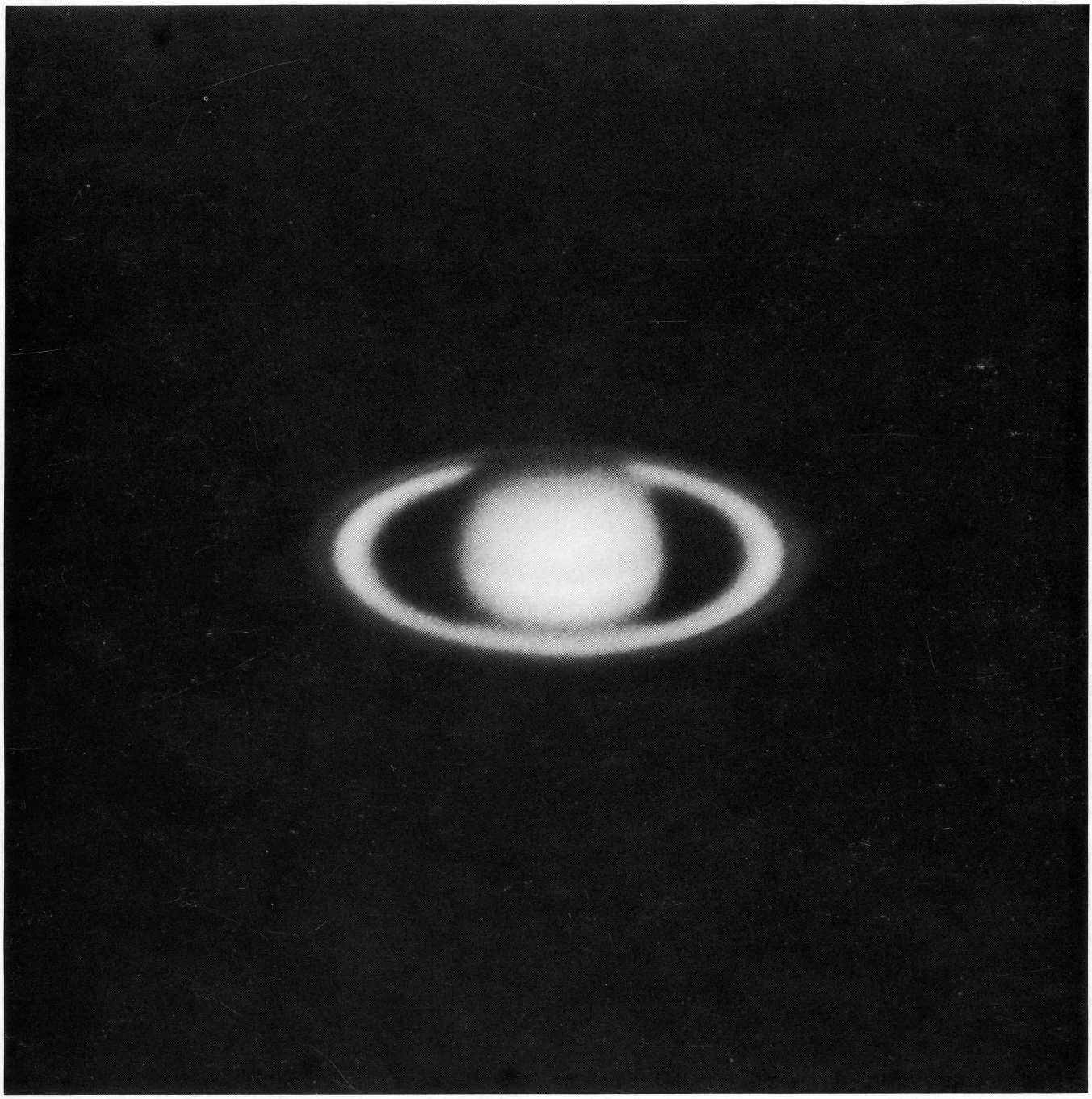
the ASTROGRAPH



VOLUME 6 NO. 1

AUGUST SEPTEMBER 1974

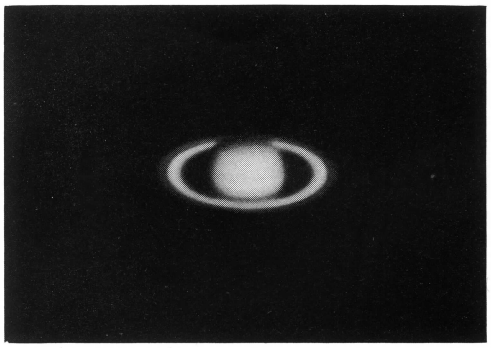
the ASTROGRAPH

The magazine devoted to Astrophotography

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Volume VI No. 1

Editor	Robert C. Price
Assistant Editor	Susan K. Price
Contributing Editors	Ralph Proctor, Greg Griffith, John Sanford
Contributors	Jim Rouse and Richard Berry



COVER PHOTOGRAPH
SATURN

Photographer	Jim Rouse
Date	November 22, 1973
Lens	8 inch F/7
Exposure	7 Seconds
Projecting Eyepiece	7mm
F/ No.	80
Film	S.O. 410
Developer	D-19
Developing Time and Temperature	4 min. @ 73°F
Enlargement	30X

