Project Presentations

April 25, 2023

1 Overview

For our last lab (**April 25**), each of you will present a project on an astronomy topic of your choice. We have provided a list of suggested projects and topics here, but you are welcome to come up with a topic of your own. All projects must be approved by Ryan and/or Jen by **April 11**, and no two topics may be the same, so they will be approved on a first-come, first-serve basis. This is your opportunity to explore something that intrigues *you* about astronomy and to share that in a creative way with us and your classmates – so have fun! Class on April 18th is dedicated to project preparation. We are also available by email or appointment if you would like to get feedback or do a dry-run of your presentation.

2 Guidelines

Preparation

- Select a project topic and medium and have your project instructor-approved by **Tuesday, April 11**.
- Prepare a 10-minute presentation about your project to deliver in class on **Tuesday, April 25**. If you'll be using slides, you should submit your presentation slides by midnight on **Monday, April 24** (i.e., the night before the presentations). Where appropriate, you should also include references (to, e.g., research papers, popular science articles, websites, books, etc.) in your slides; no special formatting or citation style is needed.
- Prepare a reflection on your project to submit on Courseworks by **Friday, April 28**.

Presentations

- Presentations should be **around 10 minutes in length**
- Each presentation will be followed by a **5 minute question period**
- All presentations should include a description of the science underlying your chosen topic as well as the limitations of our collective knowledge on this topic (see rubric under "Grading" section).
- For research project presentations, you should choose a topic that we have not covered in class. For your presentation, you may use any combination of slides and/or whiteboard.
- For non-research projects (i.e., projects that creatively interpret a topic we've covered in class), you should also include in your presentation:
  - A description and presentation of the project itself
  - Why you chose this specific medium and how you are using it to convey key information to your audience.

- Come ready to ask questions during and after each presentation; questions will count for a participation grade. Any type of question is welcome (e.g., asking the presenter to clarify a statement, asking the presenter for more background information, asking the presenter hypothetical questions based on relevant scenarios) – remember, there's no such thing as a bad question!
- All listeners will be required to give feedback to the presenters. On the day of the presentations, feedback forms will be provided with guided questions for giving feedback. This will count towards your participation grade as well!

Reflections

- Reflections should be **at least 1 page in length**
- Reflections should be done individually even if the project was a group project.
- Each reflection should include the following:
  - A description of the underlying science concept and how this concept is connected to previously covered course material. (2 paragraphs)
  - A description of the project itself. (1 paragraph)
  - A description of the key information you want to convey to your audience (1 paragraph)
  - An explanation of why you chose this particular medium and this particular representation of the concept, as well as a justification for why you think this mode of communication is particularly effective (1-2 paragraphs)
  - A summary of what you learned from this project and what else you would like to learn about this topic (1 paragraph)
  - If working in a group: a brief description of each group member's contribution to the project.

Grading

This project is worth 20% of your final course grade. The entire assignment will be scored out of 100 points, with 50 points for the presentation, 40 points for the reflection, and 10 points for participation. Here is a rubric [1] for the **presentation**:

Content: 70%

- (35%) Presenter introduces and describe(s) topic at level appropriate to this class [___]
- (40%) Presenter explains extent of and limitations on our knowledge of the topic, including data/observations underlying knowledge [___]
- (20%) Presenter provides context by drawing connections to, e.g., different areas of astronomy, concepts from lab or lecture, other areas of science, areas outside of science, etc. [___]

[1] Chiefly adapted from the American Astronomical Society—Chambliss award rubric.

- (5%) Presenter chooses and cites appropriate references (i.e., goes beyond Wikipedia and popular press releases). Presenter submits reference list. [___]

Delivery: 30%

- (35%) Presentation has a logical flow that audience can follow [___]
- (25%) Presenter can address reasonable audience questions [___]
- (20%) Presentation aids (slides or board-work) are understood by audience [___]
- (10%) Presenter stays within allotted time [___]
- (10%) Presenter speaks clearly, and keeps the audience engaged (with, e.g., questions, activities, etc.) [___]

[___] = easily and concisely (4), sufficiently (3), is somewhat able to (2), barely to did not (1)

The project **reflections** will be graded out of 40, with 20 points for depth/thoroughness of explanations, 10 points for clarity of writing, and 10 points for correctness.

3 Suggested topics

Please submit your proposed topics by **10 PM on April 11th**.

