# STAR GAZER NEWS

NEWSLETTER OF THE DELMARVA STARGAZERS

Septewmber 2004 **WWW.DelmarvaStarGazers.Org** Volume 12 Number 3

There was no inside meeting in August so the September newsletter will be a pot pouri of odds and ends starting with the president's remarks .

**From the President's Desk...** August 15, 2004
This has been the week amateur astronomers both dream about and fear. It was the week of the new moon, the week of the Perseid meteor showers, huge sunspots and solar flares, Stellafane, and our trip to the Mountain Institute near Spruce Knob, WVA. So what is there to fear? Clouds, stalled weather fronts and Hurricane Charlie, that's what. This was a real bummer by Mother Nature. In fact this has been a summer of almost no decent viewing opportunities. This summer, most of June, July and now August, has been one of cloudy nights and day after day of the muggies. My telescopes have been in the same position so long they are growing roots. And it has been so long since I had a decent view of the night sky I may have to break down and buy some digital setting circles just to find the Messier objects. My other summertime hobby, gardening, has been great and I have eaten so much corn on the cob, lima beans, squash, and TOMATOES that I truly need a diet diversion.
But, it is the middle of August and soon we will cut off the AC, open the windows and welcome some of Canada's finest Arctic air. I call those Canadian fronts Continental Conditioning. Sleeping will be done to the sound of crickets instead of the AC blower and you may even get up during the night to add a blanket. I like those Add-a-blanket nights of Early Fall. Speaking of Early Fall – I predict that is exactly what is in store for us. The trees, garden plants, flowers – mostly all plants, started early this spring and matured early. Even the crickets and summer bugs (cicada bugs) seem to have come early. So, you heard it here first – Surles predicts an Early Fall.
By the time you read this we will have only a couple of weeks until the Ninth No Frills Star Party. I know, it seems like just last month we hosted the Tenth Delmarva Star Gaze. Time is marching on. So, tell your friends and family there is plenty of space available for the No Frills – we will be at the Tuckahoe Equestrian Center again. This is a star party of lower humidity, longer nights, cooler temps, good fall food in the form of veggie soups, crab stew, fried fish, late season corn on the cob, and other fall garden goodies. Can you wait? Oh, the viewing isn't bad either. There will be the late summer Milky Way from sunset until 10-11 PM and by morning you can watch Orion and the winter sky rising in the east.
We will meet September 7 for our first inside meeting since June. We will meet on Tuesday night at 7:00 PM in First Presbyterian Church (same time and place as last always). It will be good to see each of you and to hear about your summertime astronomy adventures.

Monthly Meeting, Tuesday, September 7

**Edmund Halley**

**Presented by Bob Mentzer**

*7:00 p.m. First Presbyterian Church, Smyrna*

I will have a description of the Observing Program and Bob Mentzer will deliver his presentation on Edmund Halley. But, that leaves the topics on Eyepieces and Apollo without presenters. So, please don't be shy – there is plenty of data available on both topics. The numbers 4,6,8,9,10/71 and 3/72 are issues of S&T that have excellent articles on Apollo. The issues are in my garage (along with several hundred others to be used as resources for other programs during the coming year. Eyepiece design is outlined on the panels of Orion Telescope brochures and on their website.
**Our plans for monthly programs for the coming year are shown at the bottom of page 2.** Please review the topics and volunteer to be responsible for those that are of interest to you. Remember our very successful programs last year were the product of our volunteers. I want to thank each person who researched, prepared presentations, and shared their work and knowledge with us. We really did have some excellent presentations last year and I am sure each member enjoyed the effort they expended to make them a reality.

An Email to me is the best way to volunteer for one of the topics – my address is: don.r.surles-1@usa.dupont.com

Well, it is approaching noon, it is Sunday, and I have to go to the garden to gather the corn on the cob, lima beans, KY Wonder snap beans, squash, tomatoes, okra, etc. This is a ritual that allows Karen to assemble another of her Sunday dinners that has produced a more mature and plump physique for one who was once considered to be skinny and actually nicknamed "Slim" in his earlier years.

So, enjoy the remainder of your summer and I will see you at the Church or at Tuckahoe.

Don…

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**Gamma Ray Bursts and Hypernovae**

*Frank Sheldon*

As late as 1997, gamma ray bursts were still one of the biggest mysteries in astronomy. The reason for this may be the difficulty in studying them since gamma rays are completely invisible to the eye and, are unable to penetrate the earth's atmosphere. These bursts are intense emissions of gamma rays. They are the very highest frequency Xrays. Gamma rays have the shortest wavelength in the electromagnetic spectrum and have the highest energy photons.

