NOVAC

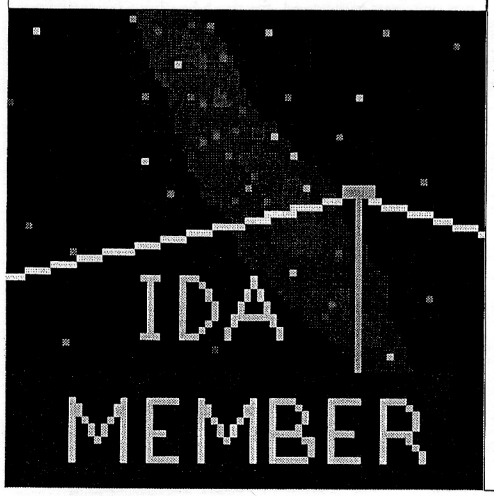
THE NEWSLETTER OF THE NORTHERN VIRGINIA ASTRONOMY CLUB

Issue Number 82 **Volume 19** **March/April 1999**

President's Message

Since there are not a lot of activities going on at the moment and the weather continues to keep us from doing much observing, I will keep this relatively short. However, there are a couple of things I would like to touch on. Our focus for 1999 will be on three major items: (1) Reduction of Light Pollution; (2) Improvements to our Observing Sites; and (3) A New Meeting Room. Details concerning Items 1 and 2 will be forthcoming from the Project Managers, but I want to comment briefly on Item #3. We have been very fortunate over the past several years to have a location such as the Arlington Planetarium in which to hold our monthly General Membership Meetings. However, with our membership approaching 350, and likely to grow even further, the capacity of the Planetarium (75) can support only one fifth of our current membership. The Board feels that this is an unacceptable restriction for the future operations of our club. If we cannot accommodate a larger percent of our members at the monthly meetings, it will be difficult to maintain their interest in NOVAC. As a result, we are considering a new location for our meetings that could handle at least 200 people. You need to be aware that NOVAC does not pay anything (zero $) for use of the Planetarium. Initial indications are that we will incur some costs when we go to a new location to cover set

(Continued on page 2)



What's Up?

Al Schumann

Winter is a splendid season for open clusters. Winter is also the season for ice, and the Christmas Eve ice storm is one we shall not soon forget. There were downed trees and limbs all around the Williamsburg area. We were without power for 3 ½ days; other poor souls had no electricity for more than a week. No juice – no heat, except for the fireplace. What a mess. In one swell foop it was as if peninsula residents were transported back to the 18th century. Conclusions? There was nothing all that good about the "good old days." Colonial living sucks!

Anyhow, after the cleanup I rolled out the 13-inch telescope and continued the search for objects I had not seen before. All too frequently over the years, I ended up looking at the same old things time and again. Lately, I've been making a plan and actually sticking to it. What a guy. The Mag 6 Star Atlas again was my guide for a run through Taurus, Gemini, and Monoceros...with a side trip to Orion. NGC 1647 is a good sized open cluster located a bit more than one Telrad circle away from Aldebaran in Taurus. It is a pretty bright cluster at mag 6.5, and it is a nice sight through the telescope. Next, I found NGC 1746 which has about 50 stars and is almost the diameter of the full moon. It's a bright rascal at mag 6. It's located on a line between Aldebaran and Elnath (B Tauri). Rounding out the action in Taurus is a dim pair of clusters, NGC 1817 and 1807. They are mag 8 and 7.5 respectively, and they sit shoulder to shoulder. There are about 50 stars in NGC 1817 and 15 in NGC 1807. While I was looking at them in the telescope, I remembered a very anemic Perseus double cluster.

During a previous visit to Gemini a year or so ago, I saw NGC 2392, the Eskimo Nebula, for the first time. Back then I didn't know what it was and later vowed to give it a closer look. This time I used a variety of eyepieces - with and without a 2X Barlow. Also, I made liberal use of a UHC filter to help increase contrast and bring out the nebulosity. Ultimately, I had the magnification up over 300X, but it made no difference. Regardless of the eyepiece combinations I used, the Eskimo still looked like a fuzzy, out of focus Neptune. I was unable to see any features at all on the disk or any sign of the mag 10 central star. So much for that. Moving on, another cluster, NGC 2266, escaped me on my last foray into Gemini, but I found it this time. It is small, dim, and nothing to get excited about. However, half the fun is in the chase. Right?

Monoceros was next on my schedule, and the first stop was to be NGC 2244, the cluster at the heart of the Rosette Nebula. I have looked

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Inside This Issue

NOVAC Programs at the Arlington Planetarium

Pete Johnson

All meetings start at 7:30 P.M.

March 17, 1999
Dr. David Akinson - NASA's Galileo and Cassini Space Missions

April 21, 1999
Joe Donavan – The Franklin Park Observatory Project

May 19, 1999
Dr. Bob Craddock, Smithsonian Center for Earth and Planetary Studies:: Presentation on MARS

June 16, 1999
Tom (Ironman) Dietz – Super Nova Hunting

Boosting Performance of A ShortTube 80

Ralph Kantrowitz

A year after Hale-Bopp receded into the distance, I started to wonder what to do with my Orion ShortTube 80 (ST80). With a focal ratio of f/5, the objective gave unacceptable amounts of chromatic aberration and coma at magnifications above 70 unless I stopped the 80mm objective to a mere 58mm. I was considering sale of the telescope when fellow NOVAC member Michael Hubbard mentioned a note on sci.astro.amateur about overtight retaining rings in the ST80 lens cells.

I unscrewed the lens cell from the tube and sure enough, the retaining ring was too tight, so tight that I couldn't loosen it with a small screwdriver. (Later ST80 models have a press-fit plastic cell held to the tube by three screws, with a press fit dew cap.) A tight retaining ring will pinch optics, introducing a variety of image aberrations. I made a makeshift spanner wrench to fit the cell from two 1 5/8-inch paneling nails knocked into a scrap of wood. I cut the heads off with a plier and filed each nail to a 2-sided chisel point to fit the retaining ring. I loosened the ring to finger-tight and gently shook the cell. There was a faint rattle, indicating that the lens was loose enough to avoid distortion.

I tested the lens on Rigel and Jupiter. The 9th magnitude companion was faintly visible, shining through a pale greenish chromatic halo around Rigel. The Great Red Spot was in transit on Jupiter and I was able to make out the Red Spot Hollow in moments of good seeing. However, there was still quite a bit of chromatic halo surrounding the Jovian disk. I was much enthused with the newfound optical clarity, but I was still troubled by the chromatic aberration. I reasoned that if the factory could overtighten the retaining ring on a lens cell, it was also possible that they fouled up the spacing between the elements as well.