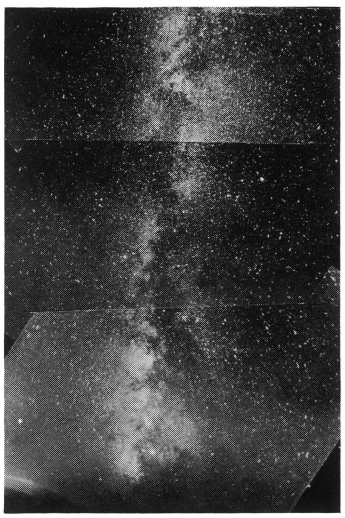
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Astrophotography for August and September 8

Scorpius 10



BACK COVER PHOTOGRAPH
MILKY WAY COMPOSIT

Photographer	Richard Berry
Lens	Metrog
F/No.	6.3
Exposures	Each 60 minutes
Film	8 x 10 Tri-X

The ASTROGRAPH is published six times yearly as follows: No. 1, August-September; No. 2, October-November; No. 3, December-January; No. 4, February-March; No. 5, April-May, No. 6, June-July.

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FILMS AND TECHNIQUES

The amateur astrophotographer has at his disposal a bewildering variety of films which he may or may not be able to use depending upon his equipment and needs. An even larger variety of developers only adds to the confusion. The following article discusses films, developers, and other techniques tried and used by the author. The goal is to help clear the confusion others may have at approaching this subject, and to present a few techniques for enhancing photographs.

Before the ultimate quality in non-professional astrophotographs can be attained the amateur must be willing to do his own black and white processing. The techniques are really very simple and can be mastered by anyone, with a little time and practice. It is assumed here that the reader has this capability. When the step is taken from lunar and planetary photography to the long time exposures for nebulas and galaxies, the results can be very disappointing at first, but persistence will begin to yield a few quality photographs. The author experimented for nearly a year before good shots began appearing.

Beyond exposures of ten minutes there lies a region of photography that will at times try ones sanity as well as ones equipment. It is here that sturdy, sag-free optics and perfect guiding control becomes a necessity. This usually means scrapping that thin, flexible fiberglass tube for a sturdy aluminum one, and turning that simple clock drive into an ultra-smooth system that can be electrically slowed in both right ascension and declination. A high power guidescope with an illuminated reticle is also a must. Once these procurements are made, and it would take a book to describe the advantages and disadvantages of every system, then the amateur can begin experimenting.

As with many amateurs the author began photographing from his driveway in the city. As everyone knows, the enemies of this approach are lights and smog. The sky is generally so bright at night that ultra-long exposures are impossible, since the film will readily fog beyond hope. Because there is no much skylight in the city, a relatively long focal length lens or telescope works best. Focal ratios faster than F/5.6 will not work well at all. Experimentation was begun with an F/8 500mm Nikkor lens attached to an 8 inch F/12 casseigrain telescope. The 8 inch was used as a guidescope at 100x. The first film tried was Tri-X developed in both Acufine and Microdol-X, for ASA ratings of 400 and 1200 respectively. The best exposed shots were 5 minutes with Acufine and 15 minutes with Microdol-X. Beyond these times the negatives became badly fogged. The Acufine developed shots were superior due to their higher contrast and slightly better recording of faint details.

The developers generally used for most Kodak films are: D-76, Microdol-X, D-19 and Acufine. There are others but they are not widely used. The first two are standard developers for ASA 400. Microdol is a solvent-type developer, which means that it dissolves the edges of the silver grains giving them a smaller, finer appearance. D-76 does not have this property, but it does create a slightly higher contrast negative. D-19 is a high contrast developer and generally does not work well with Tri-X or Plus-X. Acufine is a highly active developer with effectively increases film speed without the necessity of push-processing the film in a standard developer. Push-processing will usually increase graininess. The apparent grain in the Acufine shots was almost as fine as the Microdol shots. Since Acufine decreased exposure time by about 66%, it was judged the best choice for Tri-X.

Plus-X was also tried with the same developers and the same F/8 lens. The best Acufine shots were 8 and 10 minutes; whereas, the Microdol shots required a full 30 minutes. Again Acufine produced fainter details with more contrast and little increase in grain. The grain was much finer than with Tri-X, but the Tri-X shots recorded faint detail better with a slightly higher contrast. Most other black and white films were basically too slow to be suitable with these high F numbers.

A number of shots were also made using the 8 inch F/12 telescope and an auxilliary 3 inch guidescope. The longer focal length produced less sky fog problems, so exposures up to 30 minutes with Acufine processed Tri-X could be made. Gray card tests indicated that Tri-X records very slowly beyond 15 minutes and virtually stops beyond 30 minutes. It would probably be better to expose for 15 minutes and push the developing times. Yellow or orange filters reduce the sky fog a great deal, but their use requires exposing Tri-X for more than 15 minutes with F/8 focal ratios.