Below is a list of potential project media as well as a non-comprehensive list of suggested topics. You can choose something not listed, so long as it's relevant to the topics we've covered in lab (e.g., exoplanets, stars, galaxies, cosmology, etc.). If you are doing a research project, you should choose a topic that you haven't covered in depth in class or in this lab.

More focused/specific topics often yield more compelling presentations (and are often better suited for 10-minute presentations). A sufficiently specific topic would be something like "The Great Red Spot and other storms on Jupiter," while something like "Gas giant atmospheres" would require more specificity.

Example Project Ideas:

- A research project (with an associated PowerPoint and/or whiteboard presentation) on a topic we haven't covered in class (e.g., a new astronomy concept, an astronomer/scientist we haven't discussed in class, an instrument/observatory/technique we haven't discussed in class, etc.)
- A description of a museum exhibit that you'd design to teach the public about a specific concept
- A short performance, dialog, or play (with up to 2 participants)
- A visual, audio, or mixed-media art piece
- A creative writing piece (e.g., poetry or a short story)

- Culinary arts (e.g., baked goods representing some astronomy concept)

Topic Ideas:

- Galaxies (including our own)
  - Galactic dynamics (e.g., birth, growth, rotation of galaxies)
  - Supermassive black holes
  - Different theories of dark matter (or different dark matter candidates)
  - The intergalactic medium (IGM)
  - Dark matter halos and the dark matter content of different galaxies
  - Dwarf galaxy satellites of the Milky Way
  - Ultra-faint dwarf galaxies
  - Dark energy
  - Galaxy clusters
- Stars (including our Sun)
  - Interior structure and chemistry of stars
  - Asteroseismology or helioseismology
  - Stellar atmospheres or magnetospheres
  - Stellar or solar winds
  - The process of star formation (or the properties of star-forming regions in galaxies)
  - Binary star systems
  - Clusters of stars (globular clusters or open clusters)
  - Specific types of star (e.g., T Tauri, RR Lyrae, Population III (the first stars))
- (Exo)Planets
  - Solar system formation and history
  - Proto-planetary disks
  - Planet and planetesimal formation
  - Brown dwarfs
  - Exoplanet detection methods not discussed in class (e.g., microlensing, astrometry)
  - Exoplanet atmospheres
- Astrobiology
  - The Search for Extraterrestrial Life (SETI)
  - The Drake equation
  - Dyson spheres (or other hypothetical megastructures)
  - Technosignatures vs. Biosignatures
  - Communication and signal detection; candidate SETI signals
  - Breakthrough Listen or Breakthrough Starshot
- Telescopes and spacecrafts
  - Specific missions/projects (e.g., Hubble Space Telescope, James Webb Space Telescope, Kepler, TESS, Nancy Grace Roman Space Telescope, Vera C. Rubin Observatory, Thirty Meter Telescope).

  - Astronomy at specific wavelengths (e.g., Radio astronomy and very-long-baseline interferometry (VLBI), sub-millimeter astronomy, X-ray astronomy, gamma-ray astronomy)
  - NASA budget, missions, proposals (i.e., how funding decisions are made)
  - Space policy (i.e., laws governing space)
- Miscellaneous
  - The Big Bang and the early Universe (e.g., inflation, nucleosynthesis, the epoch of recombination, the epoch of reionization)
  - The cosmic microwave background (CMB)
  - Gravitational waves and LIGO
  - Compact objects (Black holes, neutron stars, pulsars, magnetars, white dwarfs)
  - High-energy explosions (Fast Radio Bursts or Gamma-Ray Bursts)
  - A biographical presentation on a famous astronomer. If you do this, choose 1-2 scientific contributions to emphasize. Some suggestions for scientists:
    * Annie Jump Cannon (spectra of stars)
    * Cecilia Payne-Gaposchkin (the composition of stars)
    * Vera Rubin (dark matter)
    * Jocelyn Bell Burnell (radio pulsars)
    * Nancy Grace Roman (stellar classification and motion)
    * Jill Tarter (SETI)
    * Sara Seager (exoplanets)
    * Caroline Herschel (comets)
    * Annie Maunder (sunspots, solar corona, eclipses)
    * Margaret Kivelson (solar wind, Europa's ocean)
  - A recent or historically significant astronomy paper (I recommend searching through https://ui.adsabs.harvard.edu/ or https://arxiv.org/archive/astro-ph, or asking me for help finding a paper).