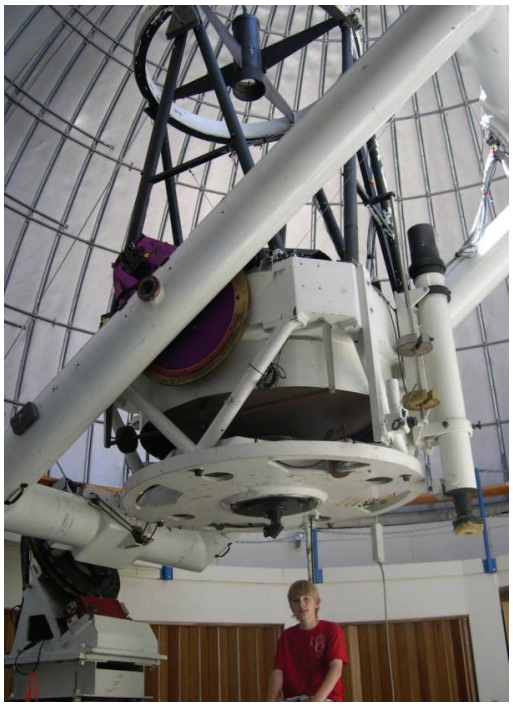
University of Arizona Astronomy Camp

By Jack Gibbons

In June, I had the opportunity to go to Astronomy camp in Tucson. We took the train from Princeton, IL, to Flagstaff, AZ, and back but that is a story for another time. Astronomy Camp is a week of fun, especially for one interested in astronomy and astrophysics, such as me. Over the course of that week, the other campers and I enjoyed the use of several large telescopes under unimaginably dark skies, as well as participating in many interesting experiments and projects. Dr. Don McCarthy, a professor of astronomy at the University of Arizona, was our head counselor, with several other counselors assisting him. We also took a trip down to Tucson to, among other things, take a tour of the Mirror Lab, a part of the University of Arizona that makes mirrors for use in the largest reflecting telescopes on Earth.



The 60" telescope is shown here with me sitting on the stepstool that you would use to reach the eyepiece.

The most obvious attractions at Astronomy Camp were the extremely good viewing conditions of the night sky and the large telescopes that we would be allowed to operate. The largest telescope up on the summit of Mt. Lemmon was the 60" telescope. This scope, as well as all of the other scopes, is moved by typing coordinates into a computer near the scope or by selecting a celestial object from several catalogs on that computer. Also, on this scope and the 61", as the computer moved the scope and dome to point at that point in the sky, it also moved a large section of the floor under the telescope up to match the level of the eyepiece, creating a platform for you to stand on so that you only needed a stepstool, rather than a ladder, to reach the eyepiece. So, if you were looking at something near the horizon, the platform would be raised pretty high up. However, if you were looking at something near the zenith, then the floor would be close to the level of the surrounding floor. Through this scope, we got many great looks at amazing objects. From galaxies to nebula to stars to planets, we saw it all. Among my favorites was the Ring Nebula. I had seen this object before, through much smaller scopes, and could hardly believe the change it undertook. When I saw it first, it was little more than a miniscule spot of color. When seen through the 60", it morphed into a huge nebula, almost filling the whole field of view, with details clearly defined and a white dwarf, the remnant of the huge star that created that nebula with its death, visible in the center. Although this was the biggest scope that we got to use every night, it was not my favorite. That honor has to go to the smallest scope, the 12". Now, I'm almost positive that you think that I've gone crazy, saying that the smallest scope is my favorite. However, there is a perfectly logical reason for this: this scope has a CCD imaging system attached. A CCD system is the modern way to take pictures through a telescope. It is a part of your average digital camera, except that when used in astrophotography, it usually takes long exposures, in order to see faint objects. Being able to create a picture of a deep sky object is very rewarding when it turns out well. For example, the favorite picture that I took was of the Sombrero Galaxy. In the picture it looked very similar to the pictures of it that had been taken by the Hubble. Now, of course it didn't have the all of the details that the Hubble reveals, but it was still a very nice picture. There was a third telescope that