The two lens elements were separated by 3 tiny rectangles of metal foil held to one of the lenses, seemingly like foil adhesive tape. The positive and negative focal lengths coupled with different optical densities are what give an achromat the ability to combine the light of the spectrum back to white light. By changing the spacing between the lenses, it is possible to alter the point at which the best focus gives the best color correction.

Getting the lenses out of the cell was a delicate operation. I unscrewed the cell from the tube once more, and unscrewed the dew cap from the front of the lens cell as well. The lens cell was now easier to handle. I unscrewed the retaining ring and a cell spacer, taking care not to scratch or touch the lenses. To get the lenses out of the cell, I placed a soft cloth over the lens surface facing the back of the cell and fit the open end of a plastic aerosol top onto the back of the cloth. The entire assembly was turned over onto a table, the cloth and aerosol top holding the lenses in the cell. I gently lifted the cell off the lenses; to track the lens positions, I drew a pencil line across the edges of both lenses and placed 2 arrows pointing inward. In hand-figured optics, the optician often rotates the lens elements to achieve the best possible image. I strongly doubt that this was done at the Orion factory in China, but I wanted a reference point.

I then cut three small rectangles from a thick piece of black construction paper (about 0.02 inch thick). I placed these over the existing spacers. To my surprise, there was enough adhesive around the edges of the foil spacers to hold the paper in place. I dusted the inner lens surfaces with a short blast of computer dust remover. I carefully put the front element in place and gingerly lowered the cell over the assembly. Once again I flipped the lens assembly using the cloth and aerosol top the hold the lenses in the cell. The cell spacer and retaining ring were slid into place as I held the cell above the table and the retaining ring was screwed to finger-tight. I gave a couple of final blasts of dust remover to the outer lens surfaces, and then I screwed the cell, tube and dew-cap together. I purposely screwed the cell onto the tube only finger-tight to prevent any possible distortions.

Once again I tested the scope on the stars and solar system objects. The clarity of image seems to be about the same, but the chromatic halo surrounding bright objects has been shifted from greenish-blue to blue-violet and is much less noticeable. (I guess I was really lucky in my choice of paper to increase the spacing.) Now, the companion to Rigel is only moderately difficult to see. Now I can see Saturn's second largest moon, Rhea. At 150x, the Cassini division is now only moderately difficult. The Moon shows quite a bit of detail although there is still a noticeable amount of chromatic aberration at the limbs. I estimate that the aberrations now visible at full aperture are no more than those I originally saw at 58mm. Compared to my 4-inch AP apochromat stopped to 80mm, the image is dimmer and softer, in part due to vignetting of the objective by the ST80 focuser tube. Rhea, in particular, was seen more easily in the stopped-down apochromat.

Is this a telescope or procedure that I would recommend to everyone? No. One needs some experience in ATM or fine craftsmanship to change the lens spacing without scratching or chipping the objective or cross-threading the lens cell or tube threads. The ST80 itself is very compact but an f/8 or longer focal length 80mm objective would give much better images. However, if you've already purchased one of these handy little 'scopes and your one-year warranty is up, you ought to at least consider loosening the retaining ring to finger-tight. You'll be pleased with your efforts.

Clear(er) skies!!

Albert Einstein Planetarium Seminar

From: Harold Geller [hgeller@science.gmu.edu]

FREE Seminar at the Albert Einstein Planetarium

Saturday, April 24, 1999 at 6:00 P.M.

"When Galaxies Collide - Reconstructing Cosmic Accidents", Dr. John Wallin, Astronomy Professor, George Mason University

Under certain conditions, galaxies smash into each other with spectacular results. Learn about these cosmic traffic accidents through the observations and models that explain them. A view of the May night sky, using the Zeiss planetarium projector will also be provided.

Cheers,

Harold

President's Message

(Continued from page 1)

up and cleaning. The reason I mention this is that NOVAC's dues ($18.00) have been static for around 10 years. Although I know this is not a popular subject, I feel that we are at a point where a modest dues increase needs to be considered. While we try to maintain a conservative financial posture, there is much that needs to be done to improve observing site conditions and meeting accommodations for our membership. I just want to alert you that this is on the table. To assist the Board on this issue, there is a short questionnaire in this newsletter. It is very important for each member to answer these questions and return them as soon as possible. // tilly

Editor's Note

Elliott Fein

Please keep those articles coming in!

The 10th of the month preceding publication is the cutoff. Material that I receive after the 10th will appear in a later newsletter. Copy (in ASCII, please), not previous published, for the May/June issue must be in my hands by April 10.

I probably should have told everyone who sends me copy for newsletter articles that when I receive copy for an article, I start to format and edit it. If later, I receive an updated copy of the full article, I need to either figure out what changed and update the article in progress, or throw away the work I've done and start anew with the second copy. It would be much better if authors would tell me what changes they want made to the first, or if the changes are too complex for that, send me the second one and tell me the paragraph or whatever that has been changed.

Questionnaire

In order to help NOVAC Officers effectively plan long-term initiatives to benefit club members, please take a few moments to answer the questions in the survey below concerning the location of the monthly NOVAC Membership meetings. Please respond to this survey TODAY! Your input is important. Please forward your response to Pete Johnson via e-mail <pjohnson@dgsys.com>, or U.S. Mail: 5554 Sequoia Farms Dr., Centerville, VA. 20120. If you prefer, you can leave your response on the NOVAC Information Hotline, 703-803-3153. // Tilly Smith

1. How often do you attend the monthly NOVAC Membership meetings? (check one)
   a._____ Most months
   b._____ Only every other month
   c._____ A few times a year
   d._____ Never (go to #3)

2. What is the most valuable aspect of the monthly meeting to you? (check one)
   a._____ NOVAC business and upcoming events segment
   b._____ Observing report
   c._____ Sky Tour
   d._____ Main program
   e._____ Socializing

3. If you do not attend the meetings, what is the major reason? (check one)
   a._____ Too busy
   b._____ Topics do not interest you
   c._____ Wrong time or day
   d._____ Meetings too long
   e._____ Meeting room too crowded
   f._____ Too far to drive
   g._____ Other(specify)_____

4. How would you rate the quality of the meeting room facilities? (check one)
   a._____ Excellent
   b._____ Good
   c._____ Fair
   d._____ Poor

5. If you think the meeting facilities are Fair or Poor, why are they unsatisfactory? (check one)
   a._____ Meeting room too small
   b._____ Can not hear
   c._____ Parking
   d._____ Seats uncomfortable
   e._____ Other (specify)

_____

6. If we find a new meeting facility that is larger and more comfortable, would you attend the General Membership meetings more regularly?
   a._____ Yes
   b._____ No
   c._____ Room not an issue

7. If we are able to get a new meeting facility in DC, would you attend the meetings?
   a._____ Yes
   b._____ No

Jeff's Observing Report

Jeff Stetekluh

Jeff's astronomical calculations are made for the Northern Virginia area. See credits at the end of this article.

