NOVAC

THE NEWSLETTER OF THE NORTHERN VIRGINIA ASTRONOMY CLUB

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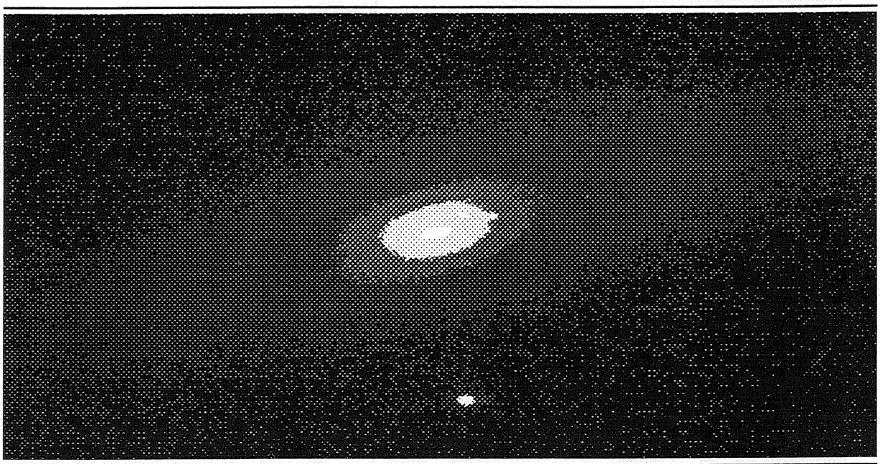
Inside this Issue:

Deep in the Virgo Supercluster: Supernova in NGC 4526



Editor's Note

by Thomas S. Parry

The last two months have brought blessed relief from the long dreary winter and produced some of the most beautiful nights for observing that we've had for a long time. It seems almost every observing night out at Crockett Park has been jammed with observers. Even non-observing nights have been scheduled and well attended. Its like NVTM every other week or so! And the astronomical fare has been fabulous. Besides all of the usual deep sky delights, we've seen two supernovas erupt in distant galaxies and the appearance of a bright comet. There were also reports of an aurora visible in the northern skies from Crockett Park early in the morning hours of April 17 long after the Astronomy Day crowd had dispersed.

This indeed is a great time of the year to be out observing. For planetary observers, Jupiter will have reached opposition by the time this issue goes to press and will provide continual excitement before and after its scheduled rendevouz with fragments of Comet Shoemaker-Levy 9 in late July. For deep sky aficionados, May and June evenings afford us spectacular views of the inumerable distant galaxies in the Virgo Supercluster. It was a thrill on the evening of April 8 at Crockett Park to view a supernova in the distant galaxy NGC 4526 (pictured above) with telescopes ranging in size from eight to eighteen inches aperture for comparison purposes. Using averted vision under steady seeing conditions, the supernova appeared as a faint bulge on the periphery of the galactic nucleus. Part of the challenge was just identifying NGC 4526 among the many galaxies in the heart of the Virgo Supercluster. Believe me, this is where good star charts really pay off!

The last couple of Crockett Park nights found a number of us spying yet another supernova in the familiar Whirlpool Galaxy M-51. Although visible in eight-inch and larger telescopes using averted vision, this supernova, like NGC 4526, posed a challenge because of its proximity to the galactic nucleus. When the atmosphere calmed down and conditions were just right, the supernova was unmistakeable.

Another exciting object was comet

McNaught-Russell. Shining at about seventh magnitude in the constellation Auriga, this comet was an easy target for all of us at Crockett Park and provided a nice attraction for the throngs who descended on our observing site for Astronomy Day. I was amazed to observe how fast the comet had moved in just one week. From the lower right-hand portion of Auriga's pentagon on the evening of April 8, McNaught-Russell moved to a position near "the kids" and Capella by April 16.

Let's hope that the rest of the spring and upcoming summer months are as beautiful and clear as March and April have been for observing—especially for the upcoming annular eclipse May 10 and partial lunar eclipse on May 25. Clear skies to all!

Highlights of March and April General Membership Meetings

by Marta Krause, Secretary

General Meeting March 16, 1994

Bob L'Hommedieu called the meeting to order at 7:30 pm. Thirty-one members and guests attended at the Arlington County Planetarium.

Announcements

1. The NOVAC library is now located in the Arlington Planetarium. See Linda Thomas, NOVAC librarian, to check out books. A volunteer is needed to serve as second librarian. Any books or other astronomy-related photos or materials that members wish to donate to NOVAC's library will be gratefully accepted.

2. NOVAC's regularly scheduled observing session on April 16 is open to the public as part of the Astronomy Day commemoration. Announcements of the event have been sent to the media and flyers are being distributed to advertise the occasion. All members are encouraged to attend and to bring their telescopes.

3. A survey of NOVAC members is planned for June. The information gathered by the survey will help club officers with short-term and long-term planning for NOVAC. All NOVAC members are encouraged to participate by responding to the survey.

4. Jon Stewart-Taylor has secured an auxiliary observing site at Parsells Field near Waxpool, ten minutes from the Herndon/Reston area. Observing nights are scheduled twice monthly closest to first and last quarter moon so as not to conflict with those scheduled at Crockett Park. Unscheduled nights may be added later. NOVAC expresses thanks to Jon for obtaining this site.

5. Myron Wasiuta ~~recommended~~ *Observatory Techniques* magazine, for those interested in CCD imaging. Also, Myron mentioned that an article in the *Journal of Lunar and Planetary Observing* reported that a gaseous outburst on the moon's crater Tycho occurs fairly regularly when the sun sets on the crater. Researchers are currently doing spectroscopic analyses and will report the results in the next issue of the journal.

6. Sandy Sanders suggested that NOVAC provide public service announcements on safe viewing techniques for the annular eclipse on May 10. The matter will be addressed at the executive committee meeting in April. Sandy volunteered to draft language for the proposed announcements.

Officers' reports:

7. Marta Krause requested volunteers to provide children's programs to the Fairfax County School-Age Child Care Summer Program, whose theme this year is *space*. Also, a troop of Tiger Cubs in Springfield, interested in earning their stargazing badges, would like to find a NOVAC member with a telescope to do some observing one night before the end of May. Anyone interested should contact Marta.

8. Brenda Jones reported that the March/April newsletters were mailed today (Mar 16). In addition: The Nature Company in Georgetown has asked any members interested in following in John Dobson's footsteps to come set up their telescopes on the sidewalk outside the store. Anyone interested should contact Brenda.

9. April 16 is Astronomy Day! Mark your calendars and bring your scopes! NOVAC will share Crockett Park with a troop of scouts camping that night. The scouts have requested that someone from NOVAC make a presentation about astronomy. Sandy Sanders volunteered to speak to the Scouts.

10. There is now a second contact person at Crockett Park besides Gary Kwolek. His name is David Petty. NOVAC members wanting to observe on an unscheduled night must speak with either Gary or David to obtain permission before going to the park.

11. ~~The Atlanta Astronomy Club is holding~~ the Peach State Star Gaze on April 7-10, 1994. Flyers are available; see Brenda. The Cape Fear Astronomical Society in Wilmington, NC offers information about photographing the night sky without magnification, using an ultraviolet and light pollution reduction filter pack. The technique yields 35mm color slides, which are then viewed under a microscope at magnifications of 50x to 500x with additional color photography through the microscope. Anyone interested in more information should contact Brenda.

12. Jupiter Watch is scheduled at the Naval Observatory for July 21, with a July 23 rain date. NOVAC members are encouraged to bring their telescopes and participate in the observations.

Old Business

1. A club picnic is being planned for June at Crockett Park on a regularly scheduled observing night. NOVAC will probably rent a large picnic shelter for the occasion. More details will be forthcoming.

New Business

1. A change to the bylaws has been proposed. Currently, Article Two - Financial Protection reads: *All checks must be signed by two trustees.* The proposed change reads: *All checks over $300 must be signed by two trustees.* The proposed change to NOVAC's bylaws would allow Treasurer Brenda Jones to handle NOVAC's routine expenses without the inconvenience of obtaining a second signature. NOVAC's regular expenses -- club insurance, Astronomical League dues, printing and postage -- all fall under $300. NOVAC bylaws require that proposed changes be read at one meeting, published in the next newsletter, and voted on at the following meeting. We will vote on this proposal at the May general meeting. With some discussion, members voiced general approval of the proposed change.