Gamma ray bursts were first detected in 1973 by US Airforce Vela Satellites when checking for violations of the then recently signed nuclear test ban treaty. The 16 gamma ray bursts detected by the Vela Satellites however, were not from nuclear tests but appeared to be more of galactic origin than local origin. At that time, it was *assumed* that all of these bursts occurred in the disk of our own galaxy. Later in 1995, when 800 more grbs were observed by NASA's improved BATSE instrument, they seemed to be occurring everywhere.

In 1997, when a very intense gamma ray burst occurred concurrently with a supernova in the Large Magellenic Cloud, a logical question arose: is there some connection between grbs and supernovae? In 1998, this link was reinforced when Supernova SN1998bw occurred in a distant galaxy accompanied by gamma ray burst GRB980425. (Note the grb naming system GRBYYMMDD Year Month Day.)

( continued on page 3)

| Month | Equipment Update | SIG Report | S&T "Looking Back" | Monthly Program |
|---|---|---|---|---|
| Sep-04 | Eyepiece Design & Pertinent Information | Observing Program | Apollo 14,15,16,17; 4,6,8,9,10/71, 3/72 | Edmund Halley - Bob Mentzer |
| Oct-04 | Eyepiece Cases - Do's & Don't's | Star Charts & Their Use | Soviet Lunar Rover "Lunokhod"; 3 & 7/71 see also 1973 for Lunokhod II | Astromart - Pluses and Minuses |
| Nov-04 | Filters and Their Use | Solar Observing program | Armand Spitz - Jun 71 | Club Swap Meets |
| Dec-04 | Handy Gadgets & Stocking Stuffers | Lunar Observation Program | Exploration of Mars; 5,6,11/71 & 3/72 | The Star of Bethlehem |
| Jan-05 | Home Observatories | Photography - Film & Digital | Johannes Keeper & Rudolphine Tables - 12/71 | Astronomy via the Internet: How WWW has Changed Amateur Astronomy |
| Feb-05 | Comfort @ the Eyepiece | Telescope Making | Issac Newton - 1st?? Newtonian 12/71 | Star Parties Compared and Contrasted |
| Mar-05 | Telescope Designs | Community Outreach | History of Astronomy in Early USA - 7/76 | How to Succeed in the Messier Marathon |
| Apr-05 | Packing for a Night of Successful Observing | Comets | Building the Space Shuttle - 6/76 | Observing Sites available to DSG |
| May-05 | Optical Coatings - understanding the jargon | Looking into the Future of Amateur Astronomy | Next 25 Years in Space - Nov 76 | Planning the Next Five Years for DSG |
| Jun-05 | Tripods - Design & Function | NASA Programs for Space Exploration | Survey of Advertisements then and now... | Monthly Programs for 2005-2006 |

As instrumentation and techniques improved, more milestone observations were made. On January 23,1999, in Corona Borealis, GRB990123 produced the **highest energy explosion ever known!** It was equivalent to a million billion suns! What forces could power an event of such high energy? Speculation turned towards blackholes and hypernovae. The GRB990123 optical remnants were observed with the10-meter (33-ft.) Keck II telescope in Hawaii, to analyze the visible light from the gamma-ray burst. While the burst had faded considerably, it was still possible to measure a redshift of 1.6 for the visible light, indicating a distance of 9 billion light years.

On January 31, 2000, GRB000131 was picked up by the gamma-ray detectors of the Interplanetary Network, giving us the **most distant** and thereby **the oldest** gamma ray burst observed to date. With a redshift of 4.5, GRB000131 is 11 billion light years away and occurred 2 billion years after the Big Bang when the Universe was less than 1,500 million years old, or only 10% of its present age. The energy of this explosion is estimated to be equivalent to 1,000,000,000,000 Suns!

On March 29 in 2003, a gamma ray burst (GRB030329) was detected by NASA's High-Energy Transient Explorer (HETE ) and appeared concurrently with its **hypernova** in a nearby galaxy in the constellation Leo. This was the **brightest** and **closest** burst yet recorded and is the "smoking gun" that finally confirmed the grb/supernova relationship. More accurately, it is the "hypernova/collapsar model," conceived of by Stan Woosley in 1993. GRB030329 was nicknamed the Rosetta Stone after the stone of archeology fame, that finally permitted deciphering of the ancient Egyptian hieroglyphics. GRB030329 occurred at a distance of approximately 2.65 billion light years away (redshift 0.1685). The galactic proximity of both GRB030329 and its related **hypernova** permitted the first detailed study ever made of the actual formation of a GRB. This event began with a Wolf-Rayet star (mass of 10 suns and radius of one sun). The core of this star collapsed independently of the outer shell, producing a spinning black hole inside the star, along with its nickel 56 accretion disk, thus creating the spinning gamma ray photon jet. The jet shatters and breaks out through the disk and the star causing the resultant hypernova/grb. Although gamma rays are invisible, the spinning double ended gamma ray photon beam does emit visible light, if seen on-end or within 4 degrees of on-end. Some of this light is attributed to the fragmented Nickel 56 disk. Almost everything is converted into pure energy (gamma rays) *a la e=mc2* where "m" is the mass of 10 suns and "c" is the speed of light.

