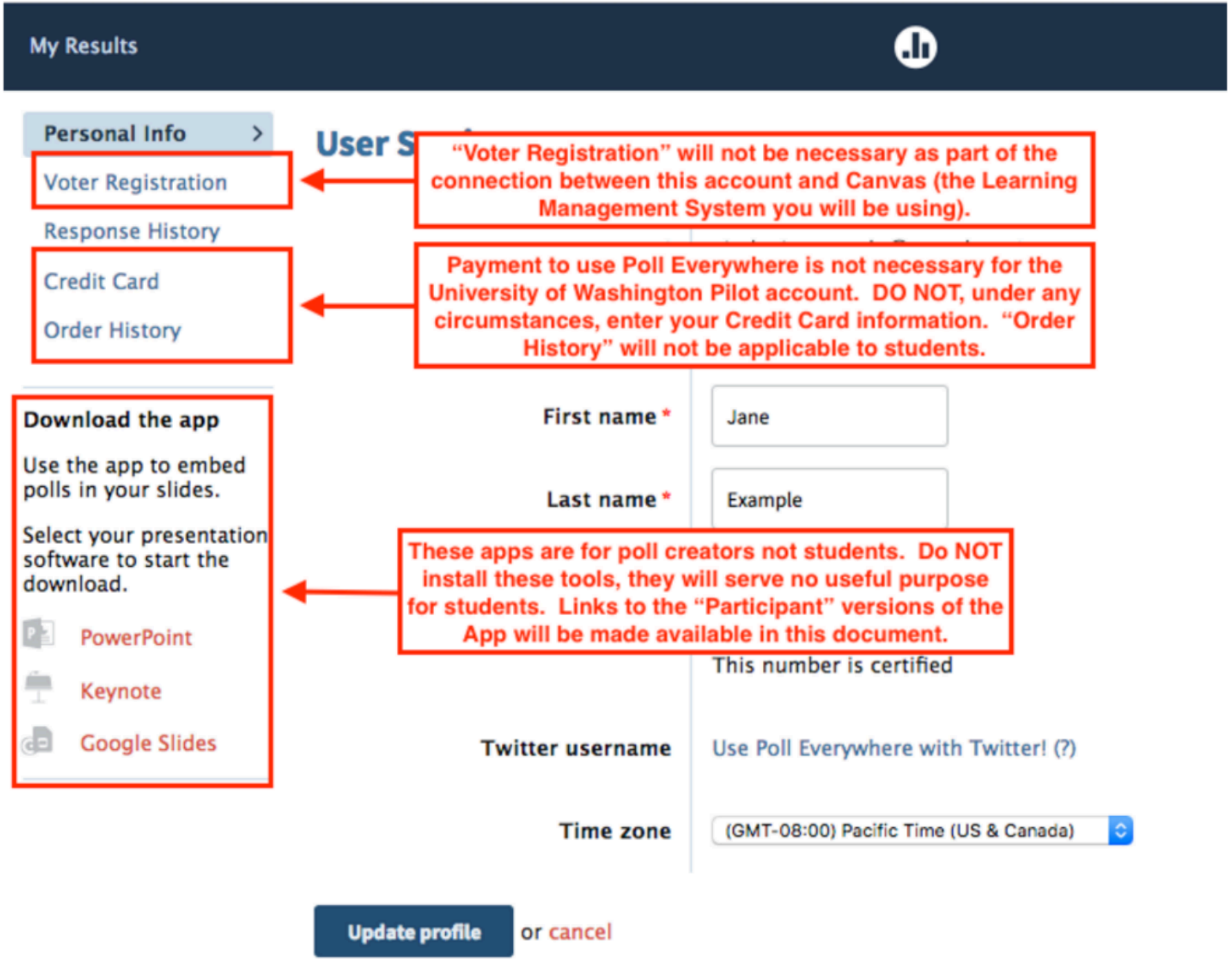
But mostly Canvas – Introduction in Lab tomorrow

Poll Everywhere

- Answer via a web login or via a text message
- https://itconnect.uw.edu/learn/tools/canvas/canvas-help-for-instructors/assignments-grading/set-up-pe-account/
- Search UW site for “Poll Everywhere Account”