Member Presentations

1. Bob Sandy shared slides of astrophotos he had taken at previous observing sessions at Crockett Park. The photos included images of the first quarter moon, M41, M44, M33, and M51.

2. Sandy Sanders briefly reported his participation in a Messier Marathon.

3. Fred Holmes briefly mentioned observing at Lake Erie in Williamsport, PA. Fred is also interested in speaking with any members who are interested in buying a large quantity of observing glasses for the upcoming annular eclipse.

4. Brenda Jones reported reading a biography of Russell Porter, the father of the amateur telescope making movement in the United States. Porter also founded the Stellafane convention. The book is available through Sky Publishing. Brenda also spoke about observing on March 11 from her cabin, twenty-one miles

from Monticello. It was an extraordinarily clear day. With her binoculars, she could see Monticello's columns and windows.

5. Tom Parry requested submissions for the May/June issue of the newsletter no later than April 15. Also, anyone interested in offering their images or photos for the newsletter should contact Tom -- the newsletter can now handle digitized images.

6. Jon Stewart-Taylor, author of the *Recreational Astronomer* column in the newsletter, asked members present to fill out a survey regarding their interest in and opinion of the column.

The observing report was given by Jeff Stetekluh, who mentioned the Lyrid meteor shower on April 22, and the appearance of a supernova in a galaxy in Virgo. The program was given by Kathleen Stewart-Taylor, who spoke about "Sharing Astronomy With Children," addressing why astronomy should be shared with children, safety considerations, techniques to use with children, and age-appropriate astronomy activities.

General Meeting April 20, 1994

Vice-President Ron Ferris called the meeting to order at 7:30 pm. Thirty-five members and guests attended at the Arlington County Planetarium.

Announcements

1. George Uhl's wife recently gave birth to their first child. NOVAC expresses its congratulations to the Uhls on their new arrival!

2. Bob Bunge reported on progress made by a group of amateur astronomers with representatives from Disney regarding its proposed theme park development in Haymarket, VA. The group of astronomers from Hopewell Observatory, NOVAC, and National Capitol Astronomers generated a statement for a meeting with Disney requesting that the company consider astronomy-friendly lighting for the park. Bob reported that Disney seemed receptive, took the request seriously, but didn't promise anything. The group's efforts are receiving publicity, including an article on page A6 of today's (April 20) *Washington Post*, and interviews with Bob Bolster from the Hopewell Observatory on local radio stations.

3. Astronomical League certificates were presented to Brenda Jones and Sandy Sanders for their binocular observations of more than 70 Messier objects. Congratulations to Brenda and Sandy for their accomplishments.

4. May's NOVAC program will be a swap meet. Members should bring equipment that they are interested in trading or selling!

Officers' reports:

5. Marta Krause reported that: a) NOVAC member Scott Bush has offered to hold an observing session for the Springfield Tiger Cubs to help the troop earn astronomy badges. NOVAC thanks Scott for his time and willingness to assist in NOVAC's efforts to provide educational opportunities to the public. b) The Amateur Astronomers Association of Princeton is holding the Fifth Annual Jersey Starquest in Sussex, NJ from Friday June 10, to Sunday June 12. Anyone wishing additional information should contact Marta. c) The Fairfax County School Age Child Care (SACC) program is still looking for individuals to offer presentations to children in grades K through 6 for its summer program, which has *space* as its theme. Anyone wishing to help should contact Marta.

6. Brenda Jones reported that Steve Smith, director of the Arlington Planetarium, is looking for volunteers to accompany Arlington secondary school students on observing field trips May 4 or May 11. Volunteers will help children find objects in the night sky and provide general astronomy information. Anyone interested should contact Brenda.

7. Steve Kesterer has offered to serve as second librarian for NOVAC's library. He will be available to check out books to members at the monthly membership meetings.

8. Ron Ferris reminded members that June's NOVAC meeting may be of interest to older children. Linda Schramm, curator of meteorites at the National Museum of Natural History will be speaking.

Old Business

1. Astronomy Day, held Saturday April 16, was a success. About 30 members brought their telescopes, and observing was good, with very few clouds. Between 150 to 200 guests, including students from George Mason University, came to ask questions and view many different objects, including Jupiter and some of its moons, the Orion nebula, Venus, star clusters, and a supernova. After the moon set around 12:30 A.M., an aurora was visible to remaining astronomers and guests.

2. A club picnic is still in the planning stages; more details will be announced as they develop.

New Business

1. Astronomical League guides to *Observing the Herschel Objects* are available from Doug Mistler for $6.00.

2. *The Non-Existent Star Clusters of the RNGC*, by Brent Archinal, is available for $9.50. This guide will provide months and years of observational challenges for amateurs.

Member Presentations

1. Ron Ferris described his efforts to silver a 40-year old telescope mirror, which was displayed.

2. Bob Bunge passed around a satellite image he obtained showing light pollution in the night sky of Northern Virginia. Bob obtained the image over the Internet

The program was given by Paul Geithner, the COSTAR Instrument Manager from NASA's Goddard Space Flight Center, who spoke about the optical problems discovered on the Hubble Space Telescope and the recent rmisson to repair the optics, solar panels, and other equipment on the telescope.

President's Column
by Bob L'Hommedieu

This warm spring weather is just the thing we need after the terrible winter we had. The next few months are the prime observing time for us here in Northern Virginia. There will be a lot of people using Crockett Park between now and October. I think we should all take a few minutes to review the rules we live under out at the Park.

We are guests of the Park and we can use it only at the pleasure of the Rangers in charge out there. Two years ago we almost lost our privileges because of an unfortunate incident caused by people who came in when we left the gate open one night. We have no other dark sky site at this time so losing the Park would be a terrible blow to NOVAC.

Now that we are in daylight savings time, we are only allowed to use the grassy field above the paved parking area. We are not allowed to use the other Park facilities after dark. The Park is officially closed at sunset, so please close the gate if you arrive or leave after dusk. Remember that all pets must be on a leash at all times. The Ranger and his family live on Park property about 100 yards from our observing site. We should always be respectful of their peace and quiet. Alcohol is never welcome at Crockett Park and is strictly prohibited.

If you are new to observing, then you may not be aware of the etiquette appropriate to stumbling around in the dark with 30 to 40 other people near by. Common sense and respect for others will get you by most situations. Please feel free to ask your fellow observers for advice.

There have been some big developments in our efforts to influence the outdoor lighting at the new Disney park. Look at the *Highlights of Monthly Membership Meetings* section of this issue and stay tuned for additional information.

Sky Sweep: May/June 1994

The Messier Objects of the Late Spring and Early Summer Sky

by Kevin Jones

Let's start this issue's telescopic tour with a bright, easy open star cluster, M-48. This sixth-magnitude cluster sits in a barren region of sky, just into Hydra across its border with Monoceros. Despite its isolated location, this star cluster is easily spotted in finderscopes and binoculars as a loose, scattered group of tens of stars, roughly half a degree across. Through a low-power telescope, M-48 looks roughly like a cartoonish Indian teepee, complete with a v-shaped stellar chain forming the door.

M-81 Spiral Galaxy in Ursa Major

Nearly overhead, the pair of Messier galaxies M-81 and M-82 can be easily found. A quick trick to find the M-81/M-82 pair is to imagine a line drawn between Alpha Ursae Majoris and Gamma Ursae Majoris (these stars make a diagonal across the bowl of the Big Dipper). Extend this line out of the bowl, past Alpha, doubling its length. M-81 and M-82 are located almost exactly where this line ends (actually, just a hair to the north of the endpoint). There is also a very distinctive 30-60-90 degree triangle asterism about a degree across visible in a finderscope or binoculars very near these galaxies. Although from a dark sky site M-81 and M-82 will be visible in many finderscopes, they aren't as easily visible in light-polluted skies. I've used this little triangle to help me find these galaxies several times under the incredibly bright skies of Arlington.