While it is unlikely that the study of grbs will help us see the Big Bang, it will lead to a greater knowledge of the nuclear synthesis of chemical elements as well as subatomic particles. It also gives us the opportunity to learn many of the details of stellar evolution of the elusive "o" and "b" super giants and their Wolf Rayet descendents. The study of the optical remnants of hypernova/grbs will broaden our knowledge of measuring age and distance in the early universe. There may be opportunities to measure extragalactic red shifts of both the gravitational field and the expansion of the universe itself.

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**Observing Report Wednesday August 5 2004**

**Kent Blackwell** Wednesday seemed promising for an observing session, so I loaded up the car with the Orion 10" IntelliScope (love that oh, so portable scope) and headed south, to Coinjock NC. The sky looked promising, you say? Perhaps I'm being mendacious; I was just desperate to observe.

Well, dear folks, by arrival time I stepped out of the car expecting to see a beautiful Milky Way but all that could be seen was a very thick haze and swarms of mosquitoes. Shall I leave, thought I? No, I chose to stay, though not even all of the stars in the Big Dipper were visible to the naked eye! I'd estimate limiting magnitude was 3.5 - 4.0 However, several objects did shine through the muck. Comet C/2003 K4 LINEAR, now in Bootes, appeared quite bright, with a large wedge-shaped coma. I could see a faint tail ex-

**How to Join the Delmarva Stargazers:** Anyone with an interest in any aspect of astronomy is welcome

NAME_____

ADDRESS _____

CITY, STATE & ZIP_____

E-MAIL ADDRESS (If any)_____

Please attach a check for $15 made payable to Delmarva Stargazers and mail to Kathy Sheldon, 20985 Fleatown Rd, Lincoln, DE 19960. Call club President Don Surles at 302-653-9445 for more information

tension due east. It was a nice contrast to see the comet share the same field of view with the 8th magnitude star HD 1203334.
Several other objects, which proved quite nice, included several open clusters in Cygnus: NGC 6991, 7031, 7044, 7067, and 7082. I continued the open cluster quest with N7129 in Cepheus and N7245 in Lacerta.
While unsuccessfully looking for Comet C/2001 Q4 NEAT I stumbled on a pretty little double star in UMa, HD 100054, a pair of close and colorful 7.31 and 8.25 magnitude stars.
My next quest was several galaxies, a fatuous quest on such a muggy night. Despite 20 bites from those damn mosquitoes I did pick up about a dozen galaxies hitherto seen before by yours truly. Mind you, they were only a faint hint of a whisper. The last object before packing up and returning on the one hour plus drive home was interesting. Next time take a look at NGC 7129 in Cepheus. SkyTools incorrectly shows it as an open cluster in one location and a diffuse nebula in another! The cluster is very faint with one bright 11th magnitude star TYC 04261-1507 involved. The diffuse nebula, which should be designated LBN 497 in SkyTools and not NGC 7129, was quite nice. I'll have to revisit the area on a clear evening.
By now the moon had risen and the haze thickened so I did what any respectable pessimist would do. I vacated the observing site and headed home. Kent Blackwell

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**The Solar system in September**
***Paul Riley***

Be sure to duck on Sept 29th, when the asteroid 4179 Toutatis (1989AC) breezes by us only 4 LD away (LD=lunar distance). It is ~ 4 Km in diameter and will reach mag 9. I'm sure the club would appreciate seeing any photos taken by a member.
This time of year is a good time to just spend the whole night looking around the "teapot" (Sagittarius). The Galactic Center of the Milky Way is just off to the right of the 'spout'. It almost looks like the Milky Way is 'steam' coming out of the teapot! There are 16 Messier objects around the teapot, plus other cool stuff like Baade's Window (where there is little opaque dust), The dark Pipe Nebula, and NGCs 6357, 6334, 6723 (might be hard to find these without BIG glass).
The Bright planets Mercury, Venus and Saturn may all be seen in the morning twilight. Mars and Jupiter will be hiding behind the Sun. Uranus, Neptune and Pluto are all shown on your Skymap for September 14 at 10:00 p.m.
I'll see everyone at the "No Frills" star party at Tuckahoe. Paul

**Club Activities**

**Club Meetings-** We meet in the First Presbyterian Church in Smyrna, DE (653-8000) on the first Tuesday of each month from 7-9 PM. From US 13, turn west at Wendy's and go one stoplight on Commerce Street; the church is on the right directly across from the Fire Hall.

