Final Presentations
April 19

1 Overview

For our last lab (**April 19**), each of you will give a presentation on an astronomy topic of your choice. I have provided a list of suggested topics here, but you are welcome to come up with a topic of your own. If you choose to pursue any topic that's not on my list, please reach out to me for approval ASAP. To select your topic, go to this spreadsheet and enter your name and the topic of your choice. You must make your selection by **April 11**, and no two topics may be the same, so they will be assigned on a first-come, first-serve basis. This is your opportunity to explore something that intrigues *you* about astronomy and share that with me and your classmates, so have fun with your presentations!

I will be available via email or appointment if you would like to get feedback and/or additional guidance. I strongly recommend that you dedicate our usual lab period (Wednesday 6–9pm) to work on your presentation, and I will make an extra effort to be responsive to inquiries during that time. Feel free to gather in the library (I will join you there if my schedule allows it), though it is by no means required. You are expected to spend approximately six hours preparing your presentation (including background research).

2 Guidelines

Preparation

- You should submit the list of research papers, popular articles, websites, books, chapters that your presentation refers to by **5 PM on April 18**, along with your slides. References used should also be included in your presentation slides.
- It will be more rewarding for both you and the audience if you focus on a specific subtopic that you are deeply interested in, versus including a lot of generalized content that is skimmed over/simply read off your slides.

Presentations

- Presentations should be **10-12 minutes in length**.

- Each presentation will be followed by a **5 minute question period**.
- You may use any combination of slides and/or whiteboard for visual aids.
- Everyone is required to answer the following questions for each of your classmate's talk; your feedback will be given to the presenter. Printed forms will be provided on the day of the presentation.
  - What's (at least) one thing you learned and/or enjoyed from this talk?
  - What's the biggest strength of the presentation that aided clarity and engagement?
  - If you were to give the same talk, is there anything you would change to convey the ideas more clearly?
- Come ready to ask questions during and after each talk; these will count for participation. Any kind: e.g. "I didn't understand your sentence just now, as it is contradictory with your previous statement", asking for more information, hypothetical questions based on relevant scenarios, etc. will count. (More thought-out questions are, of course, better!)

Grading

Final presentations comprise 15% of your final grade; 10% for your presentation, and 5% for participation. Following is a rubric[1] that you can use to guide your preparations.

Content: 70%

- (35%) Presenter introduces and describe topic at level appropriate to this class [__]
- (40%) Presenter explains extent of and limitations on our knowledge of the topic, including underlying data/observations [__]
- (20%) Presenter provides context by drawing connections to e.g. different areas of astronomy, concepts from lab or lecture, other areas of science, etc. [__]
- (5%) Presenter chooses and cites appropriate references (i.e. goes beyond Wikipedia and popular press releases); presenter submits reference list [__]

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

Delivery: 30%

- (35%) Presentation has a logical flow that's easy for audience to 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 (questions, activities, etc.) [__]

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

3 Resources

Wikipedia is often a good place to start learning about a topic, but it should not be used as your sole reference for any facts/concepts. Virtually anybody can edit Wikipedia pages, and although references are usually provided, they aren't always reliable and/or don't always support the relevant assertions. You should verify any information you learn via Wikipedia through other, more reliable sources. (If you are unsure whether a source can be considered reliable, feel free to check with me.)

Following is a list of resources that are easy for laypeople to understand and can generally be considered reliable references:

- Encyclopaedia Britannica (https://www.britannica.com)
- NASA's science website (https://science.nasa.gov/astrophysics)
- NASA's JPL website (including https://www.jpl.nasa.gov/topics/solar-system and https://www.jpl.nasa.gov/topics/stars-and-galaxies)
- Astrobites (https://astrobites.org)
- Ethan Siegel's *Starts With a Bang* column on Forbes.com (https://www.forbes.com/sites/startswithabang/)
- Articles published in the journals Nature and Nature Astronomy (free access is available through the Columbia Libraries website, https://library.columbia.edu)

References to avoid (at least, without independent confirmation):

- Pop Sci websites (e.g. iflscience.com)
- Newspaper articles authored by non-scientists (including generally credible national newspapers, e.g. the New York Times)

Tips on how to prepare a great presentation – you may find the following links helpful:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8638955/

https://cft.vanderbilt.edu/guides-sub-pages/making-better-powerpoint-presentations/ (links to more resources included)

https://www.princeton.edu/~archss/webpdfs08/BaharMartonosi.pdf

https://blog.ted.com/10-tips-for-better-slide-decks/

Make sure to avoid plagiarism! Assign credit for all figures used in your presentation.