Spectroscopic films such as 103a-F are a great help in long exposures, since they do not lose sensitivity with increasing exposure time. With a suitable filter these films can be of great benefit to city dwellers. There is one disadvantage - grain. The graininess of 103a film is far worse than Tri-X and limits print magnifications to about 12x. For excellent contrast they should be developed in D-19 and can even be pushed to 50% greater times with no detrimental effects.

At this point, a small observatory was constructed in the country far from city lights. The skies were so dark that Tri-X would not expose to its fog limit with anything but very fast optics (F/2 or faster). It was here that 103a films became unbeatable. With an F/4.8 inch telescope the



Above: North American Nebula photographed by Greg Griffith with a 300mm F/4.5 lens. Exposure was 60 minutes on 103a-E film on 8/25/73. Enlargement is 8.5X.

fog limit was reached in 60 minutes with 103a-E film. Photographs of objects such as M31 recorded nearly as much nebulosity as in many observatory photographs, though the resolution was not nearly as good due to the small 8 inch aperature. The results thus far have been very rewarding with this film at this F/4 aperature. 103a-F film is slightly less red sensitive than 103a-E and records less nebulosity (emission nebulas) at the fog limit. As many realize, 60 minute exposures are very difficult and definitely try ones patience, but one excellent shot makes it all worth the trouble. The high contrast of the film makes printing much easier also. Unless a cold camera is used, focal ratios above F/4 are not recommended if the maximum nebulosity (fog limit) is desired in a reasonable time. Even so, high focal ratios will still capture a great deal.

Recently an F/1.5 8 inch Schmidt Camera was purchased as an alternative to long exposures of faint objects. These cameras are very fast and very sharp. They require careful film handling and the use of very fine grained films. So far many films have been tested to their fog limit with this camera. It must be stressed though, a Schmidt camera is only useable under very dark skies with absolutely no lights in the area. The slightest skylight, including moonlight, will quickly fog the film. Under dark skies at about sea level the following times represent the approximate times needed to reach the fog limit of various films and developers using this camera: Tri-X (Acufine, 4 minutes; Tri-X,(Microdol-X) 15 minutes; Plus-X,(Acufine) 7 minutes; Plus-X (Microdol-X) 25 minutes; 103a-F (D-19) 5 minutes; H&W VTE (H&W Control) 25 minutes; and H&W VTE Ultra (H&W Control) 1 hour.

Both Tri-X and 103a films were far too grainy for the required 20 to 40x magnifications required in printing small galaxies with this short focal length camera. Plus-X proved adequate for magnifications under 25x, but above that the grain became excessive. The two H&W films proved to be the best by far. The Ultra required much too long of an exposure; therefore, the VTE film (EI 80) has been used exclusively. This film will provide very low grain and very high resolution for up to 40x prints. The one disadvantage of the film has been its low contrast. It must be printed on #6 Agfa paper. Another film which holds much promise is IV-E Spectrographic film. (Editor's note: This film is available through the ASTROGRAPH. Please note advertisement in this issue.) This yet untried film has very fine grain, high resolution, and high contrast. It should prove better than VTE film if exposures are not too long. Anyone who has tried it with a Schmidt Camera is encouraged to report his results. In the future, a similar evaluation will be performed on color films.

A few hints on processing will now be discussed. Of course only fresh developers should be used. Store them no longer than 6 months in bottles which do not allow a large airspace above the solution, which would oxidize them. For best results use the developer only once then discard it without returning it to the stock bottle. This prevents contamination and inconsistent results. Developers are cheap, but your hard-earned negatives are not. Avoid using acid stop baths particularly with H&W and 103a films. The acid stop neutralizes the basic developer, but in doing so releases gas bubbles which cause pinholes to appear in the negatives. A short 30 second water wash will sufficiently stop the action of the developer, until the fixer is applied. Do not fix for prolonged times. Ten minutes is enough, since the fixer will dissolve the silver image if left in contact with the negative for too long. Hypo-clearing agent should always be used, not only to reduce wash times to 5 minutes but to make negatives archieval. The finest grain for any particular film can only be achieved when all of the solutions, including the wash water, are kept at the same temperature. Anytime the film sees a sudden change in temperature, even after development, its silver grains will aggrigate and appear coarser.