M-81 is a smooth, eighth-magnitude symmetric spiral galaxy, appearing almost twice as long as it appears wide. M-81's spiral arms have quite a low surface brightness and are very difficult to detect visually. M-82 is an odd, eighth magnitude edge-on galaxy which has been seen to have long filaments of gas streaming outward from the area of the nucleus on long-exposure photographs, apparently resulting from some sort of explosion which took place in the galaxy's nucleus millions of years ago.

M-81 and M-82 are both seven-million light years from the Milky Way. They may form the nucleus of a small group of galaxies with a dozen or so members, including NGC 3077, NGC 2976, and IC 2574 in Ursa Major, and NGC 2366 and the large spiral NGC 2403 in Camelopardalis.

Low in the southeast, below Corvus near Hydra's tail, sparkles the small globular cluster M-68. This ninth-magnitude globular contains well over one hundred thousand stars, many of which are readily resolved in small telescopes. When looking at this group, try to imagine that at M-68's distance of fifty- thousand light years, light requires one hundred years to cross this cluster, only one-sixth of a degree across.

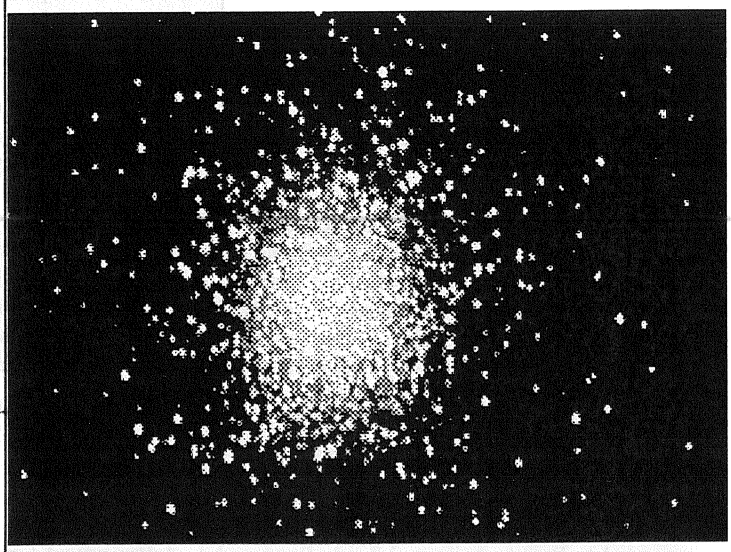
The large, eighth-magnitude Sb spiral galaxy M-83 can be found ten degrees to the west of M-68. The spiral arms of this galaxy are very well defined and can be glimpsed in large-aperture amateur telescopes. M-83 is thought to be ten million light-years from our Solar System, and its visible mass is roughly thirty-thousand light years across.

The Hercules Cluster, M-13, is located on an edge of the "Keystone" asterism of Hercules. After locating the distinctive asterism, try to pick out this bright globular cluster without optical aid. This cluster, also called the Hercules Cluster, glows between fifth and sixth magnitudes and can be seen with the naked eye when skies are dark. M-13 can be readily resolved by many telescopes, since the brightest of its component stars are eleventh magnitude. If you are observing M-13 with a fairly large telescope, the small twelfth-magnitude spiral galaxy NGC 6207 in the field can be seen. The galaxy is roughly half a degree northeast of M-13, and is directly north of one of the seventh-magnitude stars that flank M-13.

M-92, another big, bright globular cluster, is situated in northern Hercules about six degrees north of the Keystone. This seventh-magnitude cluster is very impressive through the eyepiece, despite being overshadowed by the even more brilliant M-13. M-92 is approximately one-third the visual size of M-13, and is slightly harder to resolve.

The Ring Nebula, M-57, is located to the east of Hercules, essentially in the middle of the south side of the parallelogram of Lyra. This nebula is rather large as planetary nebulae go, over one arcminute in diameter. It can easily be resolved into a grayish smoke ring through most telescopes. Don't expect to see a central star here, however. Although the ring itself is ninth magnitude, the central star is fifteenth magnitude, out of the range of average-sized amateur telescopes.

The final object on this celestial tour is in southeast Lyra, near the Cygnus border. The tiny two-arcminute globular cluster M-56 shines here at eighth magnitude. The brightest eleventh- magnitude stars on the fringes of this cluster can be resolved telescopically, although the central mass may remain simply a blur of light.



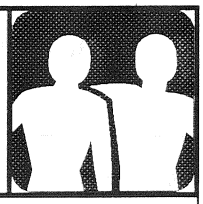
M-13 The Great Globular Cluster in Hercules

Observing these nine Messier objects will put you nine objects closer to a Messier Certificate or Binocular Messier Certificate. Enjoy observing them during the warm, comfortable nights of late spring!

Sky Calendar for May/June 1994

Compiled by Thomas S. Parry

(Times and dates are Eastern Time. Observations begin at dusk)



May

2	Last Quarter Moon Neptune 4° S. of Last Quarter Moon Uranus 5° S. of Last Quarter Moon
4	Aldebaran 6° S. of Venus low in west-northwest skies at dusk
5	**Observing at Parsells Field** for Eta Aquarid meteors Saturn 7° S. of waning crescent Moon (AM)
6	**Observing at C.M. Crockett Park**
7	**Observing at C.M. Crockett Park**
8	Mars 4° S. of waning crescent Moon (AM)
10	**Annular eclipse of the sun** (New Moon)
12	Venus 4° N. of crescent Moon at dusk
13	**Observing at C.M. Crockett Park**
14	**Observing at C.M. Crockett Park**
15	Mercury 8° N. of Aldebaran at dusk
16-17	Pluto at opposition (rises at sunset)
18	**NOVAC Monthly Membership Meeting at Arlington Planetarium** First Quarter Moon
20	**Observing at Parsells Field**
22	Jupiter 3° N. of waxing gibbous Moon (PM)
25-26	Full Moon. Partial eclipse of the moon visible between 10:37 P.M. and 12:23 A.M.
27	**Observing at Parsells Field**
28	Neptune 4° S. of waning gibbous Moon (AM) Uranus 5° S. of waning gibbous Moon (AM)
29-30	Mercury at greatest eastern elongation (23°) Good evening appearance at dusk

June

1	Last Quarter Moon Saturn 7° S. of Last Quarter Moon (AM) Comet Tempel at maximum brightness (About magnitude 9 throughout June)
3	**Observing at Parsells Field** **Observing at C.M. Crockett Park**
4	**Observing at C.M. Crockett Park**
6	Mars 2° S. of waning crescent Moon (AM)
9	New Moon Venus 5° S. of Pollux at dusk
10	**Observing at C.M. Crockett Park** Mercury 3° N. of waxing crescent Moon (PM)
11	**Observing at C.M. Crockett Park**
12	Venus 7° N. of waxing crescent Moon (PM)
15	**NOVAC Monthly Membership Meeting at Arlington Planetarium**
16	First Quarter Moon
17	**Observing at Parsells Field**
19	Jupiter 3° N. of waxing gibbous Moon (PM)
20	Venus 0.5° N. of Beehive cluster (M-44)
21	Summer solstice occurs at 10:48 AM. First day of northern hemisphere summer and southern hemisphere winter.
22	Full Moon
24	Saturn stationary Neptune 4° S. of nearly Full Moon
24-25	Uranus 5° S. of Nearly Full Moon
28	Saturn 7° S. of waning gibbous Moon (AM)
30	Last Quarter Moon

Upcoming NOVAC Meeting Programs

May 18 at 7:30 P.M.

The May General Membership Meeting will be a swap meet and include observer reports of the May 10th annular solar eclipse. Members are encouraged to bring equipment that they would like to sell or trade.

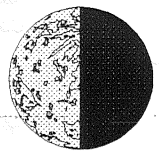
June 15 at 7:30 P.M.