**Future Meetings..**The annual meeting dates for 2004 are: January 6, February 3, March 2, April 6, May 4, July 3 Picnic at Don's house, August 3 No inside meeting;event to be scheduled, September 7, October 5, November 2 and December 7.

The regular meeting format includes discussion of club activities, observing highlights and an advertised presentation.We solicit suggestions for topics and presenters.

**Club Observing...** Observing is (usually) scheduled for the Friday nearest the New Moon to maximize the hours of deepnight without the moon in the sky. Unless otherwise stated, the monthly observing site will be at the baseball field in the camping area at Tuckahoe State Park.
The observing days for 2004 are:
January 16, January 23, February 20, March19,. **April 14-18 ( Stargaze X)**, April 23, May 14, June 18, July 16, August 13, August 20, **September 15-19 (No Frills IX)**, October 15, November 12, and December 10.

The cloud or rain date for the monthly Friday observing will be the following Saturday, but don't trust the weather man! Go outside and look for yourself or check the CNN weather link on our web page. If you still can't decide, call Don Surles (302) 653-9445 or Lyle Jones (302) 736-9842.

**Delmarva Star Gazer Officers 2004-2005**
**President.....Don Surles 302 653 9445**
**Vice President.....Jerry Truitt 410 885-3327**
**Secretary.....Paul Riley 302 738-5366**
**Treasurer.....Kathy Sheldon 302 422 4695**

## Monthly Observing List

After years of going through the northern constellations and touching on the southern constellations last year, we are retiring the constellation of the month. It was suggested that we replace it with a monthly observing list of objects well placed in the evening sky to provide a starting point for those new to the hobby. We will continue to have Paul Riley's solar system report and will add some double stars, Messiers, and some challenge objects. Kent Blackwell has agreed to provide the challenge objects each month but we need volunteers for the double stars and Messier sections. If you would like to take on a section for a while send an e-mail to kcl@dmv.com .

**Double stars**
**Beta Cygni** (mag 3.1,5.1; sep 34.0")– Common name Albireo. Excellent yellow and blue pair. Easy to locate at the foot of the Northern Cross.
**Alpha Herculis** (mag 3.5, 5.4; sep 4.7")– Common name Rasalgethi. Close pair with orange primary and greenish secondary.
**11 Aquilae** (mag 5.2, 8.7; sep 17.5")- A yellowish primary and blue secondary.

**Messier Objects**
**M 11** (open cluster, Scutum)- Common name Wild Duck Cluster. Excellent large OC easily found with binos or scopes. It has several dozen bright members with similar magnitudes.
**M 27** (planetary nebula, Vulpecula)- Common name Dumbell nebula. The shape of this object is due to our point of view along its equatorial plane.
**M2** (Globular cluster, Aquarius)- A rich compact cluster of about 150,000 stars. It has a slight elliptical appearance.

**Obscure Objects In The September Sky** Kent Blackwell kent@exis.net
I thought it would be of interest to briefly discuss several obscure objects visible in the September skies. Each is visible in 8" telescopes under dark, clear skies. Good luck, and contact me if you see them.

**IC 3568**

**Baby Eskimo**
Planetary Nebula
RA: 12h33m06.9s, Dec: +82°33'49" (2000) in Camelopardus
Magnitude: 11.60
Size: 10"
IC 3568 is a bright, but seldom observed planetary nebula. In my 12.5" scope I saw it as very bright, green in color with a bright central star. Lies a few seconds E of a 14th mag star. The planetary has high surface brightness so a filter is not necessary.

