AS.171.618 Observational astronomy / Zakamska / Homework 1.

Problem 1 (0 points now, but will be worth serious points in the last homework at the end of April). **Attending seminars and colloquia and asking questions.**

One of the major advantages of being in large and dynamic place like JHU is the exposure to the astronomical community at large. You learn cutting-edge topics of modern research from world-class scientists. I strongly encourage you to attend and ask questions. To get credit for this problem at the end of the semester, you must log at least two non-trivial questions on the group google doc here (instructions included):

https://docs.google.com/document/d/1MZ_V-KFJYINJ8_yK_TWhTYlqXRKsn20LZHEm9NAlESc/edit?usp=sharing

Problem 2 (0 points now, but will be worth serious points in the last homework at the end of April). During the semester, **present any two astronomy papers** of your choice at times of your choice at the astroph coffees. Rules: pick an interesting paper; 15 minutes per paper including all the questions; focus on the main results; prioritize why the paper is interesting and why the results are interesting over the technical details. (Hint: attending astroph coffees gives you a good idea of the format.)

https://docs.google.com/spreadsheets/d/1AxfpsdVNtiubduc9sUBoqO3Yg86TU6bOxM_ASjgvrcE/edit#gid=1133528765

Problem 3 (0 points). **Honor thy constants.** Fill out the list of constants and learn them (cgs are the standard units for astrophysics literature in the US and will be the primary system of units in the class). We will be using them in class, they come up in your research, and of course they come up at your research exams and GBOs.

Problem 4 (3 points). **Observing proposals.** One of the projects we will conduct during the semester is to write, from beginning to end, a complete observing proposal. One possible option is to write a "mock" proposal -- meaning you will not actually submit anything to any telescope, but you will get to work through the proposal process for learning purposes. In this case, the facility deadline is not important. However, you may choose instead to write a real observing proposal that you will submit to the relevant facility. If you elect to do this, we don't want to miss the relevant deadline.

In this problem, I am asking you to take a very close look at the list of the proposal deadlines below and to think about whether your current research plans

would benefit from submitting an actual observing proposal for one of these facilities. In order to get credit for this problem, write one paragraph describing possible science / ideas that you would like to pursue, at what wavelength, and what are the relevant facilities / deadlines. At the end of your paragraph, you must state explicitly whether you are interested in submitting your proposal "for real" by the relevant deadline or whether you are interested in just the "mock" version. (FYI: "real" proposals are **a lot** of work. I am happy to provide feedback on text and observational design, but this proposal will be your own work, so think carefully whether a "real" proposal will fit into your plan for the semester. For reference, in the past years we typically had 1 submitted proposal per class.)

Arecibo ~March 6
Sub-mm array ~March 6
Keck ~March 15
Chandra March 17
IRAM - mid March
NOAO / Gemini ~March 31
VLT ~early March
HST - March 4
JWST - May 1, 2020
ALMA ~April 17
SOFIA ~June
JVLA ~July 31

Problem 5 (3 points). **Take rooftop telescope training.** It takes a couple of hours on an evening with good weather, needs to be done in groups of 3-4, needs to be coordinated with Jacob Hamer and Alex de la Vega. They are available most evenings in the first couple of weeks of the semester. Please schedule with them directly.

Problem 6 (1 point). How much is 1 hour of Keck observing time worth? (What was the cost to build the observatory? How old is it? What are the operating costs? How many hours per year does Keck function in the science observing mode?)

Problem 7 (3 points). Calculate the relative brightness of the Sun and the full Moon in apparent magnitudes. State your assumptions, provide references.

Problem 8 (1 point each). Observing radio-loud quasar.

(a) Use NED to find the equatorial coordinates of a radio-loud quasar 3C273. Give them both in decimal degrees and in sexagesimal notation (to about 1 arcsec precision) and show the math of how to do the conversion.

(b) What are the Galactic coordinates of this source? Is it high or low above the Galactic plane? What criterion would you use to decide? Why?

(c) Can this object be observed with Magellan? Why or why not? Would you be able to observe this source with Magellan if the source were 30 degrees further north on the sky? Why or why not? (Hint: consider airmass).

(d) You are observing this source with your favorite telescope on April 12, 2020. Use Staralt to get the position of the Moon that night (does it depend on the choice of favorite telescope? Why yes or why no?). Calculate the angle between 3C273 and the moon; show the math.