A Guided Tour of Several Open Clusters

By Jeff Bondono

Our tour this month takes us to three groups of clusters in the part of the sky between Cassiopeia and the bright stars of Cassiopeia. The first cluster in the tour is at right ascension 2311, which is on the meridian at about 10:40 PM EDT on October 15, or 7:40 PM EST on November 15. All of the sketches and observations were made by me using an 8-inch F6 Newtonian. See the October, 1989 WASP for a list of abbreviations used in this article, and an explanation of the table at the end.

NGC 7510 in Cassiopeia is our first stop. To get there, start at Delta Cephei, which is the E-most star of the triangle at the SE end of Cassiopeia. Grab a quick look at this pretty red and blue double, then using your viewfinder, move 1 degree N and 5 degrees E (that’s 40 minutes of right-ascension), and you should see a 30' triangle of 5m and 6m stars. Move 70' N and 5' E from the E-most of those 3 stars and you’ll see NGC 7510, a small dazzling jewel of a cluster. At LP, it will appear as a faint oval-shaped 25 by 1' fuzzy patch of about 8m aligned from SW to NE. At HP, I see 24 stars, the brightest of which is a 10m red star. The bright stars in the cluster form a Y-shape.

Two clusters are very easy to find once you’re at NGC 7510. Both are faint clusters, though, so beginners may wish to skip them. 25' W and 5' S of NGC 7510 is an 8' triangle of a 9m and two 10m stars. King 19 surrounds the E-most (the faintest) of those three stars.

It is invisible at LP, but HP shows a 5' grouping of ten stars. Markarian 50 is the other easy cluster to find from here. Go back to NGC 7510, and move 30' E and 10' S and you’ve got it. At LP, it is a 1.5' triangle of one 9m and two 10m stars. HP will show several stars within this triangle. This cluster happens to lie right on the border between Cepheus and Cassiopeia. The rest of our tour will be within Cassiopeia. Before you leave this area of the sky, be sure to get a glimpse of the pretty red-green double shown on the NE comer of my area sketch of NGC 7510 / Markarian 50/King 19.

To get to our next set of clusters, move back to NGC 7510, then move 10' S and 60' E to a 7m star which is part of a 30' triangle of one 6m and two 7m stars. Move onto the 6m star (the SE-most star of the three), then 20' E, then 90' N. You’ll run into NGC 7654, which is M52. Don’t worry about missing this one...its an obvious cluster which jumps out of the field of stars as you sweep to the N. M52 is a 13' gorgeous smattering of at least 40 11m and fainter stars surrounding one reddish 8m star. It reminds me a lot of the appearance of NGC 6705 in Scutum, the Wild Duck Cluster. Most of the fainter stars are on the SE side of the bright star. Burnham says the cluster is 10-15 light-years in diameter. The density of stars in the center of the cluster is near 50 stars per cubic parsec (contrast that to about one in the solar neighborhood). 40' SSE of M52 is a 7m star, which is shown on the SE edge of my sketch of the M52 area. Half-way between M52 and that star is Czemik43, a 15' mass of about 30 faint stars. It contains quite a mix of bright and faint stars.

To reach our next set of clusters, go back to M52. Move about 150' E and you will reach a 6m star. 60' ENE of that star lies the greenish 5m star 6 Cas. Both of these stars appear on my drawing of the NGC 7788 area, which houses the rest of the clusters in this tour. Instead of giving specific directions to each cluster, just use that area chart to find your way to the various clusters. Stock 17 is a 2' cluster which shows eight stars at HP. King 12 shows about 20 stars in a 7' area, but since the catalogued size of the cluster is only 2', I’d assume that the true cluster consists only of the several 13m stars surrounding the 10m doublet. Harvard 21 is a 4' grouping of 8 stars, 5 of which are a house-shaped grouping of 13m stars. NGC 7788 is a pretty condensed grouping of about twenty 10m to 13m stars in a 7' area. Notice the intense concentration of stars toward the center of the cluster. I count 11 stars in the central 1'. Frolov 1 is a 2' nebulous spot in a LP eyepiece, but HP resolves it in to one 11m and five 13m stars in the shape of the letter V, with the vertex pointing WNW. NGC 7790 is a gorgeous prominent glow at LP. I see a 5' first-class thumbprint of at least twenty stars when I use HP and averted vision. I have no explanation for why the catalogued size is 16.5' but I see a 5' cluster, but it should be noted that source 2 lists it as a 5'cluster. Berkeley 58 is a grouping of one 12m star and...
The Warren Astronomical Society, Inc., is a local, non-profit organization of amateur astronomers. The Society holds meetings on the first and third Thursdays of each month, starting at 7:30pm