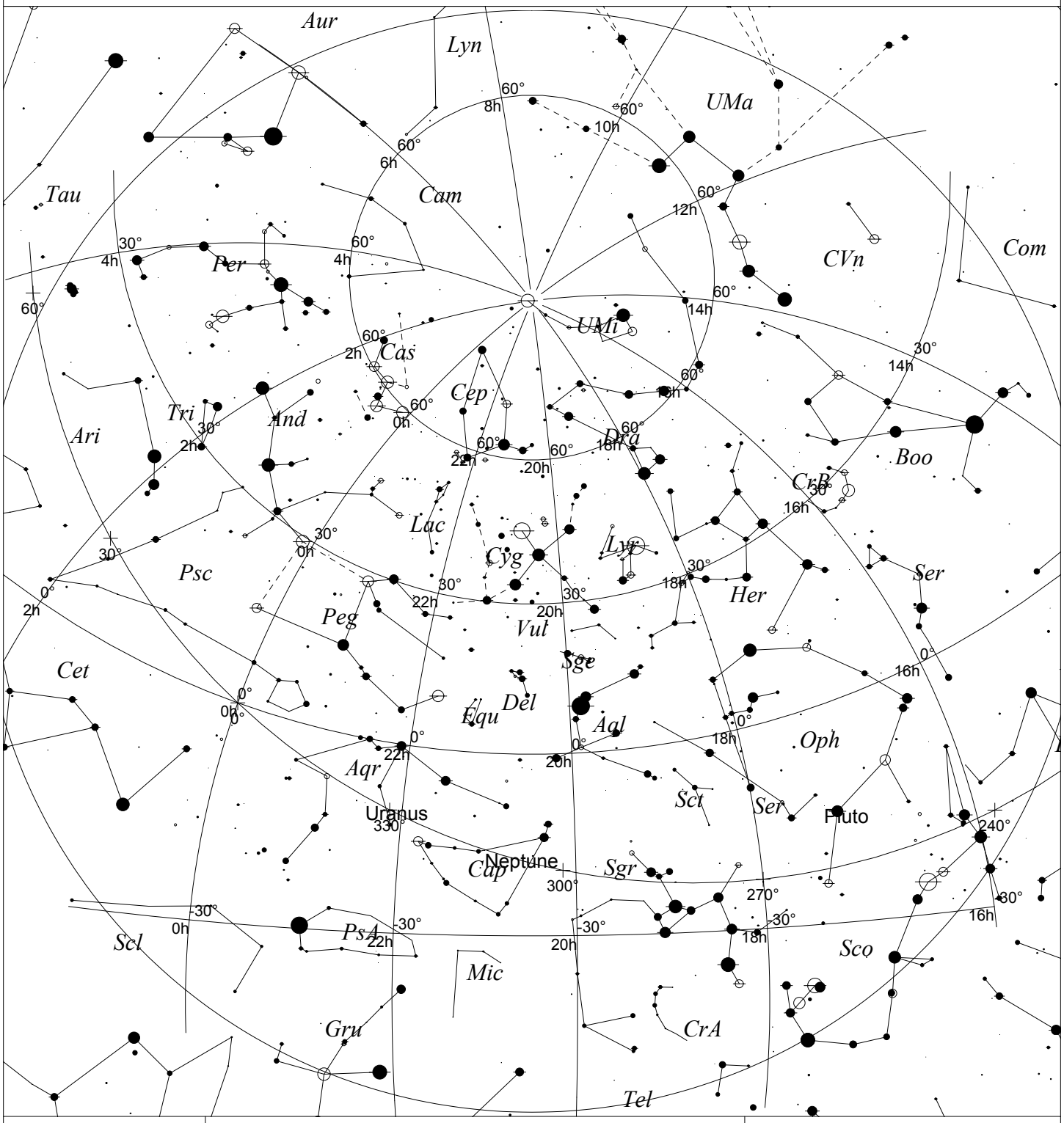
**Palomar 8**

Globular Cluster
RA: 18h41m30.0s, Dec: -19°49'36" (2000) in Sagittarius
Magnitude: 10.90
Size: 5.2'
Observing with my 25" from bright city lights I was really surprised how bright Pal 8 is. With averted vision I even suspected seeing resolution. In a dark sky you might catch a glimpse of it with an 8" scope.

**IC 4997**

Planetary Nebula
RA: 20h20m08.8s, Dec: +16°43'53" (2000) in Sagitta
Magnitude: 11.60
Size: 1.6"
IC 4997 is a bright, and gloriously green nearly stellar PN in my 10" f/4.7 Dobsonian. You'll recognize it as a PN even unfiltered because of the telltale color. An OIII our UHC filter will confirm it even further, as it will outshine everything else in the field. Watch how it blinks beautifully with the 9.9 mag star GSC1631:1973, only 1.1' to the SW.

