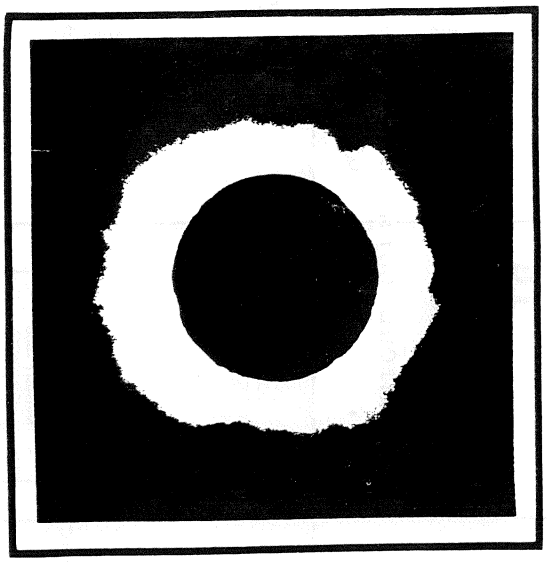


THE NOVAC CORONA

to observe and to help others observe

NEW NOVAC INFORMATION HOTLINE
ALL ABOUT LUMICON FILTERS
THE WINTER SKY

THE OFFICIAL PUBLICATION OF THE NORTHERN VIRGINIA ASTRONOMY CLUB

Issue No. 17 Volume 8 January 1988

President, Blaine Korcel 703-256-4430
Secretary/Treasurer, John Huggins 703-866-4985

NOVAC Computer Bulletin Board: 703-256-4777 - NOVAC RBBS

THE NEW NOVAC INFORMATION HOTLINE 703-866-4985

One Small Step for NOVAC

Al & Lynn Schumann

We have a new calendar. Actually, it's not a new calendar at all. We're still using the one with 12 months, Tuesdays, Fridays and all the usual stuff we've known and loved for years. However, what is new is the format of our observing and activities calendar.

We hope that with this new format the calendar will be a bit easier to read as well as enable us to add some additional items of interest. We realize that new things can be threatening or traumatic, but give it a try.

Needless to say, additional items for inclusion and suggestions for improvement are always welcome. Give us a call at (703) 971-3257.

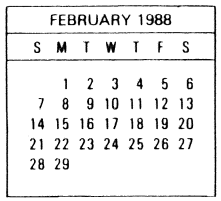
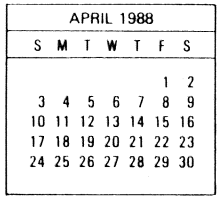
1988 FEBRUARY 1988

For More information call 703-866-4985

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1 Mercury stationary	2 Full Moon	3 Luna 9 soft lands on moon	4	5	6
7	8	9	10 Moon in last quarter	11	Lincoln's Birthday 12 Greenville Observation	13 Fauquier Observation Mars 5° north of moon. Saturn 6° north of moon
Valentine's Day 14	Washington's Birthday Celebration 15 Galileo born, 1564.	16 Kuiper discovs. Miranda, moon of Uranus, 1948	Ash Wednesday 17 New Moon	18	19 Greenville Observation Copernicus born 1473.	20 Fauquier Observation John Glenn orbits, 1962.
21 Jupiter 4 deg. South of Moon	Washington's Birthday 22 Mars 0.01 deg. North of Uranus	23	24 Moon at first quarter	25	26	27
28	29			JANUARY 1988 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	MARCH 1988 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	February

1988 MARCH 1988

For more Information call 703-866-4985

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		**1**	**2**	**3** Full Moon	**4**	**5** Voyager 1 flies past Jupiter, 1979.
6 Venus 2 deg. north of Jupiter.	**7** Mars 1.4 deg. south of Neptune.	**8** Mercury at greatest western elongation	**9**	**10** Rings of Uranus discovered, 1977.	**11** Greenville Observation Moon at last quarter	**12** Fauquier Observation Sat. 6°N. of m Mars. 5°N. moo
13 Wm Herschel finds Uranus, 1781. Per. Lowell born, 1855. Hello canals!!	**14** Einstein born, 1879. m	**15** Mercury .5°N of moon, occultation.	**16** Goddard fires first liq. fuel rocket, 1926.	St. Patrick's Day **17** New Moon	**18** Greenville Observation	**19** Fauquier Observation
20 Vernal Equinox, 4:39 am. Who cares?	**21**	**22**	**23** First photo of Moon, 1840.	**24** Moon at first quarter.	**25** Huygens discovers Titan, moon of Saturn, 1655.	**26** Vesta .5 deg. Nor. of moon, Occultation.
Palm Sunday **27**	**28** Heinrich Olbers finds Pallas, 1802.	**29** Olbers, the same guy, finds Vesta, 1807.	**30**	**31**		March

Editorial

Blaine Korcel

Boy 1987 went by fast! Here it is, another year and further in debt; that is, me not the club. 1987 was a prosperous year for the club. BLTM87 was very successful and remained clear both nights. Our membership increased tremendously and best of all we obtained two new "dark sky" observing sites less than two hours away. I feel we had an excellent year. It is certainly one to reflect on.