1st Thursday - Cranbrook Institute of Science
500 Lone Pine Road
Bloomfield Hills, MI

3rd Thursday - Macomb Community College
South Campus
Building B, Room 216
14500 Twelve Mile Road
Warren, MI

Membership is open to all. Dues are as follows:

Student .... $10  College .... $15  Senior Citizen .... $15  Individual ....$20  Family .... $25

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Observatory Chairman: Robert Halsall / 781-6784

Stargate Observatory is owned and operated by the Warren Astronomical Society in conjunction with Rotary International. Located on the grounds of Camp Rotary, Stargate features a 12.5 inch club-built Cassegrainian telescope under an aluminum dome. The observatory is open to all club members in accordance with the "Stargate Observatory Rules". Those wishing to use the observatory must call the Observatory Chairman by 7:00 pm on the evening of the session.

Lectures at Stargate:

Lectures are given at Stargate Observatory each weekend. The Lecture will be either Friday or Saturday night, depending on the weather and the lecturer’s personal schedule. Lecturers should check with the ranger at Camp Rotary early in the week to determine whether the scouts will be staying at the camp, and to inform the ranger of the day and time of the lecture. If you cannot lecture on your scheduled weekend, please make arrangements to switch weekends with another lecturer, or call the chairman as soon as possible. The lecturers for the coming month are:

Russ Patten  Oct 20/21
Frank McCullough  Oct 27/28
Dan Cwiertniewicz  Nov 3/4
Jeff Bondono  Nov 10/11
Francis Stabler  Nov 17/18
Riyad Matti  Nov 24/25

Coming Attractions

November 2  Monthly Meeting at Cranbrook Institute of Science
November 9  Cosmology Sub-Group meeting, contact Mike for details.
November 16  Business Meeting at Macomb Community College
December 7  Monthly Meeting at Cranbrook Institute of Science
Minutes

MACOMB MEETING-SEPT. 21, 1989

The meeting began late (8:01) this evening, since the class already in the room lasted until 7:45. It looks like this will be the pattern through this school term.

- The main item of business was taking nominations for the elections to be held in October. Mike O’Dowd was nominated for First VP, and Roger Bristol for Secretary, but they both wanted to consider this before accepting. Jeff Bondono volunteered for the position of Treasurer.

Marty Kunz mentioned the upcoming Star Trek convention on Oct. 14-15. Members are encouraged to show up for solar observing due to the good response we have received before. Marty also showed some solar photos he took using his new hydrogen-alpha filter, with several prominences visible. This was followed by discussion of an impressive aurora on the 17th.

Dan Cwiertniewicz is starting an "Ask the WASP" column for the newsletter. Members who have questions about astronomy can drop them in the box at meetings, and answers should appear in future issues.

The evening’s program consisted of a talk by Scott Jorgenson on orbital elements. These are the bits of information that allow the position of an orbiting object to be determined. The talk was accompanied by an amusing demonstration by our own heavenly bodies, Riyad Matti and Beverly Bakanowicz. Thanks to all concerned.

CRANBROOK MEETING-OCT. 5, 1989

Marty Kunz called the meeting to order at 7:45, and things got under way five minutes later. The library received donations from two members—two space music tapes from Mike O’Dowd and two copies of Timothy Ferris’ Coming to Age in the Milky Way from Ed Cressman. Ed was also named the new solar group chairman—congratulations!

Alan Rothenberg reported on the recent conference he attended in Ohio. The featured guest was Jack Horkheimer, who gave a great speech.

Several members had photos and other items to show. Ken Strom showed an ad for a CCD camera. It still has to be tested for astronomical use, but at approx. $200, it might be considered. Jeff Bondono had a #14 welder's filter—useful for naked-eye solar observing. Jerry Stager showed slides from his trip to Yerkes Observatory. A very nice-looking facility, but the tour staff didn’t seem very knowledgeable. Brian Orser brought his slides of the recent aurora, and Marty followed this with some hints on how to shoot such a display.

