# 2005 Cluster 7 Projects

*Astronomy Projects*

**Study of Open Star Cluster**
This project will entail getting data using the Lick 1-meter telescope and producing a Color-Magnitude Diagram (CMD) of an open star cluster. For a star cluster, a CMD is loaded with scientific information. Actually getting an adequate CMD will take some computer work, but the rewards of having an actual CMD in hand will make the final days of research quite rewarding. Students will determine the age of and distance to their star cluster by the end of the program.

**Study of a Globular Star Cluster**
This project will be similar to the above one but will focus on globular clusters. The same tasks will apply: making a CMD and extracting scientific information from it. This project will nicely complement the above project since the two kinds of clusters are somewhat similar but very different in some important ways. These differences will become apparent after looking at the two types of CMDs that result.

These two project groups will work closely together to learn about stellar evolution, star clusters and observational techniques. In the end, they will compare and contrast the results from each of the star clusters.

**Galaxy Morphologies**
Galaxies are beautiful collections of dust, gas and billions of stars. In this project, you will learn about their shapes, colors and the techniques used to study galaxies. You will learn how galaxy colors correspond to their age and formation, and develop your own system for classifying different types of galaxies. Each student will investigate one galaxy of their choice using both the Lick telescope and Hubble Space Telescope. We will create true color images from data taken by each student at the Lick telescope and then compare these to images downloaded from the Hubble Space Telescope archives.

**Variable Stars Project**
As you will learn or already know, the twinkle of most stars is caused not by the star itself, but by the atmosphere. The goal of adaptive optics is to take the twinkle out of "twinkle, twinkle little star". Some stars, however, vary not because of the atmosphere, but because of something inherent to the star. This aim of this project is to observe one of these variable stars. We will discuss why stars vary, and in the process learn how this affects the appearance of a star to an observer. In addition to the observations, there will be a hands on lab and computer simulations. This is a great project to learn more about stars and to get a hands on feel for astronomy.

**Planetary Nebula**
Planetary nebula are beautiful clouds of glowing gas which surround an old, dying star. Planetary nebula have nothing to do with planets! In this project, you learn about the final stages in a star's lifecycle as it becomes a planetary nebula. We will discuss the future fate of our Sun which will one day become a planetary nebula. We will create true color images of

planetary nebula taken by each student at the Lick telescope and then compare these to images downloaded from the Hubble Space Telescope archives.

**Secondary Astronomy Project**

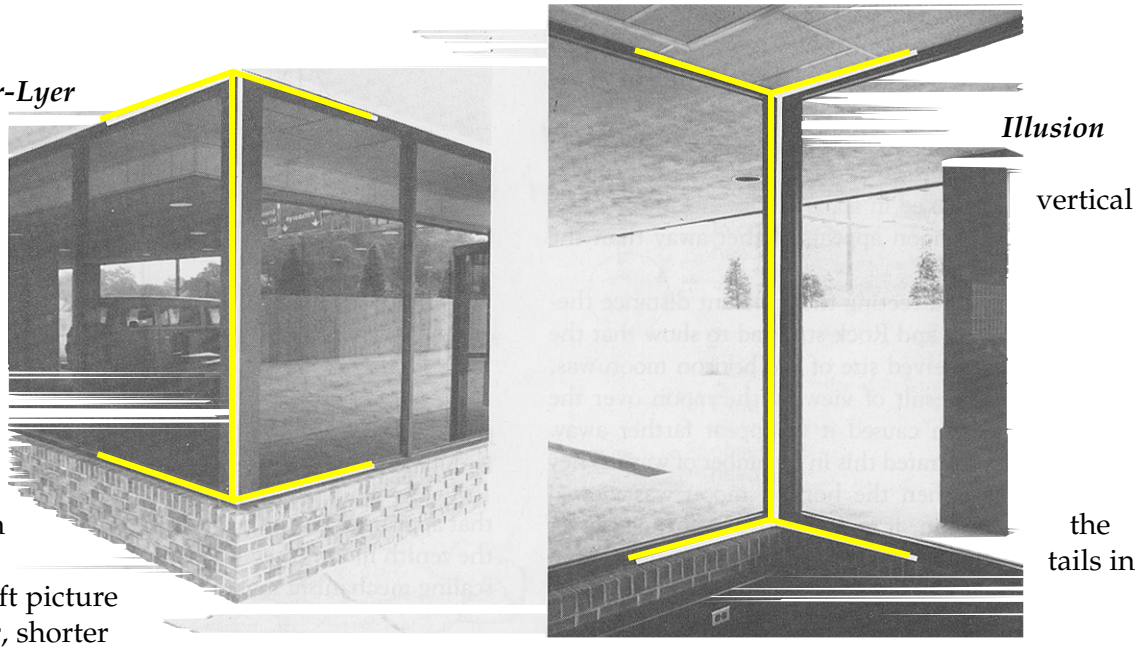
If you decide to work on a vision science project, you will still have a chance to do a smaller astronomy project. That project will include using real research telescopes just like the larger astronomy projects. In the astronomy project you will learn to ask your own questions about galaxies --- whatever you think is interesting about them --- and then learn to investigate those questions. Hopefully, this will lead you to ask even more interesting questions.