4 Suggested topics

Please submit your proposed topics by **April 11th**.

Following is a non-comprehensive list of suggested topics. You can choose something not listed, so long as you run it by me for approval first. It should be within the realm of gravitation/orbits, stars, the Solar System, life on Earth, exoplanets, and related topics relevant to our lab's focus area; it should be something you haven't covered in depth in class or this lab.

I recommend that you go one step deeper for most of the below suggestions.

Good topic: "The Great Red Spot and other storms, vortices, and zonal flows on Jupiter".

Not-as-good topic: "Gas giant atmospheres". This will help both you and me determine whether your topic is well-suited for a 10–15 min presentation.

- Solar System planets (including Earth)
  - surface geology and chemistry; prospects for life
  - atmospheres, climate
  - magnetosphere, magnetic field, aurora
  - rings and moons
  - Earth: formation of the Moon
- Smaller Solar System bodies
  - Asteroids
  - Comets (incl. Halley's Comet)
  - Kuiper Belt Objects
  - Dwarf planets
- The Sun
  - Interior structure, nuclear fusion, chemistry
  - Birth, life, and death
  - Deeper exploration of: sunspots, magnetic reconnection, flares and CMEs, tornados
  - Solar neutrinos
  - Helioseismology
- Planet/star formation
  - Solar System formation and history; meteorites
  - Age of the Solar System

  - Proto-planetary disks
  - Planet and planetesimal formation
  - Brown dwarfs
  - Star formation (very broad, you'll have to narrow further)
- Exoplanets and exo-objects
  - Types of exoplanets: size, mass, composition; rocky and gaseous planets.
  - Exoplanet atmospheres; chemistry
  - Exoplanet detection methods (I recommend that you cover no more than one) and future missions
- Spacefaring; Search for Extraterrestrial Intelligence (SETI)
  - Astrobiology; chemistry; the habitable zone
  - Speciation and extinctions on Earth
  - Energy usage, Dyson spheres
  - Communication and signal detection; candidate SETI signals
  - Space travel
- Telescopes and spacecraft
  - Ground- versus space-based telescopes
  - Specific missions/projects: Gemini Planet Imager, Hubble, Kepler, TESS (telescopes); Curiosity, OSIRIS-Rex, Dawn, Deep Impact, Rosetta/Philae (robots/probes); Juno, Cassini, New Horizons, Voyager (orbiters and fly-by spacecraft); many others.
  - NASA budget, mission, proposals; how funding decisions are made.

Other options:

- Biographical study of a famous astronomer or planetary scientist (you can choose your own or from the list below!). If you do this, choose at least one scientific contribution to emphasize. Make sure to cover the process by which the relevant discovery was made and the impact it had.
  - Vera Rubin
  - Subrahmanyan Chandrasekhar
  - Galileo Galilei
  - Johannes Kepler
  - Cecilia Payne-Gaposchkin
  - William Herschel
  - Caroline Herschel
  - Annie Maunder

  - Annie Jump Cannon
  - Arthur Eddington
  - Edwin Hubble
  - Andrea Ghez

- Present a scientific paper. I recommend looking at the Daily Paper Summaries on Astrobites (https://astrobites.org/). This is a blog that summarizes scientific papers at an introductory level; summaries are written by astro graduate students and aimed for undergrad/grad students alike. Other sources of brief, accessible scientific papers include Nature (https://www.nature.com/), Nature Astronomy (https://www.nature.com/natastron/), and Science (https://www.sciencemag.org/). For popular press that can direct you to interesting papers, consider https://www.forbes.com/sites/startswithabang/.