The Sun	rises	sets
Feb 17	6:57 AM	5:48 PM
Mar 17	6:17 AM	6:17 PM
Apr 21	6:24 AM	7:51 PM
May 19	5:53 AM	8:17 PM

The Moon

Mar 2 Full Moon
Mar 10 Last Quarter
Mar 17 New Moon
Mar 24 First Quarter
Mar 31 Full Moon
Apr 8 Last Quarter
Apr 16 New Moon
Apr 22 First Quarter
Apr 30 Full Moon
May 8 Last Quarter
May 15 New Moon

Events

Mar 3 Mercury at Greatest Elong: 18.2?E †
Mar 3 Mercury at Greatest Eastern Elongation (high at sunset)
Mar 5 Mercury is 4 degrees northwest of Jupiter
Mar 19 Mercury at Inferior Conjunction†
Mar 19 Saturn is 2.5 degrees south-southeast of Venus (from S&T)
Mar 20 Spring begins at the equinox, 8:46 p.m. EST (from S&T)
Apr 1 Jupiter-Sun Conjunction†
Apr 4 EDT starts
Apr 16 Mercury at Greatest Elongation: 27.6?W †
Apr 22 Lyrids ZHR=15, active Apr 16 to Apr 25 (from IMO)
Apr 24 Mars at Opposition †
Apr 27 Saturn-Sun Conjunction †
May 1 Mercury is 1/3 degree south of Jupiter this morning, southwest of Jupiter tomorrow (from S&T)
May 6 eta-Aquarids ZHR=60, active Apr 19 to May 28 (from IMO)
May 13 Saturn .75 degrees southeast of Mercury and one-third as bright (from S&T)
(† from Espenak)

The Planets

Feb 17	rises	transits	sets
Mercury	7:31 AM	1:05 PM	6:39 PM
Venus	8:10 AM	2:02 PM	7:56 PM
Mars	11:19 PM	4:45 AM	10:07 AM
Jupiter	8:25 AM	2:25 PM	8:25 PM
Saturn	9:39 AM	4:10 PM	10:41 PM

Feb.17	magnitude	notes
Mercury	-1.2	WSW, 9*
Venus	-3.9	WSW, 23*
Mars	0.1	
Jupiter	-2.1	WSW, 29*
Saturn	1.9	SW, 53*

Mar 17	rises	transits	sets
Mercury	6:13 AM	12:25 PM	6:37 PM
Venus	7:38 AM	2:17 PM	8:58 PM
Mars	9:50 PM	3:12 AM	8:30 AM
Jupiter	6:50 AM	12:58 PM	7:07 PM
Saturn	7:56 AM	2:30 PM	9:05 PM

From Feb 28 to March 7 Mercury will be 16 degrees above the horizon at sunset.

Mar 17	mag	diam	notes
Mercury	4.5	10.7"	W, 4*
Venus	-4.0	12.6"	W, 30*
Mars	-0.6	12.3"	
Jupiter	-2.1	33.2"	W, 9*
Saturn	2.0	16.5"	WSW, 32*

Apr 21	rises	transits	sets
Mercury	5:31 AM	11:31 AM	5:32 PM
Venus	8:19 AM	3:46 PM	11:14 PM
Mars	7:59 PM	1:27 AM	6:50 AM
Jupiter	5:53 AM	12:12 PM	6:31 PM
Saturn	6:49 AM	1:29 PM	8:08 PM

Apr 21	mag	diam	notes
Mercury	0.2	7.2"	
Venus	-4.1	15.2"	W, 37*
Mars	-1.6	15.9"	29*
Jupiter	-2.1	33.3"	
Saturn	2.0	16.2"	WNW, 3*

(* degrees elevation at sunset taking into account atmospheric refraction)
(mag = apparent magnitude, diam = apparent equatorial angular diameter)

Jupiter Eclipse Events on Club Observing Nights
None

References for Jeff Stetekluh's Corner

Sun and moon rise and set times, moon phases and Galilean moon events are calculated using my software that is based on algorithms from the book "Astronomical Algorithms" by Jean Meeus, 1991. This includes Bretagnons and Francou's VSOP87 (the 1987 version of Variations Seculaires des Orbites Planetaires) planetary theory, the Chapront ELP-2000/82 (ELP means Ephemerides Lunaires Parisiennes, although this work is not an ephemeris (a list of calculated positions), but rather an analytic theory (a series of periodic terms)) lunar theory and Lieske's theory E2 and E2x3 of Jupiter's satellites.

The Preliminary NOVAC Observing Reports are created using my software. Some of the algorithms are listed above and in the following as noted.

From Espenak: Fred Espenak's Twelve Year Planetary Ephemeris: 1995 - 2006 (NASA Reference Publication 1349, available at http://www-lep.gsfc.nasa.gov/code693ol: the International Meteor Organization calendar.

New Members - December 14 through February 9 Changes and Corrections

Kevin Brown *This directory is not to be reproduced or be used for any commercial purpose*

Guy F. Brandenburg
1316 Randolph St., NE,
Washington, DC 20017
Home: 202-635-1860
Work: 202-282-0100
guyfbran@erols.com

Tal Carawan
1459 Kingsvale Circle
Herndon, VA 20170
Home: 703-471-1636
Work: 703-631-2000 ext. 2111
talstar@geocities.com

Michael & Larry Greene
7841 Wintercress Ln.
Springfield, VA 22152
Home: 703-455-3514
traveling3@aol.com

James R. Handy
3323 N. George Mason Dr.
Arlington, VA 22207-1859
Home: 703-536-7577
jim.handy@worldnet.att.net

Jennifer, Barbara, & Ned Howenstine
6317 Summerday Ct.
Burke, VA 22015-3900

Thomas A. Johnson
6013 Netherton St.
Centreville, VA 20120
Home: 703-815-2278
aarider@aol.com