# SKYMAP FOR SEPTEMBER 2004




| STARS | SYMBOLS | | | |
|---|---|---|---|---|
| <1 | Multiple star | Dark nebula | Radio source | |
| 1.5 | Variable star | Globular cluster | X-ray source | |
| 2 | Comet | Open cluster | Other object | |
| 2.5 | Galaxy | Planetary nebula | | |
| 3 | Bright nebula | Quasar | | |
| 3.5 | | | | |
| 4 | | | | |
| 4.5 | | | | |
| >5 | | | | |

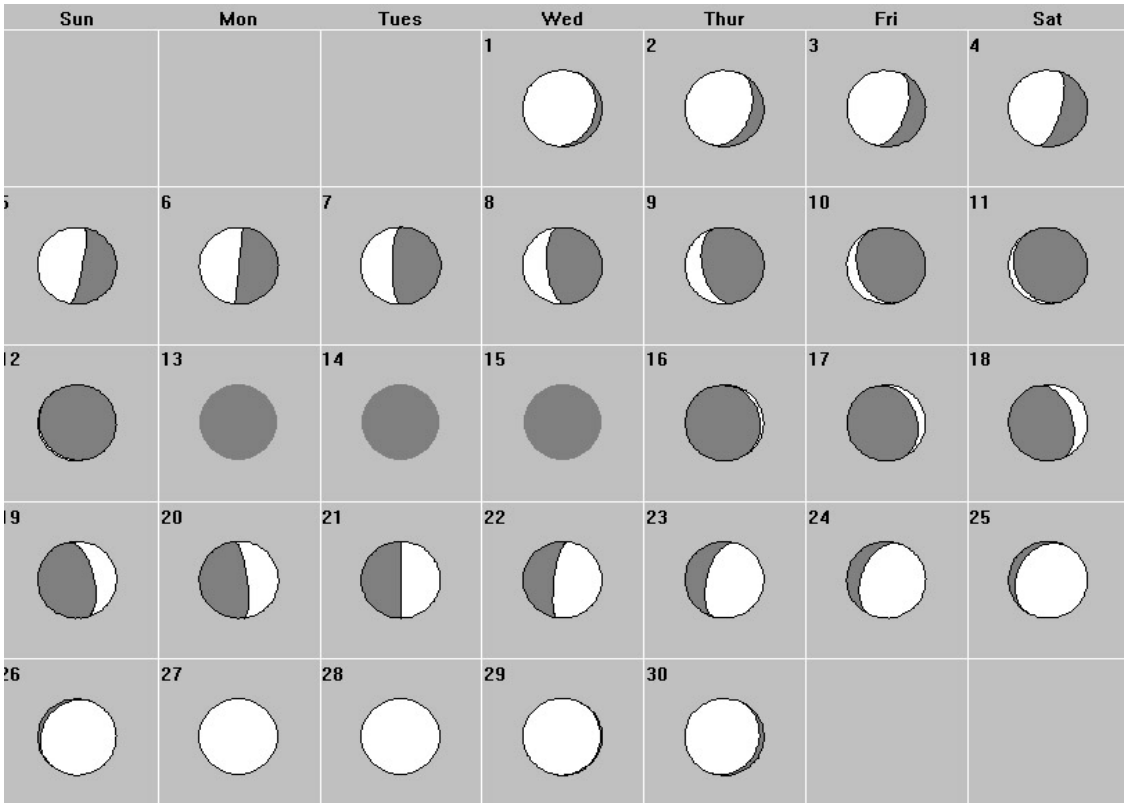
*TUCKAHOE STATE PARK, MD*
*SEPTEMBER 14, 2004*
*2200 HOURS EDST*

Local Time: 22:00:00 14-Sep-2004 UTC: 02:00:00 15-Sep-2004 Sidereal Time: 20:29:46
Location: 38° 58' 0" N 76° 56' 0" W RA: 20h29m46s Dec: +38° 57' Field: 182.0° Julian Day: 2453263.5833

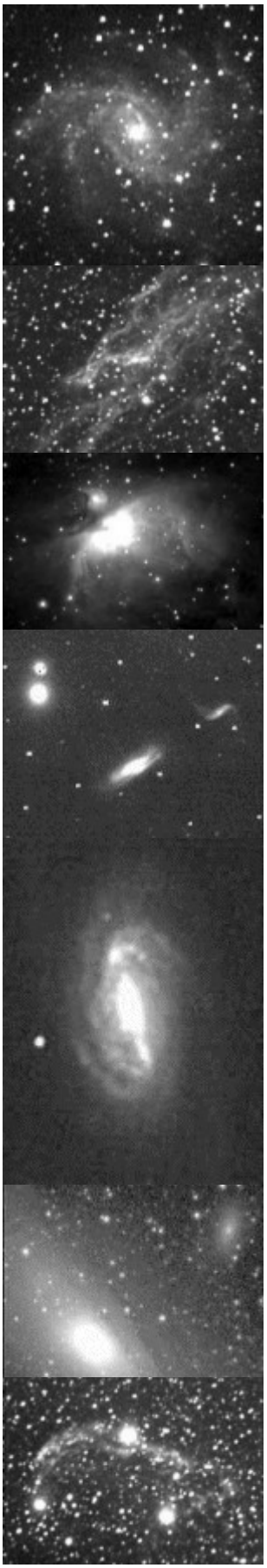
**Sun and Moon Data for September 2004 Tuckahoe,MD**