However, 1988 is under way and there are plans to make. It looks as if Burke Lake is out of the running for BLTM88 no thanks to Vepco and the intense light pollution problem we have around here. It has been suggested that we use Crockett Park for this event. I feel it will be our only chance and I'm sure it will fit right in with their regular programs. My only concern is that there will not be any camping available. Although this is of minor concern, we will have to think about this and consult with the Park.

What other events are in store for NOVAC members? Well, let's consider the possibilities. I have been dwelling on the idea of a club excursion to Greenbank, West Virginia to visit the radio observatory there. Since it is quite a haul, we would have to make arrangements to stay somewhere over night I guess. Another possibility is an excursion to Stellafane in Vermont. It would be nice to see our club there. Certainly, other suggestions will be equally considered. Please let me know.

Our BLTM87 award winners, Tracy and Doug Megenity, with their 13" Odyssey.

On another note, a new calendar has been generated and I hope you all like it. I think it is more practical than the older one and should contain more information than ever. We will try to keep it slightly ahead of the newsletter in case we goof off too long and don't get it out on time. (AHEM!)

The new NOVAC information hot line is now 703-866-4985. Please make note of it NOW!

In this issue, club members will receive the 1988 club roster. It has been developed using a program by Cygnet called "The Little Black Book." Just cut along the dotted lines. The first sheet is the title page. Turn this sheet over so that it faces down. Next, stack the remaining sheets on top, face up, one by one. The page numbers on the left hand side should increase sequentially so that page 2 is on top of page 1, etc. When your done, just staple it in the center where shown and fold over. WOLA! You now have a 1988 roster in book form. Enjoy!

Membership cards are being sent out with this issue to all members who have paid their 1988 dues. This is primarily to identify you in case there are any problems at our observing sites. These were generated by computer, of course, using our desktop publisher. I hope they meet your approval. When those of you pay your 1988 dues, you will get one also. To determine your financial standing, look on your address label and you'll find your expiration date in the upper right hand corner. If there are any questions, give John Huggins a call.

Our computer bulletin board service is now running at 2400 baud and has reached over 3000 callers world wide. It still supports lower baud rates. For those new with the club, it can be reached at (703) 256-4777. The board now supports both the IBM and compatibles and the Commodore Amiga. If you own an Amiga, you will find many astronomy related programs which you can download. Same holds for the IBM folks. You can always find the latest newsletter in text form posted there. It is a free service so give it a try.

The BBS is now international! Through the Sky Watchers Interest Group, our announcements have been sent to other systems world wide. We also receive international mail likewise from other systems. The latest on news breaking events can be found here even before it reaches Astronomy or Sky & Telescope.

Well, I guess that's it for now. Please make note of the phone and address changes of our Secretary/Treasurer in case you need to contact him. Also, keep those articles rolling in. If we don't use them right away, never fear. We will in future issues.

Clear skies,

Blaine Korcel

Blaine Korcel
President/Editor, NOVAC

Why We Use Filters!

Blaine Korcel

Over recent years, amateur astronomers have had more difficulty seeing astronomical objects than ever before. Man made light sources have turned the night into day in an ever increasing effort to prevent and deter crime and accidents. Well, we have nearly completed our attempts to turn night into day but have not even come close to deterring crime and accidents. To overcome our human mistakes, astronomers have developed ways of dealing with "light pollution."

The first, and most often exercised, method is the use of the kids BB Gun. This is not the most effective way of dealing with the problem nor is it the most convenient. Astronomers should deal with the problem in more civilized and scientific approaches. These range from bombarding your congressman with protest mail, to disrupting the metropolitan area power grid, to using, sometimes very expensive, light pollution reduction (LPR) filters. The latter is the most convenient of all and is what I will attempt to address here. Consult your congressman and/or your Anarchist Cookbook for other details.

LPR filters range in all shapes, sizes, densities, and band passes. They attempt to block out the man made light and pass the important light from our favorite heavenly body. Some are better than others for certain objects. They vary in price from twenty to several hundred dollars and as expected, some are just plain junk!

I have used many filters over the past few years and have weeded out the junk from the quality products. I will biasly suggest the Lumicon series of filters. These provide the best performance for your dollar (or dollars as the case may be.)

Joe Macrie checking his handy work on his 16" Dobsonian.