Vincent Kelly
11807 Chapel Rd.
Clifton, VA 20124
Home: 703-426-0300
Work: 703-660-0813
vk859@aol.com

Sean McNamara
7003 Kenneth Dr.
Annandale, VA 22003
Home: 703-750-1280
Work: 703-516-1369
smcnamara@fdic.gov

Linda J. & Tony Soukup
16178 Berlin Turnpike
Purcellville, VA 20132
Home: 540-338-5878
ljsoukup@erols.com

Denise C. & Don L. Tracy
1509 Kings Valley Ct.
Herndon, VA 20170
Home: 703-787-9360
jupiterii@aol.com

Ed Witkowski
2563 Sylvan Moor Ln.
Woodbridge, VA 22191
Home: 703-441-8428
Work: 703-416-5866
edwski@erols.com

New e-mail addresses:
tom.dietz@nasm.si.edu
Kevin.Brown@uspto.gov

Observing from the City: The Astronomical League's Urban List

Steve Blake

In recent months, the number of Astronomical League observing clubs has nearly doubled. Whereas before, the league had clubs promoting observing the Messier objects, double stars, the Herschel 400, and the Moon, now there are clubs for the next Herschel 400, Arp peculiar galaxies, meteors, and the Sun. Judging from the AL web site, the home page is at http://www.astroleague.org/ - additional clubs are planned to promote observing asteroids, planets and "the universe." But there is another new club that was clearly designed with us in mind -- the Urban Club.-(Members without Internet access can get details on the Urban club, as well as the list of objects, by sending a self-addressed stamped envelope to John Wagoner, Astronomical League Urban Club Coordinator, 1409 Sequoia Dr., Plano, Tx. 75023.)*

Not Quite a Messier Club

So what is on the Urban Club list? The only criterion for selection seems to be brightness. Not surprisingly, forty of the Urban Club's 100 objects are also on Messier's list. But sixty are taken from other catalogs. There are objects labeled NGC, IC, Collinder, Stock, Trumpler and Melotte. Thirteen of the 100 Urban list objects are double or multiple stars, compared with only one (M40 -- one of Messier's mistakes) on the Messier list. In addition to old favorites like Alberio and the Trapezium, there are more obscure ones such as Gamma Delphinus and Delta Cepheus. Some of the non-Messier masterpieces, such as the double cluster in Perseus and the Hyades in Taurus, finally get their due.

As you would suspect, the Urban list has fewer galaxies than the Messier list -- 11 compared to 39. There also are fewer globular clusters, only 11 compared to 29 Messier objects. But there are many more open clusters, 54 versus 27, and more than twice as many planetary nebulas, 9 compared to 4. All the objects on the Urban list are relatively bright. The galaxy M84 in Virgo is probably the faintest, and that is only around magnitude 10. I did the entire list with an 8-inch Dobsonian and 10x50 binoculars from my very light polluted backyard, and a nearby field, in Rockville.

The Rules, and Some Tips to Deal with Them

Unlike the Messier club, which will give you a certificate for observing 70 of the 110 Messier objects, you have to track down all 100 Urban list objects. You also must observe the objects from light polluted skies, defined as any area where you cannot see the Milky Way with the unaided eye. The skies from my own yard in central Rockville are never better than magnitude 4.5. Previous observations may be used as long as they were made in light polluted skies, but I recommend doing what I did. Even if you have seen an object before, look at it again because these items are worth repeated visits. Another requirement is taking appropriate notes of each observation. (The AL WWW site has the details on rules, as well as a list of all 100 objects.)

Because you cannot use observations from Savage or Crockett, a major challenge is finding a decent light polluted (!) observing site that has a reasonably good view to the south. Observing to the south is a real problem from my own yard, but I discovered that by dragging my scope to a back corner and pointing it between two trees, I had a 15-degree gap between the branches that permitted observations as far south as M8 in Sagittarius. I also discovered that when the leaves are gone in winter, it is often possible to view through trees.

You may find, as I did, that some objects are just too far south for your urban observing site. What to do? In my case, I took my binoculars to a nearby field from which I could view the open clusters M7 and M6 in Scorpius, and the globular cluster M62 in Ophiuchus. At -30 or more, these objects were simply impossible from my house.

Although I found many of the Urban list objects using just a Telrad, it became much easier after I added a finder scope. It is hard to star hop using a Telrad in the city because large sections of the sky have no stars visible to the naked eye at all. I went whole hog and bought a 80-mm finder, but I suspect a 50mm would do just fine.

I won't mention the various deep sky observing tips, except one. Increasing the power will do a lot to cut through the light pollution and improve the view. I frequently went from 49x to 81x -- 81x is still fairly low -- and doing so, darkened the skies and improved the views considerably.

What You Can Learn

The first thing you can learn is that there are some wonderful deep sky objects that are visible from a city. Yes, observing is better at Savage, but cold winter nights, a shortage of time, or light polluted skies should not keep you indoors on a clear night. Because many of these items are so bright, they also are visible when the Moon is up.

You may have a few pleasant surprises, even when observing these familiar objects. One of mine occurred in search of the object identified as Collinder 399. It was only when I got there that I discovered it was the "Coat hanger" open cluster in Vulpecula, which I had seen numerous times before. I had never viewed anything in the constellation of Lacerta, but this list introduced me to open clusters NGC 7209 and NGC 7243, two bright but often overlooked open clusters.

Surprisingly, there are objects on this list that, dare I say it, few NOVAC members have ever seen before. For example, have you seen Collinder 463? It is an open cluster in Cassiopeia that is not mentioned in such massive observing compendiums as Burnham's, Luginbuhl and Skiff's Observing Handbook and Catalog of Deep-Sky Objects or the brand new Night Sky Observer's Guide by Kepple and Sanner. Collinder 463 is plotted in Uranometria. Track it down the next time you go observing

And of course, tracking down the Urban List gives you the chance to see old friends. I never pass up a chance to see the globular cluster M 22 and the diffuse nebula/open cluster M8 in Sagittarius. Even from the city, they are very nice. (Trivia question: did you know that M22 is south of M8?)

Finally, the objects on the Urban List make a great observing list to show friends or use at star parties. Almost all the great deep sky objects are listed here, and almost all the 100 Urban List objects are great. Many, probably most, are visible with binoculars. Check them out. You will be glad you did.

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* NOVAC's membership in the Astronomical League means that all NOVAC members receive a subscription to the *Reflector*, the Astronomical League Newsletter, which explains the aims of the League and its many observing programs.

What's Up?

