

HOMEWORK #15 (due start of class Friday, March 20) (copyright D. McCarthy)

LEARNING GOALS:

1. Continue recording observations in your journal.
2. Understand the phenomena of sporadic and Earthgrazing meteors.
3. Review your understanding of kinetic energy.

TO RECEIVE FULL CREDIT:

1. If you submit multiple pages, staple them together.
 2. To receive any credit on these problems, you must **show how** you derived your answer by writing all the logical steps that led you to it.
 3. All sentence responses must be **typewritten and in complete sentences**. You may handwrite any arithmetic. Use good English grammar.
 4. **If you work more than three hours on this assignment, you should stop, record your work here, and contact Dr. McCarthy.**
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1. Continue observing the sky (day & night) and record notes, pictures, and measurements in your journal.

Dr. McCarthy has updated the link describing journal content and requirements, on our Web site. Stay up-to-date!

Through the rest of the semester, post your **DAILY** Journal Entries to the Assignments tab on our D2L site.

You should be observing the sky and your local environments with the following tools and recording results in your journal: UV beads; spectral glasses; cardboard spectrometer; cardboard telescope; sundial; planisphere.

Equinox (March 19):

In both your Journal and on the “Discussion” tab at our D2L site, record your observations and images of sunset and/or sunrise on March 19, the Spring Equinox.

2. Questions about our new online classes

- a. Are you having any difficulties participating in our Zoom classes?
- b. Can you access D2L from your location?
- c. Share any concerns you have about our course and your grade, etc.

3. Followup about telescopes

We have learned that telescopes produce magnified images of celestial objects. The amount of magnification is proportional to the telescope’s focal length. Unfortunately, despite magnification, the images of all ground-based telescopes (4-inch diameter and above) show a blurry “speckle pattern” and have the same resolution (aka, “seeing”). So, a larger telescope does not reveal more detail.

Read the following information and write 1-2 paragraphs describing why such telescopes have limited resolution and how that limitation can be overcome with technology. You must use the following words in your paragraph: Atmosphere, diffraction-limit, wavelength, speckle, diameter.

<https://www.astronomynotes.com/telescop/s11.htm>

https://en.wikipedia.org/wiki/Speckle_imaging

4. Read the following short articles relating to “meteors”.

“Kinetic energy”:

<https://www.physicsclassroom.com/class/energy/Lesson-1/Kinetic-Energy>

“sporadic meteors”:

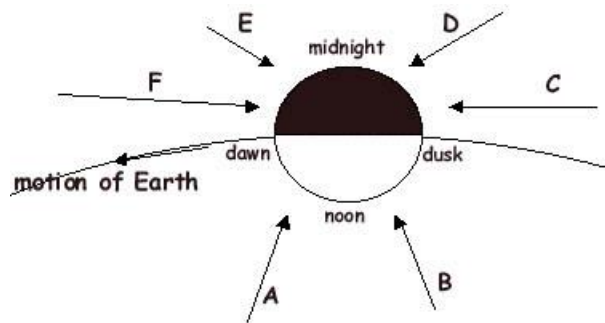
<http://www.space.com/15353-meteor-showers-facts-shooting-stars-skywatching-sdcmp.html>

“Earthgrazers”:

http://soweb.as.arizona.edu/~dmccarthy/ASTR337/files/STarticle_McCarthy.pdf

5. Questions about “meteors”.

Our Earth orbits around the Sun at a speed of 30 km/sec, as shown schematically below. Imagine meteoritic material on different orbits that intersect Earth from all the lettered directions. The maximum possible speed for material at the Earth’s distance from the Sun is 42 km/sec; otherwise the material would have escaped from the Solar System.



Source: <http://cseligman.com/text/meteors/meteors.htm>

a. Which direction produces the highest kinetic energy of impact and, thus, the brightest meteors? Why?

b. Determine the maximum relative speed of the material hitting Earth.

c. Explain why you are more likely to see meteors after midnight.

d. The Lyrid meteor shower occurs around April 22 each year. The “radiant” lies in the constellation Lyra. Use your planisphere (and/or Stellarium software) as well as the above discussion to predict the best time to see Earthgrazing meteors in the Lyrid shower.