Last summer, Al Boldt, Joe Macrie and myself did some testing of these filters on various astronomical objects. We tested four filters; the Lumicon Deep Sky filter, the Ultra High Contrast (UHC) filter, the Oxygen III (OXIII) filter, and the Hydrogen Beta (HII) filter. The results were astounding. Our test site was my front yard, about 1 mile north of Interstate 95 and the Capitol Beltway and the area of sky chosen to test was of course the South in the constellation of Sagittarius. Out of the stars visible, we could make out the Teapot and that was about it.

Our tests revealed to us how we could use these filters to our maximum advantage. Let's take a closer look at these filters from the technical viewpoint.

Joe adds teflon bushings to his rocker box. This provides smooth and accurate pointing with such a large instrument.

Lumicon provided me with some information about these filters which supplemented our findings. These included charts, matrices, and band pass graphs. I will attempt to summarize them here (See the enclosed data sheet for details).

The range of light which is considered undesirable to astronomers is that from about 365nm to 436nm (Mercury vapor), 546nm to 617nm (Sodium vapor), and 558nm and 630nm (natural air glow). So what? Well as it turns out, the desirable wavelengths (objects we wish to look at) fall very close to the undesirable wavelengths. Primarily the desirables are 500nm (Doubly Ionized Oxygen [OXIII]), 486nm (Hydrogen Beta [HII]), and 657nm (Hydrogen Alpha [HI] and ionized Nitrogen). The later two of which are important only to astrophotographers and are invisible to the eye (See chart 1).

LUMICON
"Innovation in Astronomy"
2111 Research Drive • Livermore, CA. 94550
(415) 447-9570

Getting the most from LUMICON® Filters

Congratulations: Your new LUMICON DEEP-SKY™, H-Beta™, O-III™ and/or UHC™ Filters are the result of 5 years of steady design improvement, and are the highest performance LPR (Light Pollution Reduction) filters obtainable today. This data sheet explains which filter to use and how performance differs.

Object	Examples	Best Filter-Viewing	Best Filter-Photography
Star & Star Clusters	M-13, M-11	None or Deep-Sky	None or Deep-Sky
Diffuse Nebulae	Lagoon, Swan	O-III near cities otherwise Deep-Sky or UHC	Deep-Sky
Planetary Nebulae	Dumbbell, Ring	O-III near cities otherwise Deep-Sky or UHC	Deep-Sky
Faint Planetary Nebulae	NGC 7293, Abell 33, Jones 1	O-III	Deep-Sky
Reflection Nebulae	Pleiades, Trifid	None or Deep-Sky	Deep-Sky
Spiral Galaxies	M-101, M-33	None or Deep-Sky	None or Deep-Sky
Faint Nebulae	Veil, N. American, Rosette	O-III near cities otherwise UHC	Deep-Sky
Extremely faint Nebulae	California, Horsehead	H-Beta	H-Alpha Pass, Deep-Sky

Exit Pupil The exit pupil is a measure of magnification *independent of telescope aperature.* The exit pupil is simply the eyepiece focal length divided by the telescope f-ratio, e.g. 32mm Plossl and f/10 telescope=3.2mm exit pupil. Each LUMICON filter has an optimum exit pupil (magnification) range as follows:

Filter Type	DEEP-SKY	UHC	OXYGEN-III	H-BETA
Bandpass	90nm	22-26nm	10-12nm	8-10nm
Exit pupil near cities	0.5-2mm	1-4mm	2-5mm	3-7mm
Exit pupil, dark skies	1-4mm	2-6mm	3-7mm	4-7mm

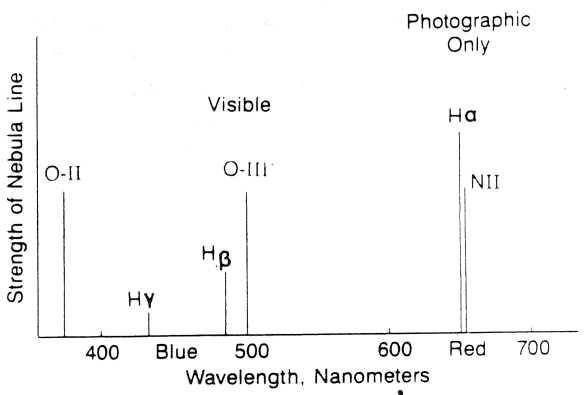
If you use an exit pupil too small, the background sky is too dark. If you use an exit pupil too large, the background sky is too bright and there is insufficient contrast. To determine the optimum eyepiece focal length to use with any filter, simply multiply the exit pupil in the above table for a chosen filter by the telescope f-ratio. For example using an f/6 telescope at a dark site, the H-Beta filter is optimum for 6X(4-7mm)=24-40mm eyepieces. As a second example, using an f/10 telescope near cities, the Deep-Sky Filter is optimum for 10X(0.5-2mm)=5-20mm eyepieces.

