the ASTROGRAPH



VOLUME 5 NO. 3 DECEMBER JANUARY 1973



Cover Photograph

Comet Ikeya-Seki

Photographer	Sherman Schultz, Jr.
Date	November 4, 1965
Camera	Pentax F/1.8, 50mm
Exposure	20 seconds
Film	Tri-X
Developer	Diafine
Printed	Poly contrast paper #4 filter

Volume V, No. 3

Editor	Robert Price
Assistant Editor	Susan Price
Associate Editors	John Sanford, Ralph Proctor and John Phillips
Contributors	Sherman Schultz, Ben Mayer, John Korintus, August Schug, E. Ken Owen, John Sanford

We would like to extend our apologies to Mr. Charles Townsend for omitting his name from the list of contributors in our October-November issue

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COMET PHOTOGRAPHY

Comets are the largest and brightest deep sky objects for photography. They are usually so large in angular extent that the ratio of film size to focal ratio must approach unity or better. Cameras that are used to photograph large areas of the sky such as the Milky Way are ideally suited for photographing comets. Also nicely suited for comet photography is the 35mm camera with 50mm or 28mm F.L. lense. The 28mm lense gives a film size to focal length ratio of 1.25 to 1, and the 50mm lense gives a film size to focal length ratio of .7 to 1. A 12" F.L. lense with 4 x 5 film has only a .42 ratio and with 8 x 10 film a .83 ratio. It would take a 6 inch F.L. lense such as the Metrogon lense with 5 x 7 or 8 x 10 film to yield ratios of 1.2 and 1.7 respectively. Thus one can easily see that in terms of angular extent a 28mm or 50mm lense and 35mm camera is ideally suited for comet photography. The 35mm camera and lenses have the advantage of being better corrected over the field as compared with most other longer F.L. lenses when both are used at maximum aperature. In addition the 35mm lenses are usually several F stops faster than say a F. 2.5 Aero-Ektar or F. 6.3 Metrogon. This fast speed allows exposures short enough that guiding is sometimes not necessary on a bright comet.

The other lenses and large film sizes have the advantage of needing only a small amount of enlarging, if any; and because of the larger aperature are usually better able to capture more background faint stars which seem to add to the photographic effect in comet photography.

In terms of cost, handling, developing and printing, there is no contest. The 35mm camera is preferred.