Poll Everywhere




My Results
Personal Info
Voter Registration
Response History
Credit Card
Order History
"Voter Registration" will not be necessary as part of the connection between this account and Canvas (the Learning Management System you will be using).
Payment to use Poll Everywhere is not necessary for the University of Washington Pilot account. DO NOT, under any circumstances, enter your Credit Card information. "Order History" will not be applicable to students.
Download the app
Use the app to embed polls in your slides.
Select your presentation software to start the download.
PowerPoint
Keynote
Google Slides
These apps are for poll creators not students. Do NOT install these tools, they will serve no useful purpose for students. Links to the "Participant" versions of the App will be made available in this document.
First name *
Jane
Last name *
Example
This number is certified
Twitter username
Use Poll Everywhere with Twitter! (?)
Time zone
(GMT-08:00) Pacific Time (US & Canada)
Update profile
or cancel

Course Expectations

- Active involvement in the class and labs
- On-Time Submission of Assignments:
  (*Assignments submitted after the due date cannot be accepted without valid excuse or prior approval*)
- Original Work: (*Plagiarism and duplicate assignments will be referred to Dean's office; Plagiarism includes word replace from a copy and paste.*)

Illness Policy

- As always, influenza is a concern
- Do NOT come to class if you have a fever and sore throat/cough
- Contact your TA immediately to let them know (Do NOT wait for weeks after)
- Work out a plan to get caught up with your TA

Academic Conduct

- Plagiarism, cheating, and other misconduct are serious violations of the student conduct code.
- We expect that you will know and follow the UW's policies on cheating and plagiarism.
- The work you turn in must be your own, no duplicate assignments.
- Any cheating, plagiarizing, or other academic misconduct will result in a referal to the Dean’s office, even for minor cases.
- More information:
  - Faculty Resource for Grading
  - Student Conduct Code (WAC 478-120)
  - Additional Information: http://coenv.washington.edu/intranet/academics/academic-policies/academic-misconduct/

Academic Conduct

- For group projects you will still be expected to turn in individual, unique reports (unless specifically stated otherwise). This means all figures, all tables and all text must be your own work.

- All copy and pasting from another source will be treated as plagiarism, even if the source is cited.

- Homework can not be redone and turned in for a higher grade after the due date.

Disability Accommodations

- Disability Resources for Students (448 Schmitz; 206-543-8924 (V/TTY) http://www.washington.edu/students/drs/).
- If you have a letter from that office indicating that you have a disability, which requires academic accommodations, present the letter to Dr. Harnett **as soon as possible** so that we can discuss the accommodations needed for the class.

Writing Credit

- Students in A* sections are committing to W credit. Students in C* sections can OPT IN by emailing TA by second week of quarter.
- To receive writing credit, students must pass:
  1. Short Research paper
  2. Scientifically correct science fiction article
  3. Participate in two peer review sessions for each during a Friday lecture period.
- If you participate in the first part of the writing track, you will be graded in that track.

GRADING

Non Writing Credit:

1. Weekly Assignments – Lecture, In-class, Lab and web-based [35%]
2. Hands-on Projects - Water Rocket & Flagship Mission [15%]
3. Three Tests – Key Concepts [total of 35%]
4. Classroom Participation [15%]

GRADING

Writing Credit:

1. Weekly Assignments – Lecture, In-class, Lab and Web based [30%]
2. Hands-on Projects - Water Rocket & Flagship Mission [10%]
3. Three Tests – Key Concepts [total of 25%]
4. Classroom Participation [15%]
5. Additional Writing Assignments [20%]

Labs

- Two labs per week: Demonstrations, hands on activities, in-class assignments, review lecture material…
- In first lab section, you will go over Canvas and the format for assignments

Lecture

- In class lecture M&W
- Video lectures, with assignments

Assignments

- Homework
  - In-class Assignment (typically done in section):
    - One or two multipart short answer/math questions
    - Project based assignments
  - Canvas Assignments (typically due Mon. 5 AM, ***even holidays***):
    - Lecture Assignments – review concepts from lecture
    - Demo Lab Assignment – review concepts from lab
    - Computer Assignment – depth of knowledge from web
    - Video Assignments – review concepts from online lectures

Assignments

- Rocket Assignment
  - In teams design and construct a water rocket to launch an egg ~100 ft. into the air and return it safely to the earth.
  - Write a report detailing your work
- Capstone Group Project – The Next NASA Flagship Mission: group report, and poster session at the end of the quarter.

Tests

- 3 Tests (50 minutes each) with multiple choice, short answer, and simple calculations.
- Tests 1 and 2 will (tentatively) be held during lab section on January 25th and February 22th.
- Final exam during finals week – Wednesday, March 14th at 2:30-4:20 in JHN 102
- *Note: No name or test version on exams = zero grade*

Participation

- Discussion based activities in lecture
- Clicker questions in lecture (some survey, some more involved, most graded for accuracy)
- Active Involvement in lab