The June Meeting will feature Linda Schramm, Curator of Meteorites at the National Museum of Natural History. She will speak on meteorites; what they are and what we have learned from them. This program should be particularly interesting to youth

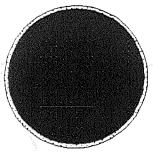
The monthly General membership Meetings of the Northern Virginia Astronomy Club are held the third Wednesday of every month at 7:30 PM at the Arlington County Planetarium, 1426 N. Quincy Street, Arlington, VA. Admission is free and open to the public. Call the NOVAC hotline (703) 256-8359 for upcoming events, special announcements or to leave a message for additional information.

Lunar Phases for May and June 1994

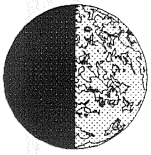
Last Quarter
May 2
June 1



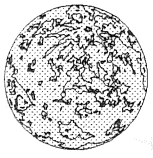
New Moon
May 10
June 9



First Quarter
May 18
June 16



Full Moon
May 25
June22



The Recreational Astronomer: A Spring Starhop for Binoculars

by Jon Stewart-Taylor

Welcome back to the Recreational Astronomer. This installment will take up where last month's left off by designing a simple star hop for binoculars. Confined to Coma Berenices (except for a short detour into Canes Venatici), it will be well positioned for most of the spring and summer. The objects to be visited include an open cluster, two globular clusters, and a galaxy. Although this hop is designed for binoculars, one could use the finderscope of a larger instrument to follow along.

Getting Ready

Before getting started, you should get your charts and field-of-view gauge ready. If you have a choice of charts, choose the one that will give the closest approximation to what you'll actually see. For average binoculars under average suburban skies, an eighth-magnitude chart is very good. I used Wil Tirion's Sky Atlas 2000 while designing this hop. Once you choose your chart, you need to make a field-of-view gauge that corresponds to your binocular's field of view for that chart. I prefer the wire-ring gauges to make it easier to draw circles on the chart. Also, make sure the chart is oriented so the stars are aligned the same way you'll see them in the sky. This won't matter much while laying out the star hop, but will be very helpful while actually observing.

Charting Our Course

I'm going to describe the star hop as if we were out under the sky, but you should walk through it on your charts first at least once. You may want to actually draw the field-of-view circles on the chart as you go. This will make the stations easier to remember and to find while you're out at night. All of the charts in this article have north at top and east to the left. They were drawn using a pair of 10x50 binoculars from my townhouse front yard.

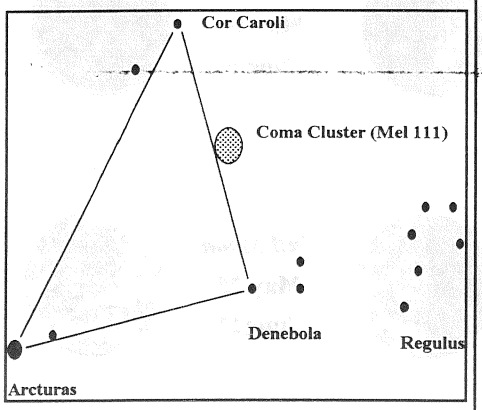


Figure 1 - Naked Eye Orientation Chart

Getting Oriented

To get oriented, start by finding Mel 111, the Coma cluster itself. It's at the apex of a triangle with Arcturus and Denebola at opposite ends of the base, about two-thirds of the way towards Denebola and on a line towards Cor Caroli (Alpha CVN) from Denebola. See Figure 1.

The Coma Cluster: It's unmistakable once you find it: a "u" shape with a flattened bottom seemingly made of diamonds. It fits beautifully within my 10x50's field of view (See Figure 2). Take a moment to do a quick count of the stars in the cluster. With practice you can increase your total- note the counts in your journal, and you'll have a tangible measure of your progress. If you have a larger instrument, you may be able to detect one or more of the 3 galaxies (NGC's 4494, 4565, 4559) just to the east of the cluster, but they're all out of my reach.

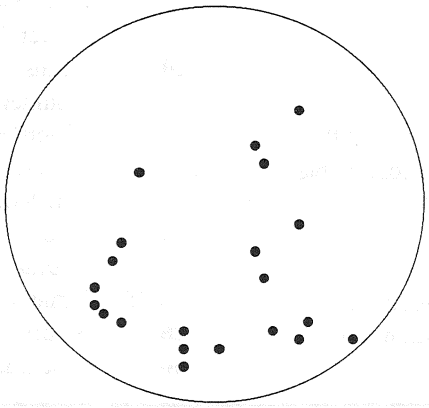


Figure 2 - Coma Cluster Binocular Field

North Galactic Pole: Move east (parallel to the bottom of the "U"), and just before the Coma Cluster disappears, 2 stars will appear on the edge of the field. They're fifth and sixth magnitude, but seem fairly bright in 10x50s.

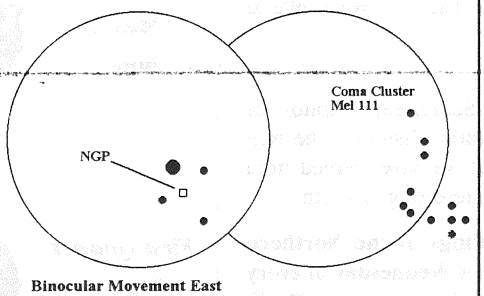


Figure 3 - North Galactic Pole Region

These stars mark the North Galactic Pole (NGP), which is less than one degree below the brighter of the two (See Figure 3). In the same field of view is a galaxy, NGC 4725, but at magnitude 9.3 it's too dim for me to detect.

Beta Comae Berenices: Move further east, placing the NGP at the edge of the field, and beta COM will appear (Figure 4). At fourth magnitude, it's the brightest single star in Coma (alpha is a double). The two fainter stars just to the west of beta show an interesting color contrast.

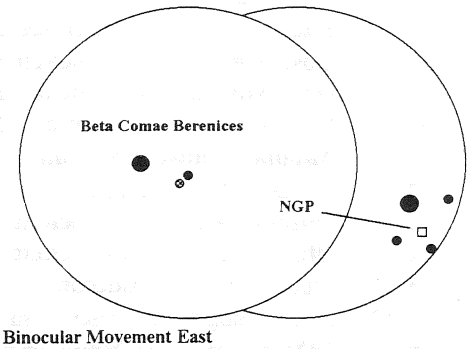


Figure 4 - Beta Comae Berenices

Globular Cluster M-3: Continue on the line from the NGP past beta. Just after beta leaves the field of view, a fuzzy patch of light will enter, just north of a faint star (Figure 5). This is globular cluster M3, a close rival in brightness and size to the better-known M13 in Hercules. In my conditions, it's basically an eraser smudge, requiring averted vision to see clearly, although it remains visible even when looked at directly.

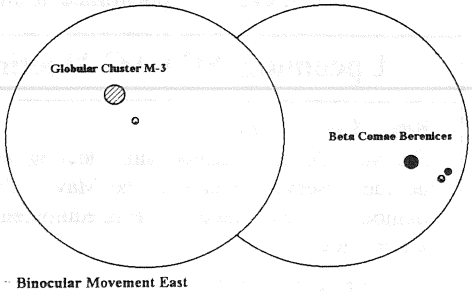


Figure 5 - Globular Cluster M-3

Globular Cluster M-53: Find beta again and head south, perpendicular to the line that lead you to M-3. With beta at the north edge of the field, a pair of sixth magnitude stars will appear nearly at the bottom. Put these stars at the north edge of your field, and there will be a sixth- and seventh-magnitude "bow tie" at the south edge of the field. Center the bow tie and Alpha COM will appear. Although Alpha is a

double star, we can't split it with binoculars. Look about halfway between the bow tie and Alpha for M-53, another globular (Figure 6). Nearly two magnitudes fainter than M-3, M-53 is an averted-vision only object for me.