Announcements!

Solar Group Reorganization!

The Solar Group has reorganized with Ed Cressman as Chairman. Monthly meetings will be held at Ed’s home on Saturday or Sunday afternoon’s. Ed lives at 30540 Pierce—between 11Mile and 12Mile Roads in Southfield. Pierce is mid-way between Southfield and Greenfield Roads. Anyone interested can call Ed during the day at 574-8660, or at home after 5pm at 645-1837.

Ed Says you don’t need a scope or filters to join in the fun. He has a C-ll with a Hydrogen-alpha filter. For a starting project the group plans to systematically log Zurich numbers and submit monthly reports to the Solar Division of the American Association of Variable Star Observers.
about twenty 13m stars in a 5' area. According to reference 1, the brightest star in the cluster is 15m, but I'm pretty sure I have the correct location and it definitely looks like a cluster to me, even though my limiting magnitude is between 13m and 14m. Before you leave this part of the sky, take one last look at the entire LP field starting with this cluster and extending to the NW. You may be able to fit all of the clusters from King 12 through Berkeley 58 in one LP field. Although some of these clusters are sparse and/or faint, the area may look like beads on a string.

Observing tip: Use "averted vision" to see the faintest things possible. To do this, instead of looking directly at an object, look slightly away from it but concentrate on the object. The part of your eye just off-center is more sensitive to faint light than the central part of your eye. In my eye, the faintest stars are best visible when I point my eye toward the side of the object which is farthest from the bridge of my nose. Experiment and learn where your best spot is. Try both eyes—the eye you don't normally use at the scope may be able to see fainter stars using averted vision.

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Sources:
2. Burnham, Robert J.; Burnham’s Celestial Handbook; Dover Publications; 1978
4. Alter and Ruprecht; Atlas of Galactic Clusters; Czechoslovakia
JOURNAL ROUNDUP
By Scott Jorgensen,

Satellites are definitely in the news lately. Voyager got all the attention in the media, but in fact several satellites have had been sending back interesting data. Unfortunately Galileo isn't the only satellite with problems; Hipparcos is having serious trouble. Hipparcos is an ESA astrometric satellite. Its mission: to plot the positions of thousands of close stars several times in order to greatly improve estimates of their proper motion (that is to say, their motion through space). Unfortunately the upper stage of its booster failed to ignite and the course correction motors had to be used to place Hipparcos in an elliptical orbit. At this time it appears that about 20% of the mission can be saved. But there is still one looming problem, what will happen when the earth eclipses Hipparcos; will the solar powered satellite survive a much longer than expected dark time? Lets hope so.

Amateurs were mentioned in "Science" last month. Twenty hours of time on the Hubble Space Telescope have been released to amateurs. The names of these lucky people were not released, but some of the projects were. Among the projects are a hunt for protoplanets in nearby star forming regions and a study of frost formation on 10. The time on the HST comes out of Director Giacconi's discretionary time, usually used to cover unplanned events like supernovas.

Remember the Russian Phobos space probes? Phobos 1 was lost due to human error, but Phobos 2 was lost during automatic operations. The folks at Babakin, the control center for Phobos, have determined that an on board computer failed. However, they have managed to unscramble the last message sent back and it is spectacular. The picture is a thermal image of Valles Marineris that shows a great deal of difference in the warmth of different various rock forms. The volcanoes near the valley show up beautiful and you can even see the shadow track of the moon Phobos since the ground is cooler where the shadow has passed over Mars. This is a lot like the mild cooling during a solar eclipses here. Its a shame this is the last picture we will get from Mars for some time.

Supernova 87A was back in the journals again. You will remember that the pulsar left after the explosion is the fastest ever found, and much faster than the accepted theory can account for. Well Dr. Duncan of McDonald Observatory has shown that radial pulsation, son of like the breathing motion seen on the sun, will account for the fast pulse rate. One prediction of the new model is that the intensity of the pulses will fade in just a few years. Since no one has seen the pulses in several months, his theory may be proven. This does not mean all pulsars work this way.