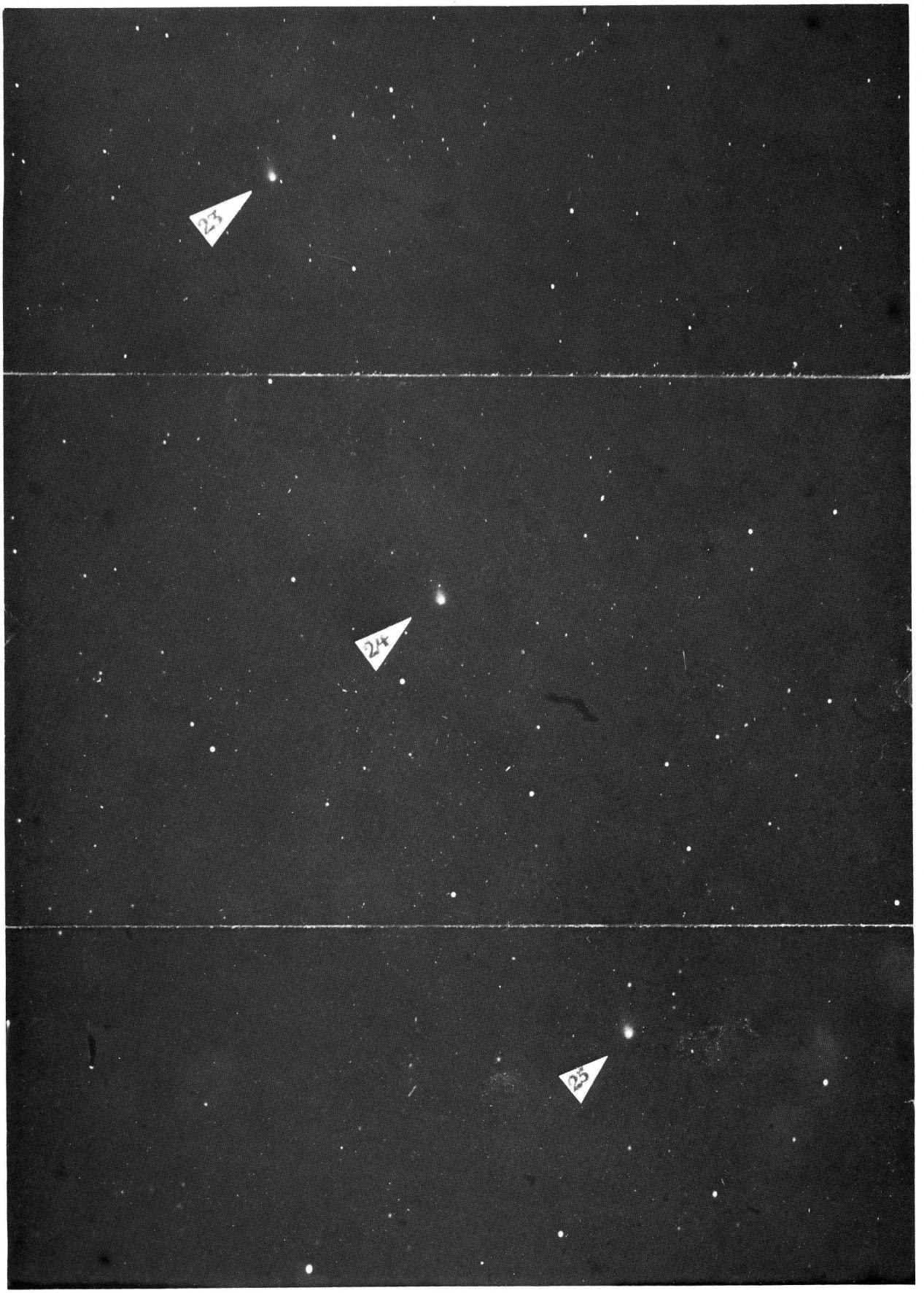
The above analysis is based on photographing a bright comet when it is large, appearing 20 degrees or more in angular extent. When a comet is not large or if it is far from the sun, it approaches being considered a galaxy or nebula. In such cases the best means of photography may be a long F. L. telescope say a 10" F/7 and 35mm film. This combination has a film size/ F.L. ratio of 1 to 49.

Note that the cover photograph required an exposure of only 20 seconds on Tri-X film at F/1.8.

I hope this article has encouraged those astrophotographers with regular camera to "hang" them on their telescopes and photograph what still promises to be a very spectacular comet, Kohoutek.

It will be visable immediately after sunset after the first of the year. It will be closest to the earth at the beginning of the third week in January. If long focal lengths are used, I recommend guiding on the comet itself for exposures greater than a few minutes.

R. C. Price



Comet Kohoutek photographed by Dr. Ben Mayer using a Celestron Schmidt 225mm F/ 1.65 on November 23rd, 24th, and 25th. The position of the comet was approximately as follows:

November 23	R.A. $12^h\ 54^m$	Decl. $-16^\circ\ 30'$	05:38 a.m. PST
November 24	R.A. $12^h\ 59^m.5$	Decl. $-16^\circ\ 50'$	05:38 a.m. PST
November 25	R.A. $13^h\ 05^m$	Decl. $-17^\circ\ 10'$	05:36 a.m. PST

In the upper photograph, the comet virtually sits astride the dividing line between Corvus and Virgo. In the center picture, the star nearest 1973F is of seventh magnitude. The largest in the bottom of the photograph is #53, Virginis, of magnitude 5.