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at this many times, and I find it by drawing an imaginary line from Orion's head through Betelgeuse and on to epsilon Monocerotis. On the way, I took a brief stab at NGC 2022, a tiny, planetary nebula midway between Orion's head and Betelgeuse. It glows at a dim mag 12, and I was unable to see it. The Rosette (actually the cluster) is just to the left of epsilon, and the finderscope picks it up easily. The thing which strikes me straight away is what appears to be a narrow six-star rectangle. It gets much better when the eye takes in the whole cluster. I have never seen the nebulous halo (NGC 2237) that surrounds the cluster. Neither the UHC nor the deep sky filter seem to help.

It's only a short hop from the Rosette to NGC 2266, the cluster which is home to the Cone Nebula. The cluster is right on a line connecting the Rosette and zeta Geminorum. There is a nice bright star (mag 5) on the edge of the cluster which tips it off. It is a pretty cluster in its own right, and again I couldn't make out any of the Cone nebulosity in the 13-inch telescope. Dew was getting to be a nuisance, but there were two more Monoceros clusters I wanted to nail down before calling it a night. First was NGC 2301. To get there, I went back to the Rosette and continued on that imaginary line to the next bright star, 18 Monocerotis. It's somewhere between mag 4 and 5. The cluster is within a Telrad circle of that star. It took a bit of fishing around, but I found it. A later check in Burnham's indicated there were about 60 stars, with the cluster

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Fixing Aristotle's Big Mistake With Your Thumb

Marc DeFrancis

For Young Astronomers ages 8 and up

Shouldn't the Sun Fall Down?

The first human being to argue that the Earth revolves around t/r

he Sun, was probably the Greek scientist Aristarchus. This was some two thousand years ago. It was a very strange idea at the time, not only to the most people, but even to Aristotle, the most famous scientist of the time and the teacher of Alexander the Great.

Aristotle had recently offered the most logical explanation of gravity. It went like this: solid things always fall downwards because their natural place is at the center of the world, meaning the center of the round earth. Next comes water, which seeks its place just above the solid earth, then air, and finally fiery things, which float at the outer edge of everything. The Earth must lie at the dead center of the universe because this is where all the world's solid stuff has clumped together. The Sun, stars, and planets can move easily, as sparks and flames do, but our Earth always rests. Here was the first logical argument explaining why the Sun moves without falling to earth.

It was good science, because it did explain a lot of what we observe. But Aristarchus believed Aristotle had left too much unexplained. For example, the astronomers of ancient Persia and Greece had known for a long time that the planets changed in brightness from time to time. If Aristotle was right, Jupiter, Venus, and Mars floated like the stars in perfect circles around us, always the same distance from us. But growing brighter and dimmer every few years, Jupiter surely was passing closer and then farther from us.

"If we draw a map with the Sun at the center," Aristarchus thought, "and we revolve around the Sun each year, then the other planets will sometimes trail behind us and sometimes catch up with us. That would explain the brightness changes." A smart idea . . . but he could offer no proof that it was true. And he could not explain what could cause our giant, heavy Earth to swing around the Sun, which everyone agreed was made of weightless flame. So Aristarchus's idea was rejected.

Use Your Thumbs and See

Some years later, another astronomer, named Hipparchus, decided to pick up the Sun-centered idea and give it another try. He thought up a new and excellent way to test it. "If our earth moves," he argued, "our view of the stars should change from one season to another." To see why this is true, try an experiment:

Hold your right thumb in front of your face with your arm fully outstretched. Without moving your thumb, compare the views you get with your right eye (left eye closed) and then your left eye (right closed). Watch your thumb against the background. Now move your thumb a few inches closer, and again compare right-eye and left-eye views against the background. Do this again, until your thumb is very close to your face.

As you moved your thumb closer, the left and right views changed, of course, but how and why? When did the background space between the views grow largest? When smallest?

Now imagine that you are a geometry-loving bird, watching these eyeball shenanigans from overhead. You (bird) could easily draw two imaginary lines between the human's two eyes and the thumb he is examining. Connect the two eyes with a short line, and you have a triangle. As the human moves his thumb farther away, the triangle gets longer and pointier. Likewise, the two background views the human sees behind the thumb become more and more alike.

By measuring corners of this triangle near the eyes, we can always tell how sharp or squat the triangle is and, therefore, how far away the thumb is. In fact, your own brain measures these angles automatically all the time, and that is why we know how far away things are without thinking about it.

Hipparchus thought up a method that would do the same thing on a gigantic scale. Instead of left and right eyes, he used our earth like a great eyeball, watching the star from opposite sides of the Sun (that is, 6 months apart). If we really orbit the Sun, our summer and winter views of the northern Pole Star, for example, should also differ. We should have to point our arms at least slightly differently as we move from one corner to the other of our giant triangle.

When Hipparchus carried out this parallax experiment, he did so as carefully as one could, without a telescope, that is. And he found that . . . the Pole Star appears in the exact same place whether you look in summer or winter. Therefore, logically, the earth must not be moving. Aristotle must be right, he decided, even if it meant we couldn't explain the planet movements.

Can you figure out the one possibility that Hipparchus overlooked, that would have explained why he saw no change in the star view even though he and his earth really were moving around the Sun?

For another 1,800 years, even the best astronomers had little reason to believe that the Sun was at the center of our solar system. They saw no parallax change in our view of the stars, and no one could explain what would cause the earth to swing around the Sun in the first place. Even the English scientist Isaac Newton, who first explained the force that causes the earth to swing around the Sun, had to make his argument without any evidence of earth's motion from parallax changes.

The first successful measurement of parallax changes came more than 200 years after people had begun using telescopes, when William Bessell examined a dim nearby star in the constellation Cygnus, he found that its position shifted --ever so slightly-- from one half of the year to the other. Using this measurement, Bessel was able to draw an extremely sharp triangle to calculate that his star was 10 light years away. That's about 60 trillion miles.

Since then, we have built ever more precise telescopes and measured ever farther stars. The most recent breakthrough came from the Hipparcos satellite telescope, which measures star distances as great as 1,000 light years. Astronomers need to rely on these measurements every time they measure any distance in space, even out to the farthest galaxies at the edge of the

What's Up?