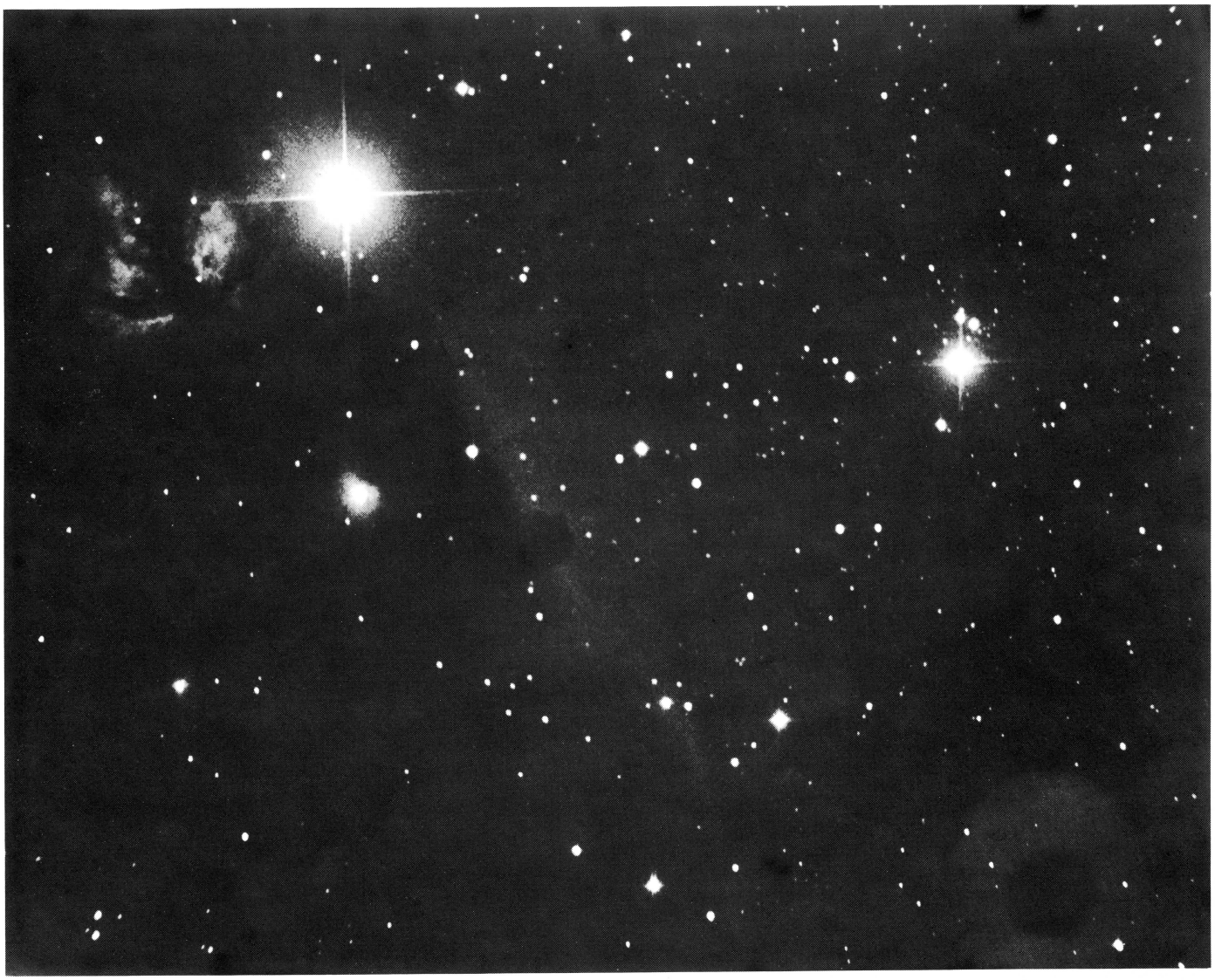
For those who prefer 103a films processing instructions can be found in Kodak's supplimment "Plates and Films for Science and Industry". These films are normally supplied with anti-halation backing to reduce the reflection halos around bright stars. The film should not be purchased without this backing as the results may not appear too pleasing. Removal of the backing, which is a black carbon coating, can be difficult at times. Kodak recommends gentle rubbing in an alkaline bath before development. This is a nuisance, since it must be done in total darkness, and the film scratches very easily. The backing will not come off during the development nor will it in an acid stop bath or fixer. If the film is given a brief water rinse with agitation just after development instead of an acid stop, almost all of the backing will immediately come off in the water. Following fixing the hypoclearling agent will remove remaining flakes of backing. After the final wash a cotton swab soaked in photoflo will remove the adhearing thin film of backing. A quick rinse in photoflo always eliminates streaks on negatives and promotes drying, but do not make the solution too strong or it will leave a film. Above all else handle 103a film with great care for it will scratch much easier than Tri-X.

Quality astrophotographs only begin with the negative. Printing the negative can also be very complex and challenging. High contrast negatives, such as produced by 103a films, are easily printed on #3 to #4 paper. The new resin coated papers are the best, as they produce defect-free glossies without the need of a print drier. Yes, just wipe them off with a chamois and lay them aside. Ten minutes later

a perfectly dry glossy will result. Resin coated paper also fixes in 2 minutes and washes in 5 minutes, compared to the ten minute fix and 30 minute wash for conventional papers. Dektol paper developer is universally used, as it produces clean whites and rich blacks. Use it diluted 1:2 with water.

Before exposing the print make test exposures on small chips of paper (about 1 x 2") to determine the best exposure. Do not expose too long since much of the faint details will be lost in the black background. Selective dodging and burning in will help on large objects such as M42. To the dismay of most amateurs much of the faint detail recorded on the negative cannot seemingly be printed. It refuses all attempts to print. All is not lost, there are ways. The first and easiest is to go to a more contrasty paper such as #6 Agfa. If you have been using #4 the switch will be very surprising. One warning. a grainy negative will become very grainy on #6 paper.

