# Project 02: Horizon Illusion

During this semester, you are given several opportunities to explore astronomical phenomena outside of the classroom. This assignment is worth a maximum of 10.0 points.

You are encouraged to collaborate on this project, but you must turn in a report that represents your own individual work.

When required, use a starwheel and/or the *Starry Night Pro™* program to plan your observations. When outside, dress warmly and be sure to observe in a safe, secure environment. Let your eyes get used to the dark for at least 10 minutes before making observations at night.

*Be persistent and patient—plan ahead and allow for contingencies, as inclement weather conditions will not an acceptable excuse for being unable to make observations.*

*Horizon Illusion*

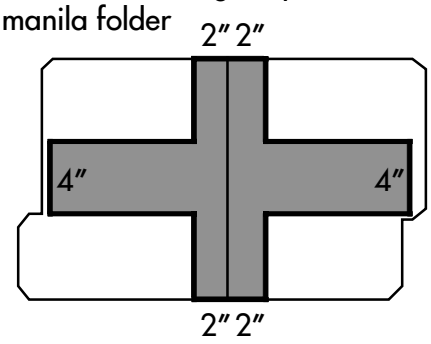
**1**. [5.0 points.] The "horizon illusion" is the phenomenon where the angular size of the Moon appears larger when it is near the horizon, while appearing smaller when it is high overhead (http://www.sandlotscience.com/Moonillusion/Moon_Illusion_Demo.htm).

(a) Construct a crossbow (instructions shown below).

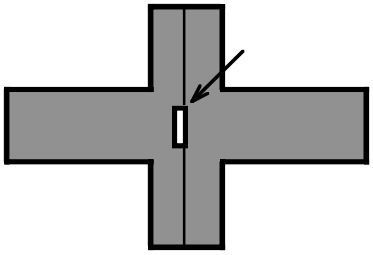
(b) Using your crossbow, make hourly observations of the full or nearly full Moon as it rises from the horizon, to when it reaches the meridian. Your data table should indicate the altitude of the Moon from the horizon (from the fist-finger method), and the angular size of the Moon (from your crossbow), for each separate observation.

(c) Discuss whether or not you are able to experience the horizon illusion with your naked eye, and then also discuss whether or not the horizon illusion is a measurable phenomenon with a crossbow.

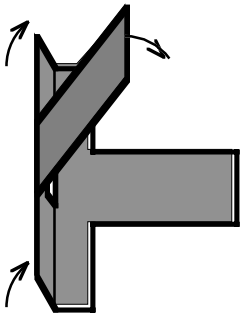
1. Cut out the following shape from a manila folder



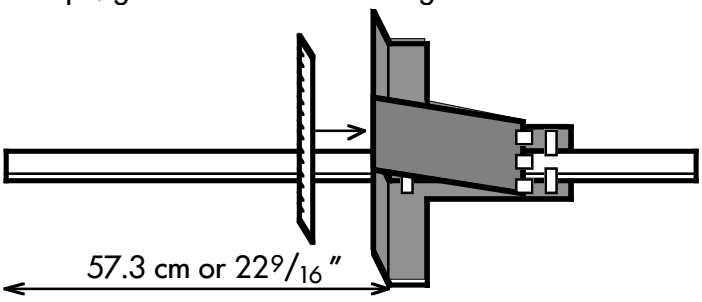

2. Cut out an opening for your meter/yardstick



3. Make the following folds



4. Securely tape down to meter/yardstick; and tape/glue cm ruler to front edge of "cross-bow"



*Project Report Format*

**2**. [5.0 points.] Your report must be typed and double-spaced. The only exception will be hand-written raw data and hand-drawn observations (if any), which you should include with your report. Presentation and creativity can be used as a complement to (but not a replacement for) carefully made measurements/sketches and thoughtful analyses. Make sure your report includes the key sections listed below.

I. *Title*
Title your project, along with your name, date and lab section number/time.

II. *Goal*
Briefly restate in a sentence (or a short paragraph) the purpose of your project.

III. *Method*
In one page or less, describe *how* you performed your experiment. It can be presented as a list, outline, diagram, or in a paragraph, and should be clear enough that an Astr 10L student who has been through this course so far, but has not done this experiment yet should be able (with some imagination) to reproduce your steps.

IV. *Data*
Depending on the type of experiment, this can be a table of measurements, sketches of naked-eye or telescopic observations, *etc*. Specifically document the date, time, weather conditions and observation locations, along with your collaborators/assistants (whether Astr 10L students or other people). Your documentation should be presented in a clear, organized format, with labels and brief explanations. Nothing should be assumed to be "self-explanatory."

V. *Analysis/Discussion*
Discuss how your data/observations are able to support a conclusion. Make sure to show your work and explain your reasoning; you are graded on the thoroughness of your analysis. This is usually the longest section of your report, but it is not required nor expected that you write an extensive, drawn-out discussion. You should focus on turning in a lab report that is "not any longer than it has to be," and strive technically and creatively to that end.

VI. *Conclusion/Remarks*
Briefly summarize the results of your discussion. Also give any guidelines for future semester Astr 10L students regarding any difficulties or interesting aspects of your project.