The standard model of a rapidly spinning star sweeping a narrow but intense light beam across space is still the explanation for almost all known pulsars. Last month we had radar images of Titan. This month its microwave imaging of Saturn's rings. Using the VLA, a group from New Mexico has shown that the A and C rings are made up mostly of particles 1/4 to 1 inch across, while the B ring is made of bigger particles. Cassini's division has almost none of the smaller particles. The amazing thing is that all this was determined from a couple billion miles away. The real reports on Voyager won't be out for a while, but some photos were released. Neptune's weather is very interesting, especially as it was supposed to be too cold to have weather. The ring sausages were pretty interesting too. It is too early to know if any of the theories put forth to explain ring arcs will explain all or the ring sausages.

As interesting as Neptune was, Triton was the real find. Like Miranda at Uranus, Triton has every sort of terrain possible. There are roughly circular depressions in ordered arrays, there is the "cantaloupe" terrain that is possibly due to faulting, long plumes possibly due to liquid nitrogen eruptions cover other pans of Triton, and flooded craters are found in other areas. A spectacular last find from satellite that showed us a solar system we never quite expected.

Clear Skies!

Plumes

Circles
Comet Aphelia and Planet X
By: Ken Kelly

One of the reasons that Percival Lowell thought that his Planet X existed was that the aphelia of several comets seemed to be concentrated at a distance from the sun of about 50 A.U. (Astronomical Unit). By referring to Brian Marsden's "Catalogue of Cometary Orbits", one can find the aphelia of long period comets, and see exactly where they accumulate. It is a well known fact that comet aphelia (point of maximum distance from the sun) tend to bunch up near the orbits of all four gas giant planets in the solar system. Then a logical extrapolation of these data should give a starting point for a search for planet X.

We shall omit the discussion of the Jupiter family of comets because his number of comets is too voluminous for our discussion. We shall use Marsden's table 1A and 1B on page 69-70 of his catalogue. The following table gives the pertinent facts.

The average distance of the nine comets in the Neptune family is 1.1 times the mean distance of Neptune from the Sun. Using the same ratio for Planet X, we conclude that it should have a mean distance from the Sun of about 50.6 A.U.

Pluto is in a 3/2 resonance with Neptune, i.e., Pluto goes around the Sun twice in the same time that Neptune goes around three. As can be seen from the above table, Lowell was probably using a 2/1 resonance with Neptune as his starting point. The difference of about 3 A.U. between Lowell's starting point and the comet aphelia makes little difference in view of the uncertainties involved. Planet X could very well have a 2/1 resonance with Neptune; the comet aphelia fit as well. Calculation of the mean daily motion of these hypothetical orbits shows that it should be about 10 seconds of arc per day.

I am assuming here that Pluto was discovered as a by-product of the search for Planet X, and that Lowell's Planet X remains to be discovered. Lowell used the pre-1900 observations of Uranus to predict, the one at the place of Planet X. In computing the orbit of Uranus, the U.S.N.O. does not use these observations, because...

If the observations of Uranus from 1830 to the present were fitted, there would be a systematic deviation from 1980 forward ... Therefore, the Uranus ephemeris is based on observational data from 1900 onward. The ephemeris differs from the pre-1900 observational data by a periodic and secular deviation. (Astronomical Almanac for 1984, page S28)

It's quite likely that Lowell interpreted this "periodic and secular deviation was due to an attraction from Planet X. In fact, he used precisely these observations of Uranus, from 1830 to 1900 as the basis for his calculations. This attraction could not have been caused by Pluto. Although the U.S.N.O. does not state that the cause of the deviation, it is, nevertheless, real.

It is interesting to speculate where this planet is now, so the last column of table 2 is of some interest. This is synodical period of these hypothetical planets with respect to Uranus. It is unknown just when Uranus would have passed Planet X, or at what distance, but if it passed around 1890, Uranus should be close to it again around the year 2000. Lowell's calculated elements for Planet X are tabulated on page 140 of Hoyt's book. He gives two possible heliocentric longitude 84 degrees being the favored one, and the one where Pluto was actually found. Using roughly a period of 360 years for Planet X, it should move about 1 degree per year, and the 75 year period since July, 1914 should put it at a longitude of 159 degrees at the present time. This would put it in the constellation of Leo.

References:

Table 1

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Table 2

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