Going a step further in the contrast game, one can resort to bleach. This technique is known to professionals, but to few amateurs. Farmer Reducer (bleach) consists of two packets. The "A" packet contains the active bleach which is Potassium ferricyanide. Dissolve enough of this orange powder in a tray of water to make a pale yellow solution. Warning, this chemical is toxic so do not swallow any, and make sure that you have no cuts on your hands. Otherwise, contact with the hands will cause no harm. Bleach will selectively brighten light areas faster than dark areas, hence increase contrast. Remove a print from the fixer and dunk it into the bleach. Be quick and completely submerge the print all at once. Areas partially submerged will streak badly. The print will lighten fast, and when the background becomes noticably lighter, quickly pull the print and rinse it off in a water bath. Return it to the fixer for ten minutes to remove the yellow cast. When the bleach turns green it is spent. Bleach solutions will not store for over an hour or so.



Above: The Horse Head Nebula photographed by Greg Griffith with an 8 inch F/4 reflector on 10/29/73. Exposure was 30 minutes on 103a-E film developed in D-19 (70% push). Enlargement is 10X.



Above: The Veil Nebula photographed on 8/27/73 by Greg Griffith with a 300mm F/4.5 lens. Exposure was 60 minutes on 103a-E film developed in D-19 for twice the recommended time. Enlargement is 8.5X.

A final step on the contrast scale involves making duplicate negatives. The author routinely uses this method to print every last faint detail on any negative. The method requires care and practice, but the results will usually be astounding. Users of the 103a and Tri-X films should not attempt this technique, as the grain will become intolerable. Users of H&W film or to a lesser degree Plus-X, will find the method very good. The technique is also valuable in producing intermediate negatives of higher magnification which are then used to make 40x prints from Schmidt Camera negatives. Few enlargers are capable of 40x prints.

Two approaches to producing a copy negative are to buy a slide duplicator attachment for your camera or to project the original negative through an enlarger into an open camera body (no lens). In the latter case,rigidly mount the camera body to the printing surface parallel to the film plane of the enlarger, and use the camera shutter or the enlarger lens to control exposure. Focusing the camera can be a bit difficult without a right angle finder or a rubber neck. Use the enlarger bellows for focusing. Load the camera with Kodak High Contrast Copy film and make many test exposures. The exposure latitude of this film is about one-half stop. Develop in D-19 and pick the best copy negative. The film has a lower density than normal films, so do not choose the one with the densest blacks, or highlight detail will be lost. Since this will be a positive, it will have to be recopied to yield a final negative. The second copy can be made with Panatomic-X rather than High Contrast Copy if the grain in the original is a little too coarse. The result will be a negative with the faint details coming through loud and clear. Unfortunately much of the intermediate tonal gradations will be lost. For this technique to work well, critical focus is important, but even more so are sharp optics. Cheap enlarging lenses found to date will not give good results. The best enlarging lenses found to date are the El Nikkor and Schneider Componon (not Comparon) lenses. The Nikkors are the least expensive of the two. When used with a condenser-type enlarger, they will also make superior prints. If grain is more of a problem than contrast then read up on highlight masking and in particular integration printing. These techniques are too complicated to discuss here, but they work very well. Integration can reduce the grain of a 103a print to an almost negligible level.

Greg W.Griffith

ASTROPHOTOGRAPHY FOR AUGUST AND SEPTEMBER

MERCURY reaches superior conjunction on August 17th and a Greatest Eastern elongation of 26° on October 1. This particular Eastern elongation is fairly unfavorable because Mercury will be at an apparent declination of -15°.

VENUS is moving to superior conjunction which it will reach on November 7th. On August 1, September 1 and October 1, Venus is located at R.A. 6^h56^m Decl. +22° 30', R.A. 9^h34^m, Decl. +15°28' and R.A. $11^h\ 55^m$ Decl. +2°07' respectively.

The MOON reaches its highest declination on August 13th 08^h, September 9th 15^h, and October 6th 21^h. It reaches perigee on August 17th 07^h, September 14th 16^h, and October 12th 16^h. As can been seen in the following table, the last quarter moon is in excellent photographic position in August being +20° in declination and the last quarter and Gibbous phases are in good photographic positions in September.

Phase	Date	Decl.	Diameter
Full	Aug. 3 (04 hr.)	-14°	29'24"
Last Quarter	Aug. 11(03 hr.)	+20°	31'09"
New	Aug. 17(19 hr.)	+ 9°	33'22"
First Quarter	Aug. 24(16 hr.)	-22°	30'37"
Full	Sept. 1(19 hr.)	- 4°	29'38"
Last Quarter	Sept. 9(12 hr.)	+23°	31'44"
New	Sept.16(03 hr.)	- 2°	33'01"
First Quarter	Sept.23(07 hr.)	-22°	29'56"
Full	Oct. 1 (11 hr.)	+ 7°	30'10"
Last Quarter	Oct. 8 (20 hr.)	+20°	32'10"

EARTH reaches summer Equinox on September 23rd.

MARS is unfavorably placed for photography in Leo in August and Leo and Virgo in September.