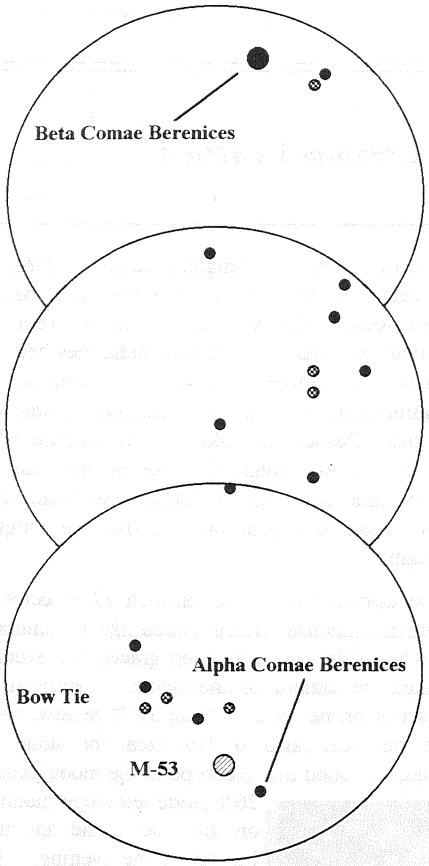


Figure 6 - Globular Cluster M-53

The Black Eye Galaxy M-64: Two more hops will bring us to our last object. Go north to put the bow tie at the bottom edge of the field, then slide slightly to the west. A six-star asterism shaped like a chunky little dog with a pointy nose will be in the field of view. Center the dog, and slide two-thirds of a field west again and a pretty little trapezoid will appear in the field. Located in the center of the trapezoid is M-64, the Black Eye galaxy Figure 7). At magnitude 8.5, this is near the lower limit of detectability for me, and I can only see it at zenith, on very clear nights. It also helps if most of the neighbors have forgotten to turn their lights on.

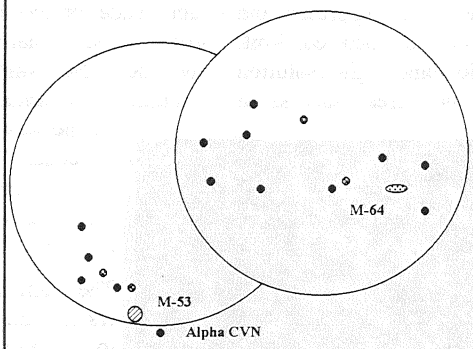


Figure 7 - The Black Eye Galaxy M-64

Summing Up

This tour and its selection of objects shows how well suited binoculars are for beginning and intermediate astronomers, and how binoculars fit in the range of instruments: about half way between unaided eyes and telescopes. Similar star hops are easy to design- just pick a section of the chart, use your references to pick interesting stops, and lay out your path with field-of-view circles.

Acknowledgments and References

For more information about star hopping, field-of-view guides and so forth, see the March/April 1994 installment of ***Recreational Astronomer: Binocular Astronomy*** in the NOVAC Newsletter.

For information about celestial objects and maps suitable for naked-eye or binocular hops, you can try ***Peterson's Field Guide to the Stars and Planets***, or Wil Tirion's ***Bright Star Atlas 2000***.

Exploring the Night Sky with Binoculars, by Patrick Moore, contains some binocular highlights for every constellation with particular emphasis on variable stars, and stars that show their colors clearly.

For detailed information about most celestial objects of interest if observing with binoculars or telescopes, try the three-volume ***Burnham's Celestial Handbook***.

The Streak Continues

by Al and Lynn Schumann

It was a bright eclipse -- the brightest in several years. The lunar eclipse of 28/29 November 1993 was the fourth one in a row we've been able to observe and photograph. It certainly was the pick of the litter. Obviously, much of the debris from the Mount Pinatubo eruption has settled out. Another big help stemmed from the fact that the moon rode very high in the sky. Thus, there was a lot less atmosphere through which to view. Judging from the cricks in our necks it seemed the moon was almost at zenith when it crossed the meridian. Timing and weather were perfect. The moon had ample time to rise clear of the trees prior to the start of the partial eclipse, and on the other end, the partial phase concluded just before the moon ducked behind the roof. We couldn't have asked for anything better.

As you recall, we had heavy rain through most of the weekend. Around noon on Sunday, however, the clouds began to break up and we took the rest of the day to get our stuff together so as to be fully organized before dark. As usual, the Celestron C-8 was the instrument of record and it was installed on our permanent pier in the backyard. The telescope and photo equipment had several hours to adjust to the outside temperature. We added a new wrinkle this time. A camera was added to the piggyback mount, this one with a 460mm, *f*/8 telephoto lens. The piggybacked camera was loaded with ISO 400 print film. With similar film speeds and *f*-stops, the exposures would be just about the same.

We started taking photos just after 11:40 P.M. when the shadow of the Earth took its first bite out of the moon. Thereafter, we clicked off pictures at five-minute intervals to get a nice progression as the shadow slowly enveloped the lunar surface. We cut down the interval to two or three minutes as totality neared. Visually, it was kind of hard to tell when totality actually arrived. There was still a very bright slice of moon visible and we had to check the clock to make sure the total phase had begun. And so it stayed for forty-eight minutes, almost like the diamond ring effect at the start of a solar eclipse. It was really beautiful. The moon was a deep orange-red color and was very clearly visible -- no guesswork this time. Also adding to the spectacle was the sight of the Pleiades to the west of the moon and the arrowhead-shaped Hyades dominated by Aldebaran just to the east. After a nice long period of totality, the moon started to pop out the other side, and our photo sequence was reversed. The wind quit around midnight, so we cranked up a hair dryer and gave the optics a periodic hosing with warm air to keep the dew monster at bay. We stuck it out until the last dog was dead -- around 3:15 A.M. It was 4 A.M. before we hit the sack. It's nice to be retired.

How did the photos turn out? OK, but not nearly as good as we expected given the superb conditions. All night long we had visions of those gorgeous pictures we've seen in *Astronomy* and *Sky and Telescope*, but it was not to be. First of all, we just could not match the speed of the clock drive with the speed of the moon. Thus any photo longer than a

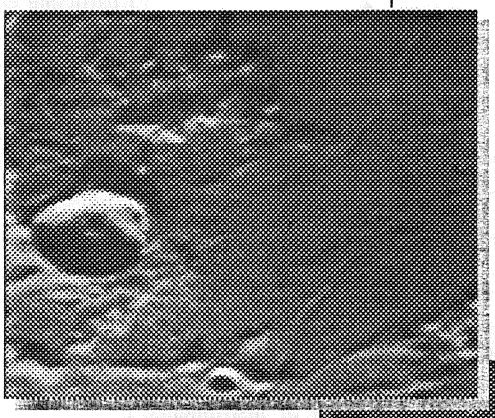
quick snapshot was doomed to be somewhat blurry. That spelled big trouble for the total eclipse phase. The shorter focal length piggyback camera was more tolerant of the motion differential, so some of the slides weren't bad at all. But through the C-8, there was not one knockout shot in the bunch. On the other hand, it was a visual treat. It was the best lunar eclipse we have seen since the 70's, and it will have to hold us for quite a while. The next really good one doesn't come until September 1996. Perhaps by then we'll get a legitimate drive corrector to stop the moon in its tracks. Meanwhile, we're gearing up for the annular solar eclipse on 10 May 1994 -- that's just around the corner! It should be about a 75 percenter for us right here in the D.C. area, so it ought to be an impressive sight. A solar filter will be coming shortly, and we're going to practice, practice, practice. We have a feeling the streak is going to stay alive.

Astro-Imaging

Getting Started in CCD Imaging: Challenges and Lessons Learned

by Myron E. Wasiuta

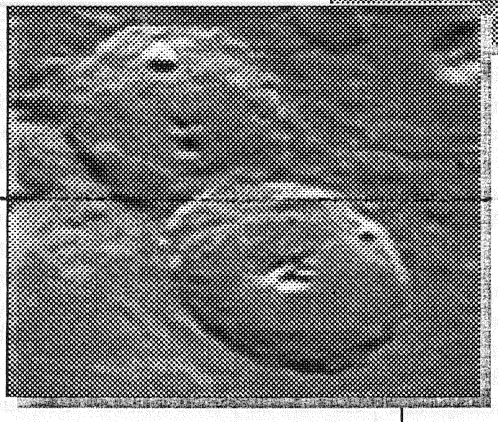
I must admit that when I got into CCD imaging three months ago, I really did not know what was in store for me. My wife Terry had just given me an Electrim EDC-1000 CCD camera as a wedding present and I was anxious to use it. The Electrim EDC-1000 is an uncooled, 8-bit, entry-level camera with which I planned to do some high-resolution planetary imaging. As it turns out, I've had great success at accomplishing my goals, but the effort I exerted and problems I overcame were frustrating at times. I suspect many folks out there might be thinking about getting into CCD imaging and I encourage their efforts. Beware, however, the tale that follows may be more the rule than the exception when getting started.