Filter Construction. These filters are made using thin film dielectric coatings on optically flat glass. The dielectric coatings consist of about 30 alternating layers of two different materials. Each layer is about a wavelength of light thick and has a thickness accurate to a few angstroms. The Deep-Sky Filters use very hard electron-beam deposited coatings on one side of the substrate with anti-reflection coatings on the backside. Both coatings are very hard, and may be cleaned carefully using alcohol. The UHC, O-III and H-beta filters have a coating protected by glass, with anti-reflection coatings on all surfaces to eliminate ghost images.

Mechanical Design: These filters are designed to thread directly into most eyepieces and telescope accessories. Additional adapters are listed separately. The 1¼" filters have 1⅛"X40 threads. The 48mm filters have M48X0.75mm metric threads.

Bandpass: These filters all reject manmade and natural light pollution; Mercury light pollution occurs at 365, 405, 436, 546, 577 and 617nm. High Pressure Sodium streetlamps emit at 570, 583, 600 and 617nm. Natural airglow occurs at 558 and more weakly at 630nm. There is a window of greatly reduced light pollution from 440nm (blue) - 540nm (green). The Deep-Sky Filter™ has a wide bandpass of 90-100nm (441-535nm) to yield maximum transmission of light from stars and galaxies. The UHC Filter has a narrow 22nm bandpass at 484-506nm. The O-III has a very narrow 11nm bandpass at 495-501nm and the H-beta has the narrowest bandpass of all, only 8-9nm centered at 486nm. The *narrower* the bandpass, the higher the rejection of light pollution and the *blacker* the skies. However, a narrower bandpass also means dimmer stars. The Deep-Sky Filter also has high transmission for the photographic red nebula emission lines.

Nebula Emission Lines. The main *visible* emission from nebulae is doubly ionized oxygen near 500nm. There is also a weaker line due to hydrogen-beta at 486nm. Red hydrogen-alpha and ionized nitrogen near 657nm are *only important photographically.* These red nebula lines are totally invisible to the dark-adapted eye.