JUPITER is in AGUARIUS at declination -6 to -9 degrees. Jupiter's diameter increases from 44 arc seconds on August 1 to 46 arc seconds on October 1. Jupiter reaches opposition on September 6th.

SATURN is placed in GEMINI high in declination. SATURN rises 5 hours before the Sun at the end of September.

URANUS is positioned in VIRGO in August and September. This sixth magnitude 4 arc second diameter planet is located at R.A. 13^h30^m, Decl. -8°45' on August 1; R.A. 13^h34^m, Decl. -9°15' on September 1; and R.A. 13^h40^m, Decl -9° 51' on October 1.

NEPTUNE is positioned in Scorpius in August and September. This 8th magnitude 2.5 arc second diameter planet is located at R.A. 16^h22^m, Decl. -19°53' on August 1; R.A. 16^h21^m, Decl. -19°55' on September 1 and R.A. 16^h23^m, Decl. -20°01' on October 1.

Pluto is located in VIRGO in August and September. On August 1 it is located at R.A. 12^h42^m, Decl +13°19'; on September 1 R.A. 12^h46^m, Decl. +12° 47'; and on October 1 at R.A. 12^h49^m, Decl. +12°21'. Pluto reaches conjunction on September 30th.

Continued on page 11



Above: Andromeda Galaxy, M31 photographed by Greg Griffith with a 300mm F/4.5 lens. Exposure was 60 minutes on 103a-E film on 8/26/73. Enlargement is 10.3X.

SCORPIUS

Scorpius is a very interesting constellation rich in telescopic and photographic objects for the amateur astronomer. No matter what focal length camera is used, whether it be a 50mm or 5,000mm, there are objects to be captured on film. The Scorpion is noted for its globular clusters and involvement of the whole area in the dust and star clouds of the Galaxy, but there are several notable multiple stars and planetary nebulae as well as a number of bright open clusters. The brightest star Antares (named as "opposite Ares" or anti-Mars), is a beautiful double if the stmosphere is calm, and Nu is a quadruple almost as easy as Epsilon Lyrae. The major difficulty with observers in temperate latitudes is, of course, the fact that even at culmination, the southerly parts of the group are very low in the sky. However, here in Southern California one can follow the whole curve of the tail of the Scorpion and easily observe objects as low as -45° in declination. The horizon in the accompanying photograph in fact is a little below -50°.

With a short focal length lens, exposures of only a few minutes at F/2.8 on Tri-X or 103 film will show the dark lanes which stream northeast from the area of Antares, as well as the reddish nebulosity around Antares itself. This cloud was picked up especially well on a ten minute exposure with Fujichrome 100 film (pushed one stop) at F/2.8. This film seems suitable for astrophotography due to high red sensitivity and low reciprocity failure. It can be processed by anyone in your area who does Ektachorme (except Kodak), since it requires the standard E-4 process.

Several of the open clusters and the large globular M-4 are good subjects for slightly longer focal lengths, the 135mm to 500mm telephoto area, especially the "Table" of Scorpius where there are several clusters and many bright stars from 4th to 7th magnitude.

Long focal length objects are numerous. For the advanced astrophotographer there are several globulars which will resolve with 60 to 100 inch or more focal lengths, notably M-4, M-80, and NGC 6388. Also, several planetaries come into possible photographic view: NGC 6153, 6337 (which I could not find with 8" but they say is beautiful) and 6302, a very peculiar object which looks like a galaxy but is classed as a planetary nebula, and about which little seems known. I would like to compare a visual drawing of this object with any result from a long focus photograph from any source, amateur or professional. If any reader knows any more about NGC 6302, please contact me at the address below.

Scorpius is especially suited to experimentation by the amateur astronomer in the areas of film and filter combinations, due to the variety of gas and dust clouds present. There are also several small H II red nebulae which show up well on color photographs a little north and west of Lambda in the stinger.

OBJECTS IN SCORPIUS

Double and Multiple Stars

Star	R.A.	Decl.	Mags.	Sep.	P.A.	Remarks
2	$15^{h}50.6'$	$-25^{\circ}11'$	4.8-7.3	2.4"	273°	Seems closer 8", 200x
Xi	$16^{h}01.6$	$-11^{\circ}14'$	4.9-4.9	AC0.7" AB7.9"		Also fine double in field south: 1999 7.4-8.9, 12"
Beta	$16^{h}02.5$	$-19^{\circ}40'$	2.9-5.1	13.7'	023	A has comp. 0.8", 9.7 mag. 105° not seen, 8"
Nu	$16^{h}19.1$	$-19^{\circ}20'$	4.3-6.5	41.4	337	Quadruple: A, 4.4-6.4 1.0" 02° B, 6.8-7.8 2.1" 50°
12	$16^{h}09.2$	$-28^{\circ}17'$	5.8-8.6	4.0"	74	Yellow and orange, 8" 200x
Antares	$16^{h}26.3$	$-26^{\circ}19'$	1.2-6.5	2.9"	274	Red, green, rel. fixed. Steadily seen thru clouds, 12" Cass. 150x seeing test.
1116	$16^{h}41.2$	$-27^{\circ}22'$	6.4-10.4	2.1"	03	Not def. seen, 8" poor seeing
Hwe 86	$17^{h}10.4$	$-38^{\circ}14'$	6.8-9.8	2.8"	145	Low, not seen, 8"
I 1013	$17^{h}54.4$	$-38^{\circ}08'$	6.6-8.5	0.8"	150	Low, not seen, 8"