Lunar Crater Agrippa

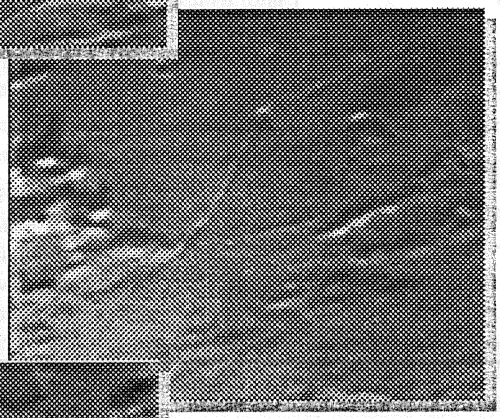
The camera arrived well packaged with a manual, computer interface card, camera body, three floppy disks containing the camera operation software and a six-foot nine-pin monitor cable neatly coiled in a bag. Total cost $412.16. The first task was to install the interface card. Although I had never done this before, I followed the instructions in the manual and had no difficulty. With the computer turned off, it was a matter of sliding the top of the computer off, removing an expansion slot cover and plugging the card into the slot. One must take great care not to touch anything inside the computer as many parts are static sensitive. The 6-foot cable plugs into the card on one end, and the camera on the other.

Now to test the camera! I hooked it up, turned on the computer and executed VGACAM (the program that operates the camera). On my screen appeared a four- by four-inch square white imaging field surrounded by a blue field with camera menu commands and status telemetry. With the exposure set at 200 milliseconds, I covered the camera and sure enough the white field on the screen went dark. It was working! At this point, however, the camera still couldn't see first light because the telescope is 50 feet from the computer and I didn't have a cable long enough to stretch. Since Electrim did not have the cable in fifty-foot lengths, I called up INMAC, a custom cable manufacturer in Texas. They assured me I could have a cable made for $60 in two weeks. The two weeks came and went and still no cable. I finally called back and to my dismay found they had lost my order! Not wanting to wait another two weeks, I called up the computer store where Blaine Korcel works. Unfortunately I was told Blaine was out sick. Desperate, I asked if they sold the cable I needed. "No, but we have twenty-five-foot lengths" was the reply. I drove up immediately and purchased two twenty-five foot long cables. Total cost about $40. "Looks like tonight's the night" I thought!



Lunar Crater Theophilus

The night fell beautifully clear. The ten-inch *f*/8 reflector on it's pier and german equatorial mount looked like a monument to the stars. A beautiful crescent moon graced the evening twilight. I hooked the camera up and placed it gently in the motorized focuser at prime focus. Using a 2X barlow, I was able to extend the focal ratio to *f*/16--ideal for lunar and planetary imaging. I aimed the telescope at the moon using a 26X guide telescope mounted on the tube of the ten inch. Earlier in the evening, I had made sure the guide and main scopes were precisely aligned. Running back into the house, I stared at the computer screen. A blank white picture! "OK, needs to be focused." I ran back out, focused the telescope, and ran back in. Still blank white. Not wanting to run in and out all evening, I got a full-length mirror, positioned it in front of the computer, and adjusted it until I could see the monitor through the window from where the scope was outside. Back outside again, I focused outward. No change on the screen. Then I went inward, and just as luck would have it, I began to see shadings gradually coming into focus! But alas, after all that effort it was not meant to be! Just before reaching focus, I ran out of focuser travel. The focuser reached its innermost position. The only way to solve this problem is to move the telescope's primary mirror forward.



Region around Hyginus

The next day, I moved the primary mirror forward 1.25 inches in the hopes this would be satisfactory for eyepiece projection as well as prime focus imaging. With another clear night to try again, I successfully achieved focus on the moon (I thought to myself how nice it would be to control the focus from the inside). At times, the moon appeared stunning as it was displayed on my computer screen. Another

problem, however, was very apparent. A pattern of blemishes appeared on the image every few seconds like a series of dots representing morse code. Furthermore, the brightness of the image varied from moment to moment. The resulting images were cosmetically flawed. Although most of the dots could be eliminated from the raw image by using a "median" filter in VGACAM, the dots became glaringly obvious after image processing. I called Electrim the next morning and they suggested it might be due to the long cord producing timing errors between the computer and camera clocks. They suggested going into my "setup function" and adjusting some feature in the ROM-BIOS program. Apparently I was the only person that either had this problem with their camera, or no one else was using such a long cord. Anyway, they weren't sure exactly how to fix it.

Several weeks went by until I hit upon the solution. I accidentally pressed the "turbo" button on my computer, which speeds up the computer to 33 mhz. EUREKA! The camera produced steady, sharp, blemish-free images from then on! During this time I did two things. I spliced fifty feet of wire onto the motor focuser as well as into the declination motor, which runs off twelve volts DC. By keeping the drive corrector inside and running an extension cord to the telescope, I can control slow-motion right ascension and declination. Focus is also now controlled from indoors. This is very handy as at *f*/16 the field of view is only about 3.5 arc-minutes on a side. At *f*/35, which I use for planetary imaging, it is less than two arc-minutes on a side. This is because the CCD chip in my camera is only 2.5 millimeters square! Locating the object of interest can be very time consuming.

This leads yet to another problem I discovered. Although the guidescope is firmly mounted to the telescope, apparently flexure is still present because as the telescope is aimed in different parts of the sky during the course of the night, alignment is lost. This isn't too much of a problem on the moon since it is so large and bright, but I have had to abort planetary imaging sessions due to the fact I could not locate Jupiter in the view.

While acquiring astronomical images with CCDs is easier in some ways than conventional film, it also is fraught with technical difficulties. Once overcome, it is very rewarding and addictive. I am now at the level where the setup and operation of the CCD camera are routine and as can be seen in the accompanying images, I am very pleased with the results that Electrim's little camera can produce. In the next installment, we will see what an imaging session is like in detail.

The NOVAC Library

The books listed below are currently part of the holdings of the NOVAC library. Books may be checked out by NOVAC members for a period of one month. To check out a book, or to donate books to the library, see Linda Thomas at the monthly meetings.

Author	Title
Bartusiak, Marcia	Thursday's Universe
Belton, Michael (editor)	Time-Variable Phenomena in the Jovian System
Berry, Richard	Build Your Own Telescope
Berry, Richard (editor)	How to Build Your Own Observatory
Bishop, Roy (editor)	Observer's Handbook 1987
Bishop, Roy (editor)	Observer's Handbook 1991
Clark, Lenwood (editor)	The Long Duration Exposure Facility (LDEF) Mission 1 Experiments
Compton, and Benson	Living and Working in Space: A History of Skylab
Covington, Michael	Astrophotography for the Amateur
Dickenson, Terrence	The Universe ...and Beyond
Donn, Bertram	Atlas of Comet Halley 1910 II
Ethell, Jeffrey	Fuel Economy in Aviation
Ethell, Jeffrey	NASA and General Aviation
Fimmel, Colin, Burgess	Pioneer Venus
Hodge, Paul W.	Galaxies
Holt, Terry	The Universe Next Door
Lord, Douglas	Spacelab, An International Success Story
Mark, Levine	Management of Research Institutions
Moore, Patrick	Exploring the Night Sky With Binoculars
Muirden, James	How to Use an Astronomical Telescope
Newell, Homer	Beyond the Atmosphere: Early Years of Space Science
Newton, Jack	The Cambridge Deep Sky Atlas
Peltier, Leslie	Leslie Peltier's Guide to the Stars
Veverka, Joseph	Planetary Geology in the 1980's
Zelik, Elske, Smith	Introductory Astronomy and Astrophysics

The library also contains copies of the "How to Buy a Telescope" FAQ from the sci.astro usenet newsgroup.