*Vision Projects*

**Visual Illusions**

Our ability to see objects in the everyday world not only depends on how well our eyes work, but also on how well our brain can interpret the information it receives from our eyes. As we get older and gain more experience, our brain begins to make assumptions about how certain objects should look. For example, let's say we have two people who are the same height, but one is standing 10 feet away from us and the other is a football field away. Even though the 2nd person who's standing a football field away *appears* much shorter than the person 10 feet away, our brain assumes that the 2nd person is not actually 1 foot tall, but must be further away from the 1st person because we know that people are not really 1 foot tall in real life. Through our experiences in life, our brain makes certain assumptions about the way things should look or where they're located and, as a result, can play tricks on us, causing us to perceive objects differently than the way they actually are.

We'll investigate some well-known illusions in our "Visual Illusions" project. In this project, you'll perform tests on your classmates and instructors to explore some factors that cause us to incorrectly perceive the appearance or orientation of certain objects. Some of the illusions we may investigate are the Müller-Lyer (pictured below), Poggendorf and Ponzo illusions. After conducting our experiments, we'll analyze the data to see which factors most influence these illusions and share the results with our group!



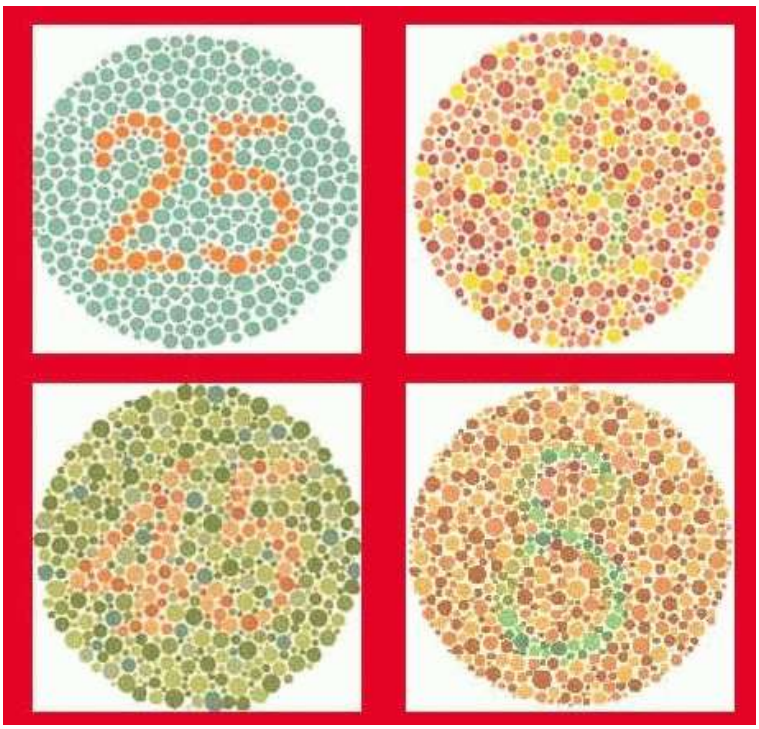

What happens to the illusion if the arrow tails become longer or shorter? Steeper or flatter?

**Color Blindness**

How is it that we see and perceive color? What separates color blind people from those who have normal color vision? Can color blind people see any colors at all? Have you ever wondered if your family and friends see the exact same color blue that you think is blue? How

do you test to see if someone has normal color vision? Or is there even such a thing as having "normal" color vision?

We' ll try to answer some of these questions in our "Color Blindness" vision project. In this project, you' llperform tests on all of your classmates, instructors and average Joe' sjust walking by to see what their color vision is like. You' llbecome familiar with and perform the same tests that your eye doctor would use to see if you have normal color vision. Some of the tests that are commonly used include the D-15 Test, the AO-HRR test and the Ishihara Plate test (pictured below). After testing the group, we'll tabulate the results and report back to everyone to let them about the color vision of our cluster!



***Ishihara Plate*** - Can you see the numbers hidden in each circle?