(Continued from page 5)

clocking in at mag 6. Quite nice. The final cluster in my program was NGC 2215. After swabbing off the Telrad and the finderscope for the umpteenth time, I went after it. The cluster is located a bit more than halfway along a line drawn between Orion's belt and Sirius. From there it is a little more than a Telrad circle above that line. Confused? Check out your charts. There are a couple of fairly bright stars that almost frame the cluster, and they should be readily visible in the finderscope. However, all I could see was a foggy halo. The dew had won, and the party was over. I still think that should be an easy cluster to find, and I'll get after it another time. By and large, it was a very successful outing.

I found another observing location. The Fort Eustis Army Post has a number of picnic areas along the James River. A tree line to the east cuts off most of the light from the post, but the whole western sky over that big river is wide open. There are very few lights on the opposite shore. On the downside, the location is only about three feet above sea level, so there is a bodacious amount of atmosphere to peer through, not to mention a bloody cold wind coming off the river. I made a site survey with binoculars one night, and the area shows promise. Now all I have to worry about is getting arrested or shot for setting up a strange cannon-like object on the post. It's worth a try. Otherwise, ice storms that create power outages are a sure way to stamp out light pollution. Hmmmm!

NOVAC Budget for 1999

Pedro Martinez

Revenues	1998 Actual	1999 Budget
Membership Dues:		
Renewals-Regular & Additional	$4,062.00	$4,368.00
New Members-Regular & Additional	$2,352.00	$2,082.00
Total for Membership	$6,414.00	$6,450.00
Library Book Sale		$900.00
Interest Income	$251.56	$250.00
Calendar Sales	$335.90	
Hat Sales	$30.00	
Astronomical League Book Sales	$46.00	
Donation	$88.00	
Kalmbach Book Sales	$1.26	
Total Revenues Expected	$7,166.72	$7,600.00

Expenses

Newsletter		
Printing & Assembly	$1,186.23	$1,650.00
Postage	$744.64	$861.00
Total for Newsletter Expenditure	$1,930.87	$2,511.00
Astronomical League		
Dues	$868.00	$1,210.00
Library		
Books	$101.22	$100.00
Binoculars	$90.00	
Total for Library	$191.22	$100.00
Observing Site Expenses		
Observing Site Improvements		$1,550.00
Total for Observing Sites		$1,550.00
NOVAC Annual Picnic		
Picnic Permit-Year 2000	$135.00	$120.00
BBQ Food & Supplies	$151.57	$180.00
Invitations-Printing & Postage	$72.37	$100.00
Total Picnic Expenses	$358.94	$400.00
NOVA Star Party		
Publicity	$21.95	$25.00
Printing	$34.43	$35.00
Lightsticks/Necklaces	$241.84	$240.00
Miscellaneous	$295.25	$200.00
Total Star Party Expenses	$593.47	$500.00
Arlington Planetarium		
Reception Food	$394.06	$400.00
Science Fair Prizes	$40.70	$100.00
Astronomy Day Publicity (Printing & Postage)	$19.86	$50.00

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Slide Show Presentation Project	$349.83	$200.00
International Darksky Association	$100.00	$100.00
ETX Drawing Tickets	$20.00	
Calendar (For Resale to NOVAC members)	505.25	
Administrative		
Liability Insurance	$367.00	$375.00
Printing-Membership Applications	$60.62	$100.00
Printing-Stationery	$0.00	$50.00
Printing-Administrative	$142.32	$120.00
Postage	$275.91	$250.00
Supplies	$156.09	$200.00
State Registration Fee	$25.00	$25.00
Personal Property Tax	$13.53	$24.00
Bank Service Charge	$0.00	$10.00
Subtotal Administrative	$1,040.47	$1,154.00
Subtotal Expenditures	$6,432.67	$8,275.00
Light Pollution Project		$200.00
Remaining New Projects Reserve		$300.00
Total Reserve		$500.00
Total Expenses		$8,775.00
Total Revenues Expected		$7,600.00
Subtotal Expenses		$8,275.00
New Projects Reserves		$500.00
Net Revenues		($1,175.00)

Split of Expenditures Based on $8275 for 380 members unit cost of $22.95

	1997	1998	1999
Newsletter	$4.40	$5.86	$6.43
International Dark Sky Membership	$0.00	$0.30	$0.23
Astronomical League	$2.32	$2.64	$3.21
Administrative	$3.01	$2.76	$2.98
Operations	$8.27	$6.44	$10.10
Total	$18.00	$18.00	$22.95

Highlights of NOVAC Board Meetings and General Meetings

Kevin Brown

December 9 Board Meeting

19:32 Tilly Smith called the board meeting to order.

Tilly Smith talked about the goals for 1999. It was agreed that NOVAC would focus on four major goals in the coming year:
1) Light pollution reduction project.
2) Improve observing sites.
3) Improve new member orientation/education.
4) Investigate a larger meeting site.

Bill Burton talked about the upcoming elections. No further nominations have been submitted. For future elections we will consider sending out a ballot for members who don't attend the meetings.

Tilly Smith and Pedro Martinez led a discussion of the proposed budget for 1999.

Submitted by Kevin Brown,
Secretary

December 16 General Meeting

19:33 Tilly Smith, President, called the meeting to order. The prospective and new members introduced themselves.

Tilly announced that Crockett Park would be closed from December 24 thru January 1 and also reminded members of the NOVAC Annual Meeting on January 13, 1999.

Craig Tupper talked about the book sale.

Officers' Reports:
Tilly Smith gave the Vice President's Report on upcoming general meeting programs.

Pedro Martinez gave the Treasurer's Report and handed out the financial statement for the period January 1 - November 16.

Kevin Brown gave the Secretary's Report.

Bill Burton conducted the election of NOVAC Officers for 1999. The slate was elected by the membership.

Jeff Stetekluh gave the observing report.

Bob Bunge gave the sky tour.

Jon Stewart-Taylor gave a brief presentation about the potential astronomy park that may be created at the former Nike site at Great Falls, pending approval by Fairfax County.

For the main program, Brent Archinal gave a presentation on the NOVAC and Hidden Hollow Star Parties and Bill Burton gave a presentation on 1998 Stellafane.

There were 41 in attendance, 5 of whom were not members.

Submitted by Kevin Brown,
Secretary (interim)

January 13 Annual Meeting

19:33 Tilly Smith, President, called the annual meeting to order. There were 9 Board members and 14 regular members in attendance.

Tilly Smith introduced the Board for 1999 and then reviewed the Five-Year Plan with particular emphasis on NOVAC's goals for 1999.

Tilly Smith and Pedro Martinez presented the proposed budget for 1999.

Tilly Smith spoke about the three major NOVAC events at Crockett Park for 1999: Astronomy Day on May 22, the NOVAC Picnic on June 12, and the NOVA Star Party on October 16.