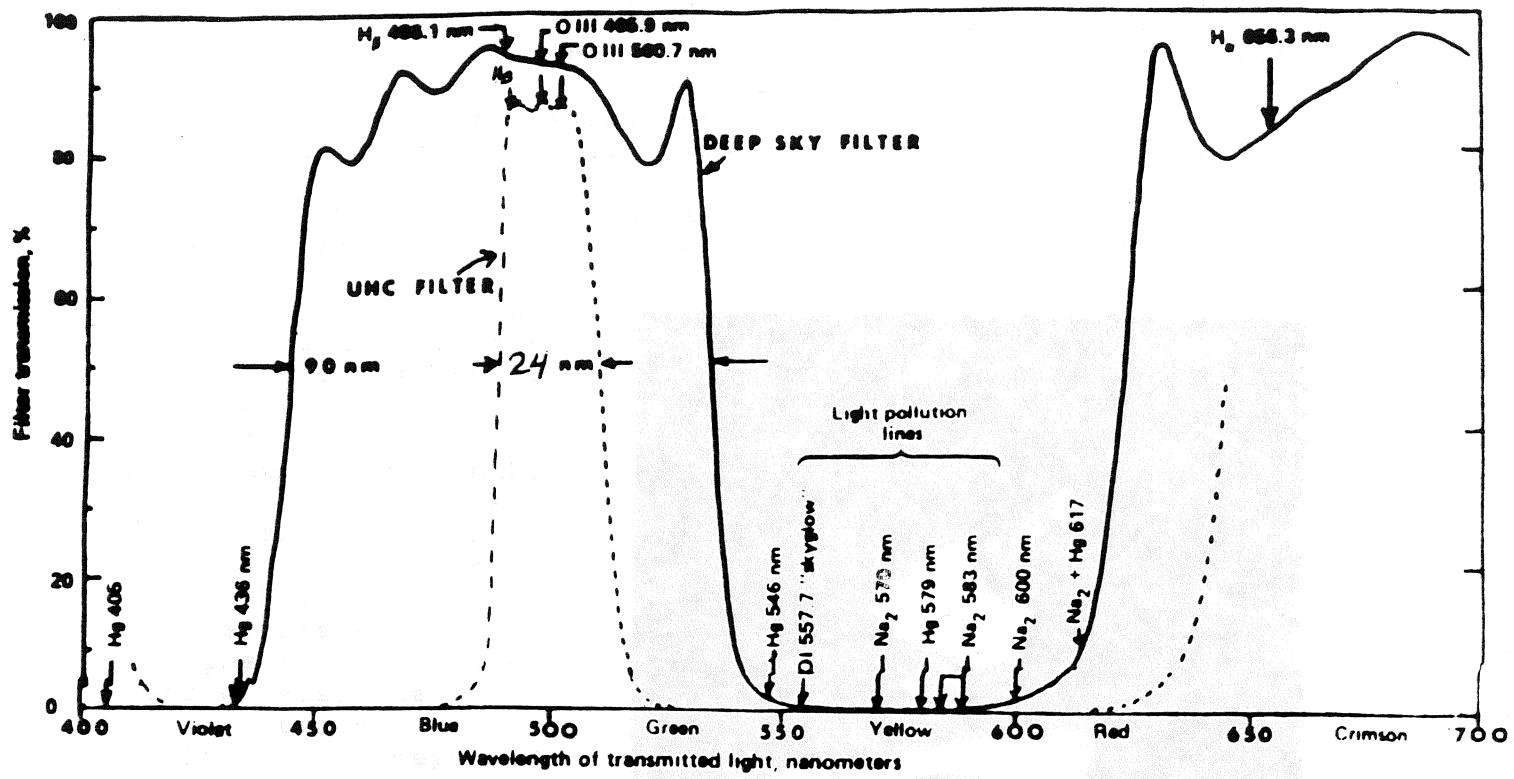


* CHART 1 *

Helpful Adapters

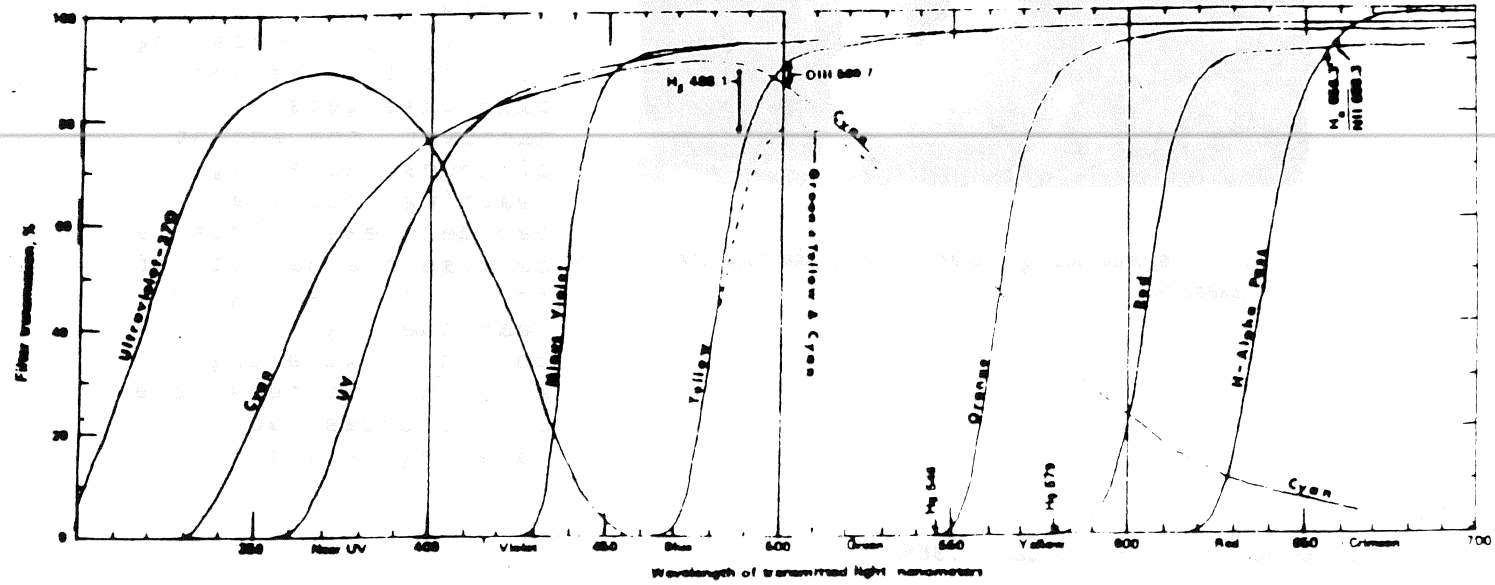
2" Universal eyepiece adapter, threaded for 48mm and 2" filters	$26.00
1¼" Universal filter adapter, threaded for 1¼" filters	$16.00
Adapter to fit 48mm filter to 46,49,52,55,58mm telephoto lens threads	$6.95
Adapter to fit 58mm filter to 49,52,55,58,62mm telephoto lens threads	$6.95
Adapter to fit 72mm filter to 62,67,77mm telephoto lens threads	$7.95

TRANSMISSION SPECTRUM OF LUMICON FILTERS



* CHART 2 *

FILTER TRANSMISSION SPECTRUM



The Lumicon Deep Sky filter has the widest band pass of the four tested. The band pass of a filter, is the range of light wavelengths that are allowed to pass through the filter. Band rejection is the rejection or blocking out of undesirable wavelengths. The band pass of the Deep Sky filter is from 441nm to 535nm which is 94nm (See chart 2). This is the reason why this filter does not help as much visually as some of the others. It allows more of the undesirable light to pass through the filter and hence, into your eye. We found it performed best on star clusters as well as reflection nebula and most bright galaxies. The Deep Sky filter does have its application in astrophotography. This will be discussed in more detail later.