38.98°N 75.93°W 5hrW Daylight Time Astronomical Twilight

| | Sun | | | | Moon | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | Twi. | Rise | Transit | Set | Twi. | Rise | Transit | Set | % |
| 9/1/2004 | 4:59a | 6:33a | 1:04p | 7:34p | 9:07p | 9:07p | 2:51a | 9:10a | 92 |
| 9/2/2004 | 5:00a | 6:34a | 1:03p | 7:32p | 9:05p | 9:31p | 3:36a | 10:16a | 85 |
| 9/3/2004 | 5:02a | 6:35a | 1:03p | 7:30p | 9:03p | 9:57p | 4:20a | 11:21a | 77 |
| 9/4/2004 | 5:03a | 6:36a | 1:03p | 7:29p | 9:01p | 10:26p | 5:06a | 12:25p | 69 |
| 9/5/2004 | 5:04a | 6:36a | 1:02p | 7:27p | 9:00p | 10:59p | 5:52a | 1:28p | 59 |
| 9/6/2004 | 5:05a | 6:37a | 1:02p | 7:26p | 8:58p | 11:39p | 6:41a | 2:30p | 50 |
| 9/7/2004 | 5:06a | 6:38a | 1:02p | 7:24p | 8:56p | ***** | 7:31a | 3:27p | 40 |
| 9/8/2004 | 5:07a | 6:39a | 1:01p | 7:23p | 8:54p | 12:25a | 8:22a | 4:19p | 31 |
| 9/9/2004 | 5:08a | 6:40a | 1:01p | 7:21p | 8:52p | 1:18a | 9:14a | 5:04p | 23 |
| 9/10/2004 | 5:09a | 6:41a | 1:00p | 7:19p | 8:51p | 2:17a | 10:04a | 5:43p | 15 |
| 9/11/2004 | 5:11a | 6:42a | 1:00p | 7:18p | 8:49p | 3:20a | 10:53a | 6:15p | 9 |
| 9/12/2004 | 5:12a | 6:43a | 1:00p | 7:16p | 8:47p | 4:24a | 11:40a | 6:44p | 4 |
| 9/13/2004 | 5:13a | 6:44a | 12:59p | 7:15p | 8:45p | 5:29a | 12:25p | 7:09p | 1 |
| 9/14/2004 | 5:14a | 6:45a | 12:59p | 7:13p | 8:43p | 6:35a | 1:09p | 7:33p | 0 |
| 9/15/2004 | 5:15a | 6:45a | 12:59p | 7:11p | 8:42p | 7:40a | 1:54p | 7:56p | 1 |
| 9/16/2004 | 5:16a | 6:46a | 12:58p | 7:10p | 8:40p | 8:47a | 2:39p | 8:20p | 5 |
| 9/17/2004 | 5:17a | 6:47a | 12:58p | 7:08p | 8:38p | 9:57a | 3:27p | 8:47p | 11 |
| 9/18/2004 | 5:18a | 6:48a | 12:58p | 7:07p | 8:36p | 11:08a | 4:18p | 9:19p | 18 |
| 9/19/2004 | 5:19a | 6:49a | 12:57p | 7:05p | 8:35p | 12:22p | 5:13p | 9:57p | 28 |
| 9/20/2004 | 5:20a | 6:50a | 12:57p | 7:03p | 8:33p | 1:36p | 6:12p | 10:45p | 39 |
| 9/21/2004 | 5:21a | 6:51a | 12:57p | 7:02p | 8:31p | 2:45p | 7:14p | 11:43p | 50 |
| 9/22/2004 | 5:22a | 6:52a | 12:56p | 7:00p | 8:29p | 3:46p | 8:17p | ***** | 61 |
| 9/23/2004 | 5:23a | 6:53a | 12:56p | 6:58p | 8:28p | 4:37p | 9:18p | 12:50a | 72 |
| 9/24/2004 | 5:24a | 6:54a | 12:56p | 6:57p | 8:26p | 5:18p | 10:14p | 2:04a | 82 |
| 9/25/2004 | 5:25a | 6:54a | 12:55p | 6:55p | 8:24p | 5:51p | 11:07p | 3:19a | 90 |
| 9/26/2004 | 5:26a | 6:55a | 12:55p | 6:54p | 8:23p | 6:19p | 11:56p | 4:32a | 96 |
| 9/27/2004 | 5:27a | 6:56a | 12:55p | 6:52p | 8:21p | 6:44p | ***** | 5:43a | 99 |
| 9/28/2004 | 5:28a | 6:57a | 12:54p | 6:50p | 8:19p | 7:08p | 12:43a | 6:52a | 100 |
| 9/29/2004 | 5:29a | 6:58a | 12:54p | 6:49p | 8:18p | 7:31p | 1:27a | 7:58a | 99 |
| 9/30/2004 | 5:30a | 6:59a | 12:54p | 6:47p | 8:16p | 7:56p | 2:12a | 9:04a | 95 |