Jon Stewart-Taylor gave a status report on the Great Falls Nike site.

Pete Johnson reviewed the upcoming general meeting programs.

New business:
Craig Tupper talked about the overdue library book situation.

Tilly Smith talked about a proposal to allow the members to vote by e-mail in future elections.

Submitted by Kevin Brown, Secretary

January 20 General Meeting

19:33 Tilly Smith, President, called the meeting to order. The prospective and new members introduced themselves.

Tilly Smith introduced the NOVAC Board members for 1999.

Craig Tupper beat up the membership concerning overdue books from the library.

Officers' Reports:
Pete Johnson gave the Vice President's Report on upcoming general meeting programs.

Pedro Martinez gave the Treasurer's Report.

Kevin Brown gave the Secretary's Report.

Following the Officers' Reports, Jeff Stetekluh gave the observing report.

Ian Keith gave the sky tour.

For the main program, Bill Burton gave a presentation on advanced deep sky observing techniques.

There were 64 in attendance, 11 of whom were not members.

Submitted by Kevin Brown,
Secretary

DINNER BEFORE THE MEETINGS

Brent Archinal

So that members may get together socially other than at a crowded meeting or while observing in the dark, NOVAC has a planned dinner before all of our regular meetings on the third Wednesday of each month. The place is the **Santa Fe Cafe in Rosslyn, at 5:45 P.M.** This is a nice Mexican restaurant with good food and reasonable prices, although credit cards are not accepted. Smoking is allowed in one part of this (large) one room restaurant, but NOVAC members have not been smoking and few others usually are. If you arrive first, please sit in the front in the non-smoking section.

The restaurant is located at 1500 Wilson Blvd., in Rosslyn, with entrances off of both Wilson Blvd. and Clarendon Blvd. It is just west of "downtown Rosslyn", on the southwest corner of Wilson Blvd. and N. Oak St., where Wilson splits becoming Wilson one-way west and Clarendon one-way east. On street parking is often available in front of the restaurant, around the long block (make two left turns) on Clarendon just before it ends by the restaurant, or one block north. Be sure to feed any parking meter if you arrive before 6 P.M. This location is quite close to the Rosslyn Metrorail station. So we'll know about how many are coming, or for more information, or in case of cancellation due to weather, please contact Brent Archinal, at baa@casa.usno.navy.mil, or (evenings) at 703-237-0201.

NOVAC Notices and Benefits

Discounts on *Sky & Telescope* and *Astronomy.*

As a member of NOVAC, you can get astronomy magazine subscriptions at a discount. To obtain *Sky & Telescope* for $27.00 (instead of the standard $36.00), make your check out to "Sky Publishing Co." You can subscribe to *Astronomy Magazine* for $29.00 for one year (Note price increase from $24.00, effective November 1). Make your check payable to "Kalmbach Publishing Company". In each case, note on the check: "new subscription" or "renewal." If a renewal, include your customer number. Send your check to Treasurer Pedro Martinez, Jr., 6319 Anneliese Dr., Falls Church VA 22044.

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.

Discount on Books

NOVAC is participating in the discount book sales program offered by Kalmbach Publishing. They will sell our members any astronomy-related book in their catalog for 25% off the list price when we send in a group order. Kevin Brown is coordinating the sales. If you are interested, please see him at a meeting, or call him at home (703) 503-9523 to place an order. Make your check payable to "NOVAC" for the price of the book minus the discount, when you place the order. We anticipate doing this 3 - 4 times a year if demand warrants.

Club Telescopes and Binoculars

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.

One telescope is a Celestron model SP-C6 on a Super Polaris German equatorial mount and wood tripod. The telescope comes with Orion Ultrascopic 10mm and Meade MA 25mm eyepieces with 1.25-inch barrel sizes.

The other telescope is a homemade 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 a telescope you will need to show your NOVAC observing pass and leave a $500 (for the Celestron) or $250.00 (for the Dobson) security deposit. To borrow the Celestron, contact Doug Mistler at (703) 437-0513; for the Dobson, contact Bob L'Hommedieu at (703) 978-0946. Note: Checks must be made payable to "NOVAC". The club also has a pair of 10x50 binoculars available for members to borrow. They are kept in the club library in the back of the planetarium, and can be checked out after the regular monthly meeting, for a period of one month. Please show your observing pass.

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 borrow books, see NOVAC Librarians Pedro Martinez or Craig Tupper 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 available upon request.

General Membership Meetings

General Membership Meetings are held at the Arlington Planetarium, 1426 North Quincy Street, Arlington, Virginia, on the third Wednesday of every month. To reach the Planetarium, take Interstate 66 to Exit 71 West, North Fairfax Drive (Route 237). Go east on Route 237 to the fifth stoplight, North Quincy Street (about 0.8 miles). Turn left onto North Quincy Street (at the funeral home). Go six blocks (about 0.5 miles). The planetarium is the low white domed building on the left.

Trustee Meetings are held the Wednesday before the week of the General Membership Meeting. Members who are not trustees but are interested in attending should contact a club officer or board member for further information.

NOVAC On-line

NOVAC maintains an e-mail mailing list. Messages sent to the list include reminders about scheduled observing sessions, announcements for unscheduled sessions, requests for quick observing session summaries, MIR observability predictions, etc. For more information, send a message to Chewning Toulmin, pct@his.com.

NOVAC Observing Site Rules

C. M. Crockett Park:

We have permission from Crockett Park to unscrew the light bulbs on the light sensor fixture on the side of the gate guard building facing the observing field (south side).

Please leave the lights on the far side (north side) active so people can see the gate.

Weekends (Fri./Sat. only), NOVAC has unlimited access to the park for all weekends. The weekends will also be open to the public. The gate will be locked and will not be unlocked unless a NOVAC member enters the park; after which time the gate will stay open to approximately 10:00 p.m., when the Assistant Park Manager will ask the public to leave. The gate will then be locked, and should remain locked through the rest of the evening. NOVAC members may remain until they are finished with their observing sessions.

Weekdays (M-Th & Sun.), NOVAC members need to notify Assistant Park Manager Bonner Davis by e-mail (crocketcow.aol.com) or phone (540-788-4867) by 2:00 p.m. on the day they plan to observe. Assume approval unless the park notifies you in the negative. The weekdays are not open to the public. The gate should remain locked after you enter the park and throughout your observing session.