The president adding rocker rings to the tube box assembly.

The UHC filter has a slightly narrower band pass which ranges from 484nm to 5Ø6nm which is reduced to only 22nm. We can see from chart number 2 on the data sheet that this band pass centers itself on the HII and OXIII wavelengths, the desirable wavelengths, and also again in the HI and ionized Nitrogen region which although invisible to the eye may still make photography possible on bright objects. This filter is best when used visually on diffuse and planetary nebula such as the Lagoon and the Dumbbell.

It is interesting to note that as the band pass gets narrower, the amount of undesirable light reaching your eye becomes less. This is because the density of the filter is higher near the light pollution wavelengths and that filters more of the undesirable wavelengths out.

Joe removing a few rough edges before assembly. Note the tube assembly in the background.

The OXIII filter has an even narrower band pass of 11nm from 495nm to 5Ø1nm. This puts it right in the OXIII range on chart 2. This one is really only good visually and since it has a narrow bandwidth, will only be good on certain objects such as planetary nebula like the Helix and NGC-7293.

The Hydrogen Beta (HII) filter has the narrowest band pass of all four. It is only 8nm and is centered at 486nm, the HII wavelength. As with the OXIII filter, this one is also only good for visual use and primarily is best on objects like the Horsehead nebula in Orion (See the November, 1987 issue of the NOVAC Corona) and the California Nebula near Perseus. Both of which have narrow wavelengths in the HII region.

Now most people ask, "Which one should I buy?" Well, our tests as well as others show that eventually you will buy all of them or at least two of the four. I would suggest that if you were a visual astronomer, you should get the UHC filter. It provides the filtration needed in heavily light polluted areas while still passing mostly all of the light from our desired objects.

If you are into astrophotography, the Deep Sky filter is recommended. "Why?" You ask. "Wouldn't the UHC filter cut out the light pollution even more?" Yes indeed it would. There are two major problems though. The first is that the UHC filter would throw the color balance of your photo way off. "What if I use B&W film?" You might add. The second and most important problem is that your photo is based on light reaching the film. The UHC filter's density is so high, that exposure times would be too long to make it practical.

The Deep Sky filter is the perfect filter to use in this case. It provides good to excellent light pollution rejection while still passing enough light to keep exposure times to a minimum.

We also noticed out at my test site that the exit pupil at the eyepiece made a difference as to which filter to use. The Lumicon data sheet explains how to calculate the exit pupil as well as determine which eyepiece to use with each filter.

As you know, I'm sure, when you increase the magnification of your optical system, the background sky becomes very dark. The reverse is also true when you decrease magnification. You can take advantage of the different filter densities by using a wide bandwidth filter (low density such as the Deep Sky filter) at higher magnifications and a narrow bandwidth filter (high density such as the UHC filter) with lower magnifications. Lumicon has outlined which filter type is best at which exit pupil.

But wait! Another variable! The amount of light pollution in your viewing area also plays a part in choosing the right filter. In this case though you can use your common sense. In the city, you may want a denser filter. Out in Fauquier where the skies are dark, you might choose a lighter filter since you have less undesirable wavelengths to filter out.

Lumicon offers a wide range of filters to satisfy everybody's observing and photographic needs. They are moderately priced but definitely worth the investment if you plan to get serious about visual and photographic astronomy in, at, or near the city. They are available from many sources including Lumicon (415) 447-9570 as well as from local telescope dealers such as Redlich's Binocular and Optical Repair in Arlington, VA (703) 527-5151. As far as the previous methods of reducing light pollution, you probably do not wish to commit a crime, but do contact your congressmen and your local Board of Supervisors for specific instructions on combating our most feared ally, "Light Pollution." The problem will and cannot be corrected unless they hear from us, the astronomical community.

Each issue, we will try to feature an article about the use of filters in astronomy. If you have some information or some experience you would like to share on this topic, feel free to send it in. We would like to hear from you. Ed.

New Home for NOVAC

John Huggins

For those of you who have called 644-4331 and have gotten the disconnected message, don't despair. NOVAC now has a new number.

IT IS 703-866-4985

There is also a new address.

IT IS 6028 Ticonderoga Court
Burke, Virginia 22015

I apologize for the abrupt disappearance of 644-4331. The phone company took away my line almost instantly even though they said it would take a week.