A Special Thanks

by Ron Ferris

Did you know we have a NOVAC member among us to whom each and every one of us owes a special thanks? Did you know that he's responsible for providing us heat in winter, air conditioning in summer, electricity, water and shelter throughout the year? Did you know that he makes sure we have acoustics galore so that we can hear whispered conversations clear across the room? Did you know that he's given us a place to sit down, relax, lean our heads back and soak in the good stuff that NOVAC has to offer at each of our monthly meetings? In fact without his generosity we'd be hard pressed for a place to hold our monthly club meetings period!

I speak of none other than Steve Smith, Director of the Arlington County Planetarium. So the next time you see Steve, whisper a "thank you" across the planetarium room in his direction; I bet he'll bend an appreciative ear. In the meantime, on behalf of all NOVAC members, let me express my sincere and hearty thanks to our friend and fellow NOVAC member, Mr. Steve Smith, for his generosity in giving us such an ideal place to hold our meetings each month. Let us all continue to respect the facilities there and remember that Steve has made it all possible.

Observer Report: Sighting the Space Shuttle Endeavor

by Guy W. Moore

In the predawn sky of April 15, 1994 at approximately 5:17 A.M. EDT, the space shuttle Endeavor appeared first as a second-magnitude "star" out of Hercules not far from Vega. Within a second or two it brightened to nearly magnitude minus four (about that of Venus at its brightest) and passed just below Vega, cruising steadily southeastward almost brushing Deneb (missing it by a few arc-minutes). As it continued on, it stayed at the same brightness for several seconds until I lost it in the stars of Pegasus and the treetops to the northeast of my observing position beside my house. In 7X30 binoculars, I seemed to pick up two bright "ends" of the object, perhaps reflecting off brighter material or perhaps nothing more than an optical illusion or defect in my vision. The Endeavor was visible during its transit of the sky for about three minutes and was an impressive sight.

Notices NOVAC Notices

Sky & Telescope Discounts

As a member of NOVAC you can get a subscription to Sky & Telescope for $20.00 instead of the regular $27.00 rate. To start a new subscription or renew an established subscription, make your check out to SKY & TELESCOPE for $20. Note on the check if this is a new subscription or a renewal. Send your check to Brenda Jones, 883 N. Kentucky St., Arlington, Va. 22205.

You can also order any publication directly from Sky Publishing at a 10% discount. Just mention the Club Discount Plan and that you are a member of NOVAC.

Discounts on Astronomy Magazine

Your NOVAC membership entitles you to subscribe to Astronomy Magazine at the annual rate of $16.00. This is a significant discount over the usual $24.00 rate. A two-year subscription costs $32.00. To start a new subscription or renew an established subscription, make your check payable to KALMBACH PUBLISHING COMPANY for $16.00 (one-year subscription) or $32.00 (two-year subscription). Note on the check if this is a new subscription or a renewal. Send your check to Brenda Jones, 883 N. Kentucky St., Arlington, VA 22205. NOTE: There are no special 10% discounts offered on publications through Kalmbach Publishing.

Club Telescopes Available for Use

NOVAC makes available two six-inch (*f*/5) Newtonian reflectors for club members to check out free of charge and use for a limited time.

The first scope is a Celestron model SP-C6 on a Super Polaris German equatorial mount and wood tripod. It will readily fit disassembled in any car and is easily transported and can be set up quickly at remote observing sites. The scope comes with an Orion Ultrascopic 10mm and Meade MA 25mm eyepieces with 1.25-inch barrel sizes. To borrow this scope you will need to show your NOVAC observing pass and leave a $500.00 security deposit.

The second scope is a home-made six-inch reflector on a dobsonian mount and comes with a 25mm Kellner eyepiece. It is easy to transport to dark sky sites and easy to use. To borrow this scope you will need to show your NOVAC observing pass and leave a $250.00 security deposit. If you are interested in borrowing either of these scopes, contact Bob L'Hommedieu, NOVAC President, at (703) 978-0946. He will schedule a time for you to pick the scope up at his home. Bob resides at 4415 Eastwood, Fairfax, VA 22032.

NOTE: Checks must be made payable to NOVAC. Checks used as security deposits on telescopes ARE NOT deposited and will be returned to the originator when the scope is returned in the same condition it was checked out. The scopes may be checked out for two to four weeks at a time depending on demand.

NOVAC Library

NOVAC has established a library at the Arlington Planetarium for use by NOVAC members. Books may be checked out and returned only at the monthly meetings. Members may check out books for one month at a time. To check out books, see NOVAC librarian Linda Thomas at the monthly meeting. The NOVAC library seeks book donations to the library. If you have any astronomy books or materials you are thinking of discarding, please consider a donation to the NOVAC library. A complete list of all library holdings is published in this issue.

NOVAC Meeting & Observing Schedule for May/June 1994

Observing at C.M. Crockett Park
May 6, 7, 13, 14
June 3, 4, 10, 11

Observing at Parsells Field
May 20, 27
June 3, 17

Observing at Parsells Field for Meteor Showers
May 5 (Friday)
June 9 (Thursday), 28 (Tuesday)

General Membership Meetings

General Membership Meetings are held at the Arlington Planetarium on the third Wednesday of every month. Meetings will be held May 18 and June 15 at 7:30 P.M. The Arlington Planetarium is located at 1426 N. Quincy Street, Arlington. Trustee Meetings are held on an *as needed* basis, usually the Tuesday before the week of the General Membership Meeting. Non-Trustees interested in attending should contact a Club Officer or Board Member for further information.

NOVAC Observing Site Rules

C. M. Crockett Park: NOVAC members may use Crockett Park for observing on nights other than those scheduled for club observing; However, YOU MUST HAVE PRIOR APPROVAL FROM PARK MANAGER GARY KWOLEK or DAVID PETTY. Call (703)-788-4867 early in the day on which you wish to observe. If you reach the answering machine, leave a message saying that you are a NOVAC member and you wish to observe that night. Also, leave a telephone number where someone can reach you. If you do not receive a return call, you MAY NOT use the park. THERE ARE NO EXCEPTIONS! Use of the park is limited to NOVAC members only. Park management locks the entrance gate at sunset and you may use the combination shown on your Observing Pass to gain access. Do not reveal it to anyone. You must lock the gate behind you after entering and please remember to lock it after you leave. During EDT, you must set up on the large field to the left. During EST, you must set up on the paved cul-de-sac 200 yds. past the gate. No loud radios, alcoholic beverages or loose pets. Do not leave trash or debris behind. We are guests of the park and park management may revoke our observing privileges at any time due to the carelessness of one person.

Parsells Field: NOVAC members may use Parsells Field in Loudoun County as an alternative observing site ONLY ON THE NIGHTS DESIGNATED for general observing and meteor showers. Currently there are no provisions for unscheduled observation nights. You must park and set up ONLY IN THE PARKING AREA and not go onto the field itself. Please park to the left near the entrance and set up to the right away from the entrance. No loud radios, alcoholic beverages or loose pets. Do not leave trash or debris behind. We are guests of the Dulles Little League and they reserve the right to revoke our observing privileges any time due to the carelessness of one person.

Directions to NOVAC Observing Sites

C. M. Crockett Park: From the Washington DC/Northern Virginia area, go west on I-66 to the 47-a exit. This is 234 South to Manassas. Continue on 234 for 2.8 miles then turn right on Godwin Drive at the "Po Folks" restaurant. Follow Godwin Dr. for 1.8 miles to where it merges with Rt. 28 West. Once on Route 28, continue driving for another 13.7 miles through the towns of Nokesville, Catlett and Calverton until you turn right on Rt. 643 toward Warrenton. There is a small country store (Mayhugh's) on the corner of the intersection. Go on about a mile up Rt. 643 to the Park Entrance road. Look for a small

sign for C.M. Crockett Park on your right directing you to turn left. Once on the park entrance road, go one-half mile to the park gate.