Star Clusters

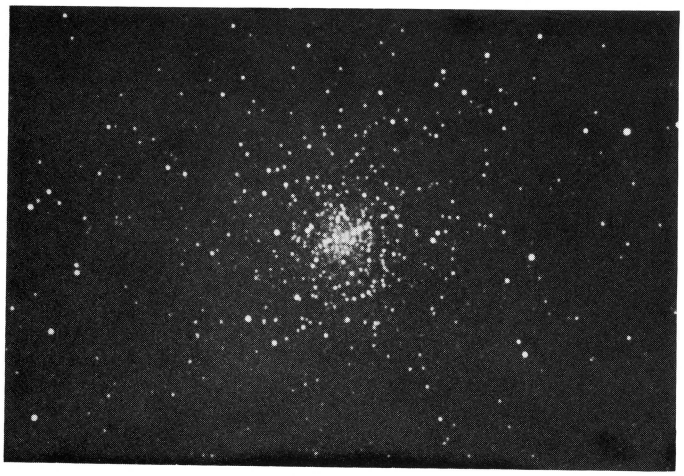
Star	R.A.	Decl.	Mags.	Mag. Photo.	Remarks
M-80(6093)	$16^{h}14.1^{m}$	$-22^{\circ}52'$	Globular	6.8	Resolves, 8"avert vis. 6mm.
M-4(6121)	$16^{h}20.6^{m}$	$-26^{\circ}24'$	Globular	5.2	Lg. brt. easy resolve, lines of *

NGC 6139	$16^h24.3$	$-38^\circ44'$	Globular	9.8	Dim fairly lg. Hint res. 8" 123x
NGC 6144	$16^h24.2$	$-25^\circ56'$	Globular	10.3	Faint res. one * brighter 8"
NGC 6231	$16^h50.6$	$-41^\circ43$	Open	8.5vis.	Brt. open cl. Many faint *
NGC 6242	$16^h52.2$	$-39^\circ26'$	Open	8.1vis.	Lg. scattered
NGC 6281	$17^h01.4$	$-37^\circ50$	Open	8.6vis.	Arrow shpd. pretty
NGC 6388	$17^h32.6$	$-44^\circ43$	Globular	7.1	Lg. bright haze not well res. 8"
M-6(6405)	$17^h36.8$	$-32^\circ11'$	Open	5.3vis.	Lg. many bright stars.
NGC 6441	$17^h46.8$	$-37^\circ02'$	Globular	8.4	In field G Sco(3.25), no. res. 8"
M-7(6475	$17^h50.7$	$-34^\circ48$	Open	3.2vis.	Naked eye. V. lg. loose.

Nebulae

Star	R.A.	Decl.	Mags.	Size in "	Mag.	Remarks
NGC 6153	$16^h28.1$	$-40^\circ09'$	Planetary	28x21	11.5	Fair bright center darker 8mm 8" F/10, flat diamond w 3*s
NGC 6302	$17^h10.4$	$-37^\circ03'$	Planetary	?	11.4	Curious, like galaxy, not symn takes power well.
NGC 6337	$17^h18.9$	$-38^\circ25$	Planetary	40x30	12	V. faint ring. Not def. seen 8" F/10

John Sanford
2215 Martha Avenue
Orange, California 92667



Above: M4 photographed on 7/21/74 by R.C. Price with a 12 inch F/6 reflector. Exposure was 10 minutes on 103a-F.



Above: NGC 6302 photographed by R. C. Price with a 12 inch F/6 reflector on 7/20/74. Exposure was 3 minutes on 103a-F. Enlargement is 5X.

ASTROPHOTOGRAPHERS

Six more guides have been added to bring the total number to 24. THE L.F.K. ASTRONOMICAL EXPOSURE GUIDES now cover the Sun, Moon, Solar and Lunar eclipses, prominences, corona, diamond ring, Earthshine, Venus, Mars, Jupiter, Jupiter's moons, Saturn, Titan, Uranus, Ceres, Vesta, Pallas, Juno, sunspots, and comets. Formulas for four methods of through-the-telescope photography are included along with photographic tips on technique, extenders, and image size. This booklet is a valuable exposure reference for all astrophotographers. *Send $2.25 to:*