Please make a note of these important facts. Any correspondence with the club should be made through the phone number or the address.

You may be asking yourself, "Why doesn't John just let the phone company announce the new number on their disconnected phone referral recording?" Well, we have been receiving many dozens of prank phone calls. I figure it's just a better idea if we start out from scratch and advertise the number (and the address!!) liberally, but carefully.

Let's talk dues. Please take a look at your expiration date on the mailing label. If you expire in January 1988 or before and desire further membership in NOVAC please send in a $10.00 check made out to "NOVAC" and mail it to the above address.

Thanks.

EXCUSES! EXCUSES!

John Huggins

During the last five months or so you may have noticed a bit of sloppiness in the operation of the club. If you did notice, you are correct. Recent events have caused my priorities to slip a bit in the club. Things like not getting to the bank quickly with your checks, getting the newsletter out late, etc., are all problems. However, the accuracy with which I have kept records has not been lost. Everything is at it should be. Every check that I receive is thoroughly recorded. If I didn't record it then I didn't get it.

To help avoid future problems please make a note of the new address to send correspondence to. Correspondence includes, dues, things you would like to see in the Corona, complaints, etc.

You can expect better performance out of the club as I have made the operation more efficient. Better use of a computer and moving out of my folks house both contribute to this better performance.

EYEPIECE

By popular demand, we are continuing our section on the night sky, "The EYEPIECE." Thanks to Joe Macrie, we had a good start. We hope this will prove to be a helpful column. Let's see some clear skies now!

One of the most interesting constellations in the Winter sky is the constellation of Orion. It is the home of many bright as well as challenging objects. Let's look at a few.

NGC 2024 (RA 0539.4 DEC -01 52) Galactic Nebula (gn) or Diffuse nebula. Located about 15 minutes east and slightly north of the belt star Zeta Orionis.

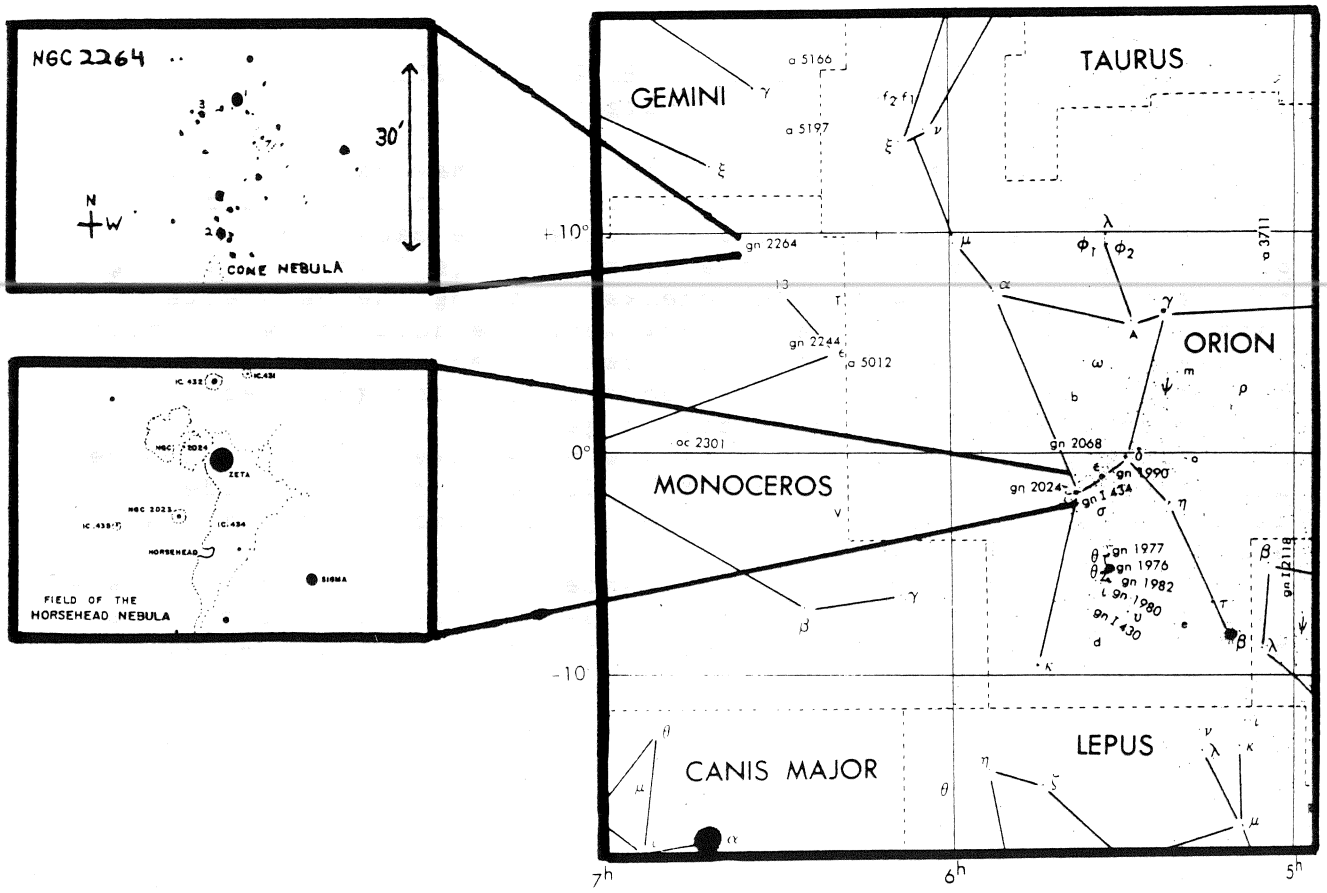
I 434 Directly South of Zeta Orionis and contains the Horsehead nebula.

