Independent Observing Project Description
ASTR:1070 (Stars, Galaxies, and the Universe) Lab

For your observing project, you will document your study of an astronomical object in greater detail than we've done in in lab, taking on the role of an amateur astronomer. In science, we strive to explain how we collected our data and how we analyzed it as clearly as possible. This is so that other scientists can reperform our experiment and (hopefully!) confirm our results. We communicate how we collected the observations, analyzed the data, and arrived at a conclusion as part of a publication in scientific journals. Professional journals are "peer-reviewed", meaning they are vetted by other scientists for clarity and correctness. *A goal throughout your final project is to offer enough details that your work could be peer-reviewed – if a classmate looked at your paper or presentation, they should follow it closely enough to be able to reproduce your work.*

For your project, select an object from the list below. Every group must pick a different object. You will then examine observational data of that object taken with the Iowa Robotic Observatory. All data products are contained in the LabImage directory on the computers in your lab room, and supplemental materials are available online. Assume the pixel scale of each image is 0.7"/pix. You will then produce an astronomical data product (e.g. a tri-color image or an animation) with the help of the labs performed in class. You'll lastly make a calculation based on that data, and report your results to the class and your instructor.

Table 1: Potential Objects to be Studied --

OBJECT TYPE	**OBJECT OPTIONS (backups *italicized*)**	**DATA PRODUCT**	**CALCULATION OPTIONS**
NEBULA	- Dumbbell Nebula - Orion Nebula - Crescent Nebula - Veil Nebula - Crab Nebula - Eagle Nebula - *Dumbbell Nebula* - *Crab Nebula* - *Horsehead Nebula*	Tri-color Image	Physical Size
GALAXY	- Andromeda Galaxy - Triangulum Galaxy - Bode's Galaxy - Cigar Galaxy - NGC 2903 - *Whirlpool Galaxy* - *Bode's Galaxy* - *Cigar Galaxy* - *NGC 2903*	Tri-color Image	Physical Size

ASTEROID	- Pallas (2 Pallas) - Victoria (12 Victoria) - Juno (3 Juno) - *40 Harmonia* - *76 Freia* - *228 Agathe*	Animation	Orbital Period Angular Speed

Table 2: Calculations --

CALCULATION OPTIONS	RESOURCES
PHYSICAL SIZE	Image Analysis I lab / Small Angle Formula / (/Angular Size lab)
ORBITAL PERIOD	Image Analysis II lab / JPL Minor Planet Database / Kepler's 3rd Law
ANGULAR SPEED	Image Analysis II lab / Pythagorean Theorem / Small Angle Formula