THE CONSTELLATION TAURUS

Taurus, the large and important second constellation of the Zodiac, is also possessor of many telescopic objects for the amateur astronomer. Most as double stars, since this area contains much obscuring matter,and is also away from the galactic center (we are looking almost directly away from the center). There are several open, or galactic type clusters, however, and the two large ones happen to be the nearest of their class. The V-shaped head of the bull is composed mainly of stars belonging to the Hyades association (except Aldebaran), of which we are a close neighbor, only being 88 to 150 light years away. There are about 350 known members of the "Taurus star stream" as it has been called, all travelling in the same direction, to a converging point at 6h 07m and +09° 06', near Betelgeuse in Orion. Members of the star stream have been found in various areas of the sky, so we might infer that the solar system is passing through the outer fringes of the group on its journey toward Hercules.

The other cluster in Taurus is of course the Pleiades. This is a young group, and the nebulosity around the brighter members is genereally interpreted as interstellar matter which is left over (or still condensing) around the stars that we see. The matter is mostly seen by reflection, and therefore, must be closely associated with the young stars (B6 to B8). Age estimates vary from a youthful 20 million years (Sandage) to 100 millions of years (W. Lohmann.) The distance to the Pleiades is about 450 light years, and its brightest member is Alcyone, or Eta Tauri, at magnitude +2.86. Tempel discovered the reflection nebula near Merope +4.25), and it can easily be seen, providing a dark sky is present. It is easiest to see using an occulting bar (try a match stuck in your eyepiece at the focus) to hide the star. Photographically, this nebula (named NGC1435) is quite easy to photograph, being recorded by a 10 minute exposure on Tri-X with a 55mm Micro-Nikkor at F/4. Larger cameras and telescopes show more and better, as is always the case with faint objects. There is considerable detail in the nebulae around the Pleiades, with striations in the clouds at different orientations perhaps saying something about the axis of rotation of the hot young stars within. Little of this detail is available to the visual observer, with the streaks near Merope (see Schmidt photo) perhaps the easiest to see. I believe the cluster itself is best seen in binoculars or finder, or perhaps a 6" F/4 RFT with a large eyepiece.

I have not seen this object but would like to hear from observers who do see Hind's Variable Nebula, apparently a faint, small relfection nebula surrounding the variable star T Tauri. It is plotted in the Atlas Coeli (Becvar) as NGC 1554-5, at coordinates RA 04h 19.9m, +19°25'. No magnitudes are listed, but the distance is given at 1000 parsecs (3,260 l.y).

There are two large open galactic clusters which are not rich in star density, NGC 1647 at RA04h 43.2m, +18°59' containing about 30 stars, and NGC 1746, at 5h 0m +23°44' containing 60 stars.

Messier 1 or the Crab Nebula was first noted by Bevis in 1731, and recovered by Messier as the first object in his famous catalog published in 1774. It is a faint, large planetary nebula, apparently the expanding gas cloud of a supernova observed and noted by the Chinese in 1054 A.D. Recently the Crab Nebula pulsar has been intesly studied, along with the strong radio source, Taurus A, both of which are located at or near the center of the gas cloud. A 12-inch telescope shows several faint stars within the glow, but none of these are the pulsar or 16th megnitude central star. I see the nebula as granular, but this is a common effect caused by structure of the eye when looking at faint extended surfaces. The nebula is easy to photograph, but so small that at least 80" of focus are needed to begin to make out structure. The total magnitude is 8.4 photographic, but a square second of arc has only the brightness of a 19th magnitude star.

Some telescopic objects for Taurus are tabulated below:

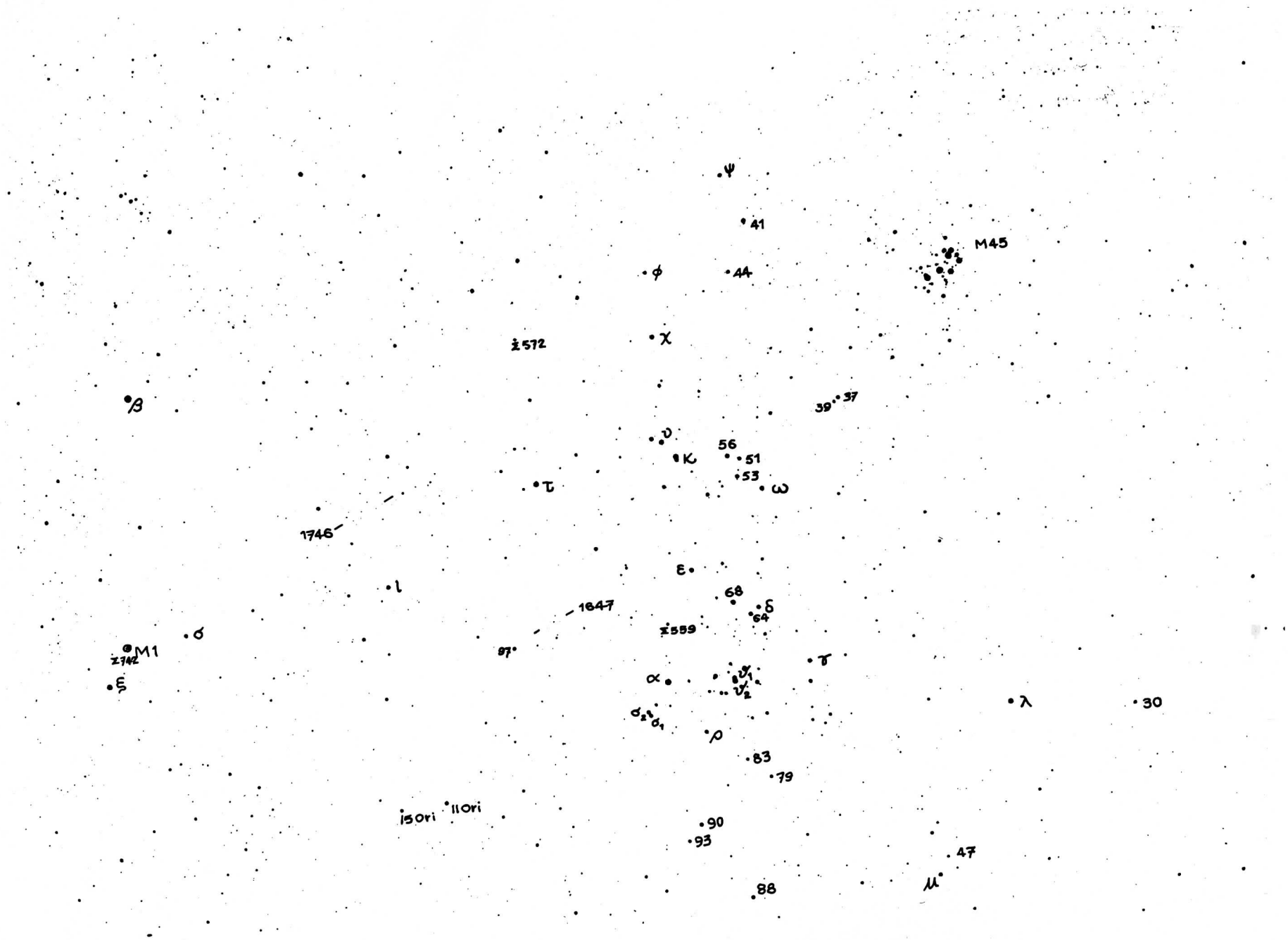
Object	R.A.	Dec.	Magnitude (Vis.) and Separation			P.A.	Remarks
Σ 422	3h 34.2'	+0°26'	6.1,	8.9	6.5"	261°	Np 10 Tau. binary
30	3 45.5	+10 59	5.0,	9.6	9.0	59	Bluish-orange
47	4 11.2	+9 08	5.0,	8.0	1.1	351	Difficult
Σ Chi	4 19.5	+25 31	5.7,	7.8	19.9	25	Blue Orange
Σ559	4 30.6	+17 55	7.0,	7.0	3.1	277	
Σ572	4 35.4	+26 51	7.2,	7.2	4.0	195	Same Color
Σ716	5 26.2	+25 07	5.9,	6.6	4.8	206	
Σ742			7.2,	7.8	3.5	269	26'Sf Crab neb.

There is also a minute double star ADS 3201 which Hartung mentions and I saw nicely in a 10" F/6, and its located right between the bright components of the wide double kappa Tauri. 9.5, 9.8 6" separation.

John Sanford
2215 Martha Avenue
Orange, California 92667