Parsells Field: From the Northern Virginia area go west on the Dulles Access (Toll) Road until you reach Route 28 (last exit before Dulles Airport). Proceed north on Route 28 until you come to Route 625 (Waxpool Rd.). You may also take Route 7 (Leesburg Pike) to Route 28 and go south on 28 until you reach Route 625. Go west on Waxpool Road passing through the town of Ryan and Route 641 (Ashburn Rd.). Continuing on Route Rt. 625, Parsells Field will be on your left a short distance beyond Ryan. If you make it to Route 659 (Belmont Rd.), you've gone too far.

Jupiter Watch - July 21 Volunteers Needed!

July 20, 1994 will mark the 25th anniversary of the Apollo 11 Lunar Landing. At the same time, there is much excitement surrounding the predicted impact of Comet Shoemaker-Levy 9 with Jupiter. The Planetary Society is planning a number of activities throughout the week to celebrate this event including a *Jupiter Watch* star party at the U.S. Naval Observatory. Some of the activities on tap for the star party include lectures, videos, and observatory tours. The observatory will have two of its telescopes open and amateur telescopes will be set up for public viewing. That's where you come in! NOVAC members have been asked to bring their telescopes out to the observatory and join in the Jupiter Watch activities. So mark Saturday July 21st and a rain date of July 23rd on your calendar. NOVAC and the U.S. Naval Observatory need your help.

NOVAC Newsletter is the official publication of the ***Northern Virginia Astronomy Club*** and is published six times per year at 12000 Vale Road, Oakton, Virginia 22124-2321, telephone (703) 758-8224, Thomas S. Parry, Editor and Publisher. NOVAC Newsletter is sent to members of NOVAC as a regular membership benefit.

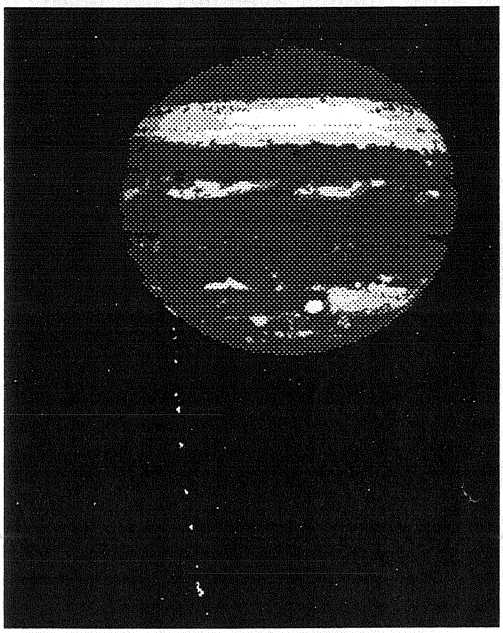
Membership in the Northern Virginia Astronomy Club is $18.00 per year and is open to anyone interested in astronomy or the sciences. Contact Brenda Jones, Treasurer, 883 North Kentucky Street, Arlington, Virginia 22205, telephone (703) 527-7963. All notices of change of address should be sent to Brenda Jones. Please include both old and new addresses.

NOVAC does not knowingly accept advertising for products of inferior quality nor does it accept the responsibility for the quality of such products.

NOVAC members are invited (and ENCOURAGED!) to contribute materials of interest for publication consideration in the NOVAC Newsletter. The editors, however, reserve the right to edit all materials submitted. Ideally, materials submitted for publication consideration should be sent on 3.5" or 5.25" floppy disks in ASCII text format to the address of the editor. Other electronic formats are acceptable as well as double-spaced typed and letter-quality manuscripts. Contributors may post their article submissions to the NOVAC RBBS. Please post them as personal uploads to Tom Parry. Contact the editors for details and/or possible direct electronic file transfer.

Comet Shoemaker-Levy 9 Collides wth Jupiter in July

Comet Shoemaker-Levy 9, torn into pieces as a result of a close approach to Jupiter in July 1992, will collide with Jupiter during the third week of July 1994. Of tremendous scientific importance, the impacts of the cometary fragments will release more energy into Jupiter's atmosphere than that of the world's combined nuclear arsenals. Because the impacts will occur on the night side of Jupiter, the explosions will not be directly observable from Earth. Professional and amateur astronomers, however, may observe the impact light flashes reflected off the inner satellites of Jupiter. Any lasting effects on Jupiter, such as atmospheric clouds, ejecta plumes, or seismic thermal disturbances, may be observable an hour or so later when the rotation of Jupiter brings the impact sites into Earth's view.



Courtesy NASA/JPL, Pasadena, CA

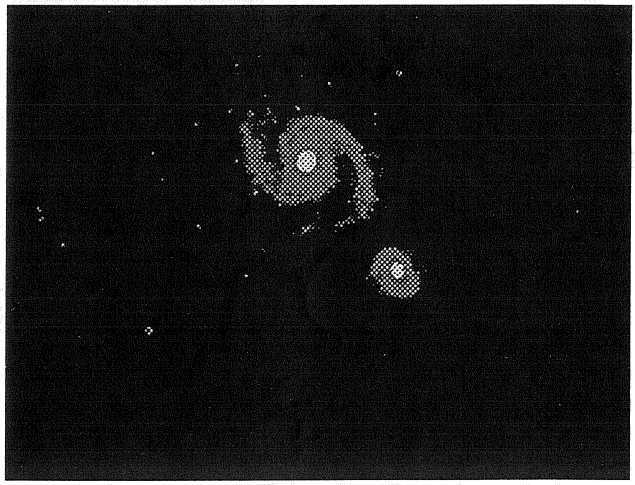
Analysis of high-resolution images of the comet taken by the NASA Hubble Space Telescope in July 1993 suggests that the major cometary fragments range in size from one to a few kilometers. The large fragments are embedded in a cloud of debris with material ranging in size from boulder-sized to microscopic particles. Although comet-like outgassing of the fragments has not been observed, the fragile nature of the object suggests that it is indeed a comet rather than a more compact asteroid.

Comet Shoemaker-Levy 9 was the ninth short-periodic comet discovered by Eugene and Carolyn Shoemaker and David Levy. It was first detected on a photograph taken the night of March 24, 1993 with the 0.4-meter schmidt telescope on Palomar Mountain in California. Subsequent observations were forthcoming from observers at the University of Hawaii, the Spacewatch telescope on Kitt Peak in Arizona and McDonald Observatory in Texas. These observations were used to demonstrate that the comet was in orbit about Jupiter and had made a very close approach (within 1.4 Jupiter Radii from Jupiter's center) on July 7, 1992. During this close approach, the unequal Jupiter gravitational attractions on the comet's near and far sides broke apart the fragile object. The disruption of a comet into multiple fragments is an unusual event, the capture of a comet into an orbit about Jupiter is even more unusual, and the collision of a large comet with a planet is an extraordinary millennial event.

The illustration here shows comet Shoemaker-Levy 9 impacting Jupiter from the perspective of Earth. For visual appeal, most of the large cometary fragments are shown close to one another in this image. At the time of Jupiter impact, the fragments will be separated from one another by several times the distances shown. Image created by D. A. Seal of JPL's Mission Design Section using orbital computations provided by Dr. P.W. Chodas and Dr. Donald K. Yeomans of JPL's Navigation Systems Section.

Images

The Whirlpool Galaxy M-51 in Canes Venatici



Known as the "Whirlpool Galaxy," this was the first such object discovered to show a *spiral* form. Although discovered by Charles Messier in October 1773, it was not until 1845 that the spiral pattern was first detected by Lord Rosse with his giant 6-foot reflector at Parsontown, Ireland. High overhead in late spring and early summer evenings, just below the handle of the Big Dipper asterism of Ursa Major, M-51 is detectable in binoculars as a faint patch of light on clear, dark nights. Very little detail will be visible except through large-aperture telescopes under the darkest sky conditions.

NOVAC

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