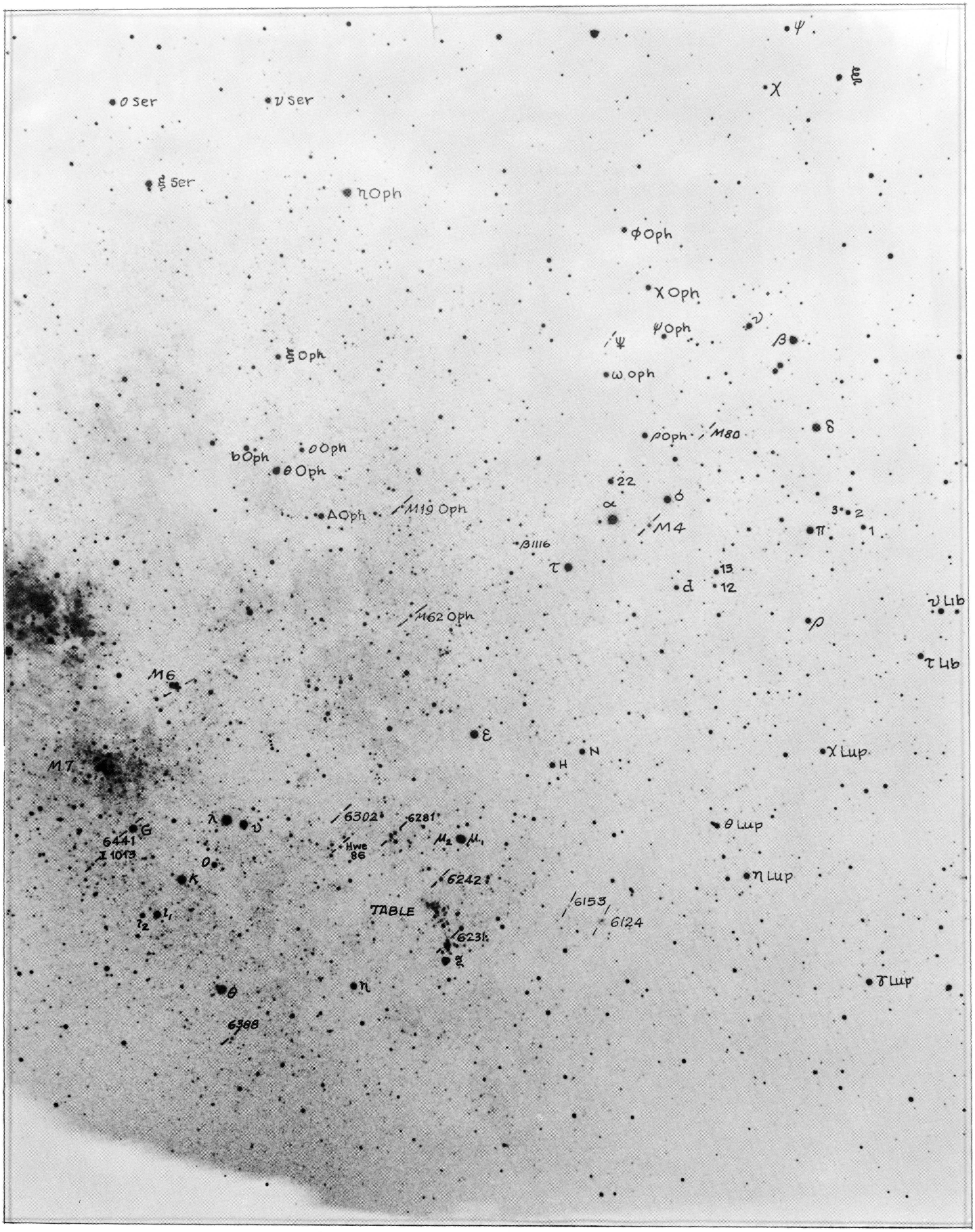
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EVENTS

Ceres reaches opposition on September 1 (00^h).

Juno reaches opposition on September 5 (05^h).

Planet	Magnitude (visual)	Position Sept. 1 R.A.	Sept. 1 Decl.	Oct. 1 R.A.	Oct. 1 Decl.
Ceres	7.3-7.5	23^h03^m	$-23^\circ00'$	22^h40^m	$-24^\circ30'$
Pallas	9.4-9.6	19^h18^m	$+12^\circ22'$	19^h19^m	$+6^\circ28'$
Juno	8.1	22^h51^m	$-3^h17'$	22^h32^m	$-8^\circ59'$
Vesta	7.2-7.4	14^h18^m	$-9^\circ11'$	15^h13^m	$-14^\circ36'$



Above: Scorpius photographed by John Sanford on 4/28/74 with a 35mm Nikkor F/2.8 lens at F/3.5. Exposure was ten minutes on Fuji 100 slide film (pushed to 200 ASA). Photographed at Orange County Astronomers site at El Cariso, California.



Above: M6 photographed by R. C. Price with a 12 inch F/6 reflector on 7/21/74. Exposure was 10 minutes



Above: M7 photographed by R. C. Price with a 12 inch F/6 reflector on 7/21/74. Exposure was 10 minutes on 103a-F Enlargement is 5X.

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Above: M80 photographed by R. C. Price with a 12 inch F/6 reflector on 7/20/74. Exposure was 10 minutes on 103a-F. Enlargement is 5X.





Above on Page 14: Antares Region photographed by John Sanford with a 105mm Nikkor lens. Exposure was 10 minutes on Tri-X Pan film, developed in Microdol X.

Above: Antares Region photographed by John Sanford with a 5.5 inch F/1.65 Schmidt Camera. Exposure was 7 minutes on 103a-F film developed in D-76.