If any NOVAC member notices any member of the public violating park policy, he or she is to notify the Assistant

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(Continued from page 10)
Park Manager, who lives in the house adjacent to the end of the parking lot. During EDT, set up on the large field to the left. During EST, set up on the paved cul-de-sac 200 yds. past the gate. No loud radios, alcoholic beverages, or loose pets permitted. Please do not leave trash or debris behind. We are guests of the park; Park Management may revoke our observing privileges at any time due to carelessness of one person.

Savage Farm Site: The Savage Farm site is reserved for NOVAC use on nights listed in our schedule at the back of this newsletter. For unscheduled observing sessions, contact the park manager, Paul McCray, at (703) 729-0596 or <wodtrail@erols.com> at least 24 hours in advance, and leave a message with your phone number or e-mail address. You may use the site for that session ***unless*** you hear from Mr. McCray stating otherwise.

No loud radios, alcoholic beverages, or loose pets. Pick up after yourself, and do not leave any trash behind. Make sure the gate is locked whenever you are in the park, and when you leave. We are guests of the NVRP and could have our access to this site revoked at any time if it is abused.

Mickey Gordon Regional Park:
There is a light pole on the road entering the park and it is a problem towards the entrance of the park. We recommend you set up further back in the park or on a lower field behind the baseball diamond to escape the light.

The park is available without notice to all members seven days a week. As sports season begins we will post the schedule when the lighted baseball facility will be in use.

Directions to NOVAC Observing Sites

C. M. Crockett Park
From the Washington, D.C./Northern Virginia area, go west on I-66 to Exit 43A in Gainesville onto Rt. 29 South toward Warrenton. After 11.8 miles on Rt. 29, stay left (toward Culpeper), to bypass Warrenton (but still on Rt. 29 S.) Go about 1 mile to the Rt. 643 exit, Meetze Road. Turn left (East) on Rt. 643. Go 7.5 miles on Rt. 643. Watch for the C.M. Crockett Park sign on your right, and turn right into the Park Entrance Road.

Alternate directions to Crockett
From Washington, D.C./Northern Virginia, go West on I-66 to exit 44. (234 bypass around Manassas). Take 234 bypass to Rt. 28 West. Stay on Rt. 28W for about 13.7 miles, through Nokesville, Catlett and Calverton. Turn right at Rt. 643 (store on corner). Go 1 mile to Crockett Park entrance road on left.

Savage Site:

From D.C. I-66 West to Route 17 North. Stay on Route 17 North until it intersects with Route 50 at Ashby Gap. Turn left onto Route 50 and go 1.0 mile and turn right on Route 601. Continue on Route 601 (Blue Ridge Mountain Road) and go two miles past the main gate of the FEMA installation. Turn right at the park entrance after passing the gateposts with *Belle Allee* and *Ball Alley 1875* on your right.

The park entrance on Route 601 is marked by a small brown and white NOVAC sign. The neighbors periodically pull up the sign, so it may not be there. As you turn into the park, go straight ahead until you reach the gate, which is secured by both a keyed padlock and a combination lock. These locks are located to your left behind the gate as you face it from the outside. The combination is on your NOVAC observing pass. **Always** lock the gate behind you. The NOVAC lock **must be locked to the keyed lock, not to the chain,** to allow emergency access by the fire department. Drive to the observing area (the stone patio next to the house). There is very limited parking at the observing area itself, so please park in the parking area on the right as you face the patio.

Mickey Gordon Regional Park
The park is located fifteen miles west on Rt. 50 from the intersection of Rt. 28 and Rt. 50. It is only a 20-minute drive from the Centreville area and should be a convenient site for most members in western Northern Virginia. Directions to the park: take Rt. 66 west to Rt. 28 north. Take Rt. 28 to Rt. 50 West. Go 15 miles until you see the brown Mickey Gordon Regional Park sign. Make a right on Rt. 627, Carters Farm La. Go a few hundred yards to the park entrance on the left. The park has a gate but should never be locked.

Site Locations
Here are the locations of four observing sites as provided by NOVAC members:

- Savage: 39 ° 04.7' N; 77 ° 51.7' W
- Crockett: 38° 37' N; 77° 43' W
- Big Meadows: 38°32' N, 78°26' W
- Little Bennett Regional Park: 39°17.0' N, 77°17.5' W

The NOVAC Newsletter is the official publication of the **Northern Virginia Astronomy Club** and is published six times per year at 5 Carter Court, Rockville, MD 20852-1005, Elliott D. Fein, Editor and Publisher. The *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. Additional memberships at the same address without additional copies of the newsletter are $6.00 per person. Contact Secretary Kevin N. Brown, 5755 Walnut Wood Ln., Burke, VA 22015, 703-503-9523.
All notices of change of address should be sent to Kevin N. Brown. Please include both old and new addresses.

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

NOVAC members are invited to submit articles for publication in the *NOVAC Newsletter*. The editor reserves the right to edit all materials submitted.

Article submissions, in ASCII please, may be sent to Elliott Fein at elliott.fein@erols.com, or to Elliott's address in Rockville, given above. Questions? Call 301 762-6261, or send e-mail.

Deadline for submissions is three weeks in advance of publication, e.g., December 10 for the January/February newsletter.

1999 NOVAC Observing Schedule

C. M. Crockett Park

All weekend nights (Friday/Saturday)
Astronomy Day - Saturday, May 22
NOVAC Picnic - Saturday, June 12
NOVA Star Party - October 16

Savage Farm

March 12, 13, 14, 19, 20, 21
April 9, 10, 11, 16, 17, 18
May 7, 8, 9, 14, 15, 16
June 11, 12, 13, 18, 19, 20
July 9, 10, 11, 16, 17, 18
August 6, 7, 8, 13, 14, 15
September 3, 4, 5, 10, 11, 12, 17, 18, 19
October 1, 2, 3, 8, 9, 10, 15, 16, 17
November 5, 6, 7, 12, 13, 14
December 3, 4, 5, 10, 11, 12, 31
January 1, 2, 2000

Meteor Shower Dates for C. M. Crockett, Mickey Gordon, and Savage

March 13 through 20 Messier Observing
May 6 Eta-Aquarids meteor shower
August 12 Perseids meteor shower
October 21 Orionid meteor shower
November 17 Leonid meteor shower
December. 14 Geminid meteor shower
December 22 Ursid meteor shower

NOVAC

The Northern Virginia Astronomy Club
c/o Kevin Brown
5755 Walnut Wood Lane
Burke, Va. 22015-2710

Inside:
The Urban Club
For Young Astronomers
And much, much more . . .