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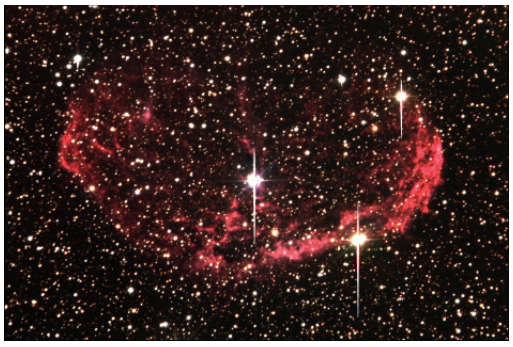
we were able to use. This was a 20" telescope, and there was little to be said about it, for although it was an amazing telescope, it had few unique features. It had no CCD, and was not the largest scope there. The final telescope that we were allowed to use while at camp was the 61" Kuiper telescope. This relatively well-known telescope was available to us for one day during our week-long stay. This was mainly because it was not on the same peak with the other scopes. Instead, it was located about 15 minutes down the slope from the peak of Mt. Lemmon.

With this camp being run by the University of Arizona, we were privileged to be able to tour the Mirror Lab. At the Mirror Lab, some of the largest mirrors on earth are created. The Mirror Lab technicians have built the Large Binocular Telescope (LBT), in which the primary mirror is made of two 8.4 meter mirrors. Currently, the Mirror Lab is working on creating the Giant Magellan Telescope (GMT). This new telescope, when completed in 2018, will by far have more light gathering power than any telescope on earth today. With its primary mirror made out of 7 separate 8.4 meter mirrors, it essentially will be equivalent to a 24.5 meter telescope. The largest telescope on Earth today is only 10.4 meters across. When we were there, we were able to witness a mirror for the GMT in the making. The Mirror Lab uses a new way of creating mirrors. Rather than grinding down a solid chunk of glass into the right size, the small chunks of glass are set into a mold and then heated while the mold is spun around a point in its center. This gives the glass a shape closer to its final form, saving time and money.



We took pictures like this one with the CCD-equipped 12" scope. This picture of the Crescent Nebula, however, was taken by the 2009 campers through the same scope.

We also got to watch, and sometimes participate in, many experiments and presentations. The most spectacular of these were the Liquid Nitrogen experiments. Liquid Nitrogen is extremely cold. Nitrogen boils at -321˚ F, as opposed to water which boils at around 212˚ F. This means that if Liquid Nitrogen touches or gets near to something hotter than -321˚, it will boil, and turn into gas. Now, when it turns into gas, it also expands rapidly. Every square inch of Liquid Nitrogen will expand to 694 square inches of Nitrogen gas when it boils. We used these properties to do some very fun experiments with it. The first experiment was the Liquid Nitrogen cannon. In this experiment, we took two 2-liter bottles and filled one with water and filled the other partway with Liquid Nitrogen. Then we put both bottles in a tube just wide enough for them to fit, with the water bottle on top. We then backed away from the tube, which was pointing straight up, while we waited for the pressure of the expanding gas to get high enough to burst the bottle. BOOM! Suddenly we saw a water-filled Mountain Dew bottle go careening over 400 feet in the air, with many 'oohs' and 'aahs' following it. Another experiment was the Liquid Nitrogen ice cream. However, it was not ice cream made out of Liquid Nitrogen, as you might expect. Instead, we combined all of the normal ingredients to make ice cream in a large bowl, with one exception: ice. As we stirred the mixture, we poured Liquid Nitrogen over it, which rapidly cooled the cream into crystals, and then evaporated off. We repeated this process quite a few times, but I lost track of exactly how many, because it was very late at night after using the Kuiper telescope. The result was delicious vanilla ice cream! The final experiment that I have room for is the spectrometer. Spectrometers are used in astronomy to look at stars and tell what elements they are made of by looking at lines of color that are separated by the spectrometer. Our spectrometer was basically a film canister with a slit cut in one end and a hole on the other covered by a sheet of special plastic designed to spit the light coming through into emission spectra, much as a prism splits light to make a rainbow. When you look through the slit end at an object emitting light, you will see lines of color, which can indicate what element is in the light-emitting source.

Now you can surely see why I had such a great time at Astronomy Camp. With all of the awesome projects, fun places, and huge telescopes, how could you not? Then, when combined with dark skies and friends interested in the same things as me, it seemed almost unreal. ♦