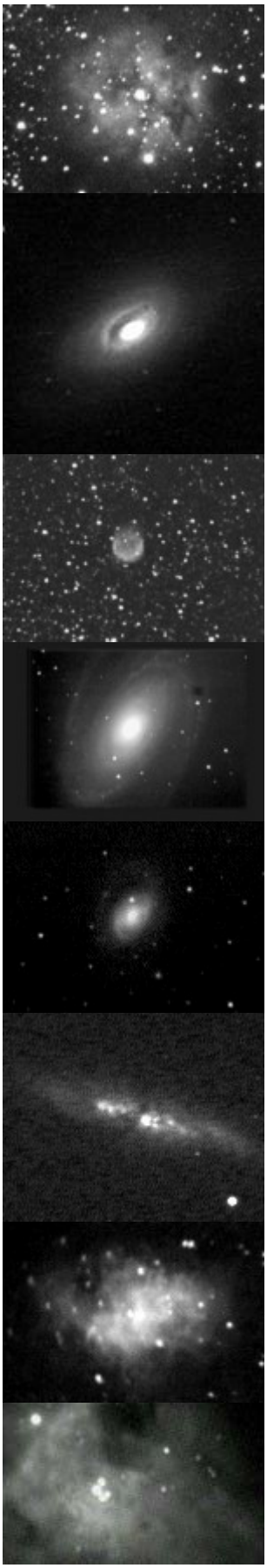
## Moondark for September: Happy Birthday Cookbook CCD—10 years of imaging



Sultry summer nights in 1994 were not especially favorable for observing. When clouds obscured the comet crash aftermath, I worked on building a Cookbook CCD camera—a tenth anniversary worth noting as well. While CCD's had been professionals' standard equipment for years, amateurs were just catching on to electronic imaging. The Cookbook CCD cameras were low cost, build-it-yourself kits that resulted in very capable astro-imagers. Cookbookers even pushed the envelope with novel techniques for color imaging.

Many enjoyable nights and some occasional frustrations were spent with that camera. On my backyard 8-inch LX3, success always required juggling several things at once. Polar alignment became easier with practice. The clock drive was adequate, and tracking "hiccups" with trailed images were simply deleted. The camera itself rarely gave me any trouble, but all the wires, cables and cooling water tubes were a handful to connect in the dark. Usually I spent as much time finding objects and tweaking focus as taking multiple, 60-second images. But on a good night, I could capture a dozen or more deep sky objects. I think the biggest "wow" factor came from seeing a supernova in some distant galaxy appear on the screen. By comparison, today's 32-bit processors and GUI software have made image calibration much less of a chore, and cheap memory and blazing clock speeds have removed post-processing roadblocks. Nowadays, printers and LCD projectors can display a wealth of detail and subtlety.

Over the years, my camera collected its share of photons, but technology advances and the CB 245 is definitely showing its age. Webcams and digicams in afocal mode produce stunning, high resolution color images of the sun, moon and planets. Advances in sensor design have produced video cameras with amazing sensitivity. Low noise chips now allow digicam exposures of a minute or more, while software transforms them in to bona fide deep-sky imagers. In magazines, astro-dedicated "turnkey" color CCD systems are now advertised for less than what Cookbook parts cost in 1994.

Astrophotography today encompasses all forms of film and electronic imaging, and digital now dominates this segment of the hobby. There's no telling what we'll be using ten years from now. Two things are for certain though: imaging will continue to become easier and more spectacular, and there will be exciting things to image under a starry sky.

Can you recognize these deep-sky objects? These are my favorites of about 40 Cookbook images that have appeared in past issues. Moondark is written by Doug Miller, published on the Moondark web site, and printed in the Delmarva Star Gazers' Star Gazer News. This document was last revised on 22 August 2004. Text and images copyright © 2004 by Douglas C. Miller, All Rights Reserved. This material may not be reproduced in any form without prior permission.