M42/43, NGC 1976/1982 (RA 0532.9 DEC -0525) A naked eye object, this deep sky object is one of the most observed objects. It is easily photographed with a camera and tripod. Use a fast lens (f/1.4 - f/2.8) and 400 to 1000 ASA film with a 45 second to 1 minute exposure via cable release.

M78, NGC 2068 (RA 0544.2 DEC 0002) Diffuse nebula is 2.3 degrees NE and just about on the celestial equator.

BETA, 11 Monocerotis (RA 0626.4 DEC -0700) Easily resolved triple star. Magnitude 4.5, 5.2, and 5.6

NGC 2244/2237 (RA 0629.7 DEC 0454) 2244 is at a distance of 2700 light years with 15 stars of magnitude 7 to 9. Better known is the nebulosity called the "Rosette nebula." Its overall size is 80' X 60' and is an easy target with either a UHC or Deep Sky filter.



The NOVAC Corona is published six times a year. Subscriptions are available through membership in NOVAC. Dues are $10.00 a year. All material regarding the club, including that for publication, should be directed to John Huggins, Secretary/Treasurer, 6028 Ticonderoga Court, Burke, VA 22015, 703-866-4985.

5/6/88

Crockett Park

M95,96 - pair of lr. ellipticals
M105, 3384 - close pair of ell. - 3389 vis. in 13, not 20
3~~379~~, 9 - failed 3377 or 77A, sm. bright - 3367 faint oval
3478?
3326, 3227 - extr. close pr. of sp?
- cluster around 3454-5 - failed (20 mm
3608,5 (only) - close pair ell?
3626 - faint half-sp.
3659 - larger ell., v faint
3681,84 ell. pr - 3686 not vis?
3697A,B,C - failed 3691
Copelands septet, Jeo: "something there" in 20mm
cluster around 3860 - only one visible
3801-3 cluster - one visible
3193, ell., 3190, sp., 3185, faint (photo p. 196)
4559 - lg. half-sp, 4565 - lg edge-on sp.
4525 - lg sp w/ bright nucleus
4448 - sm half-sp.
4251 - sm. half sp w/ bright core
4283, 4278, 4274 - faint one 1/3 sp, sec. 2 sm. ells.
4314 - larger 1/2 sp.
4245 - faint ell.
4203 sm. lr. ell.
4395 - lg. & not vis.!
4656 - big edge-on sp., bright; 4631 - cluster, fainter edge-on - both in 20" field!
4485, 4490 - colliding 3/4 spirals ?
4369 - sm. ell.
4244 - very edge-on galaxy spiral!
4214 - lg lr. 1/2 Sa sp? - 4190 failed
gc 4147 - sm, bright
4293 - 1/3 sp.
M85 - lr. ell. w/ compan. 4394
4450 - sm, 1/2 sp? 4498 failed
M100 - mod. lr. ell., brighter core
M98 - nice edge-on sp.
M99 ell.
4527 faint ell. →

faint
4216 edge-on sp. w/ lr. core
4267 sm. ell.
M84, 86 lr. ell, 4387 v. faint ell.
4388 bet. 1/4 sp.
4435, 38 close pair ell?
4458, 4461 close pair ell?
4473, 77 lr. ell.
M87 - lr. ell, no elong.
4476, 77 - ells. near M87
M89, sm. lr. ell.
M90. lg. lr. spir.
M88 lr. 1/2 sp.
M91 lg. faint ell.
M58 lr. core ell.

65-

4564 - sm. 1/2 sp?
4567,8 - v. close pair
Uranom. wrong! M59 lg. lr. ell.
4607, 4606 - too close together?
M60 lr. ell.
4606,7 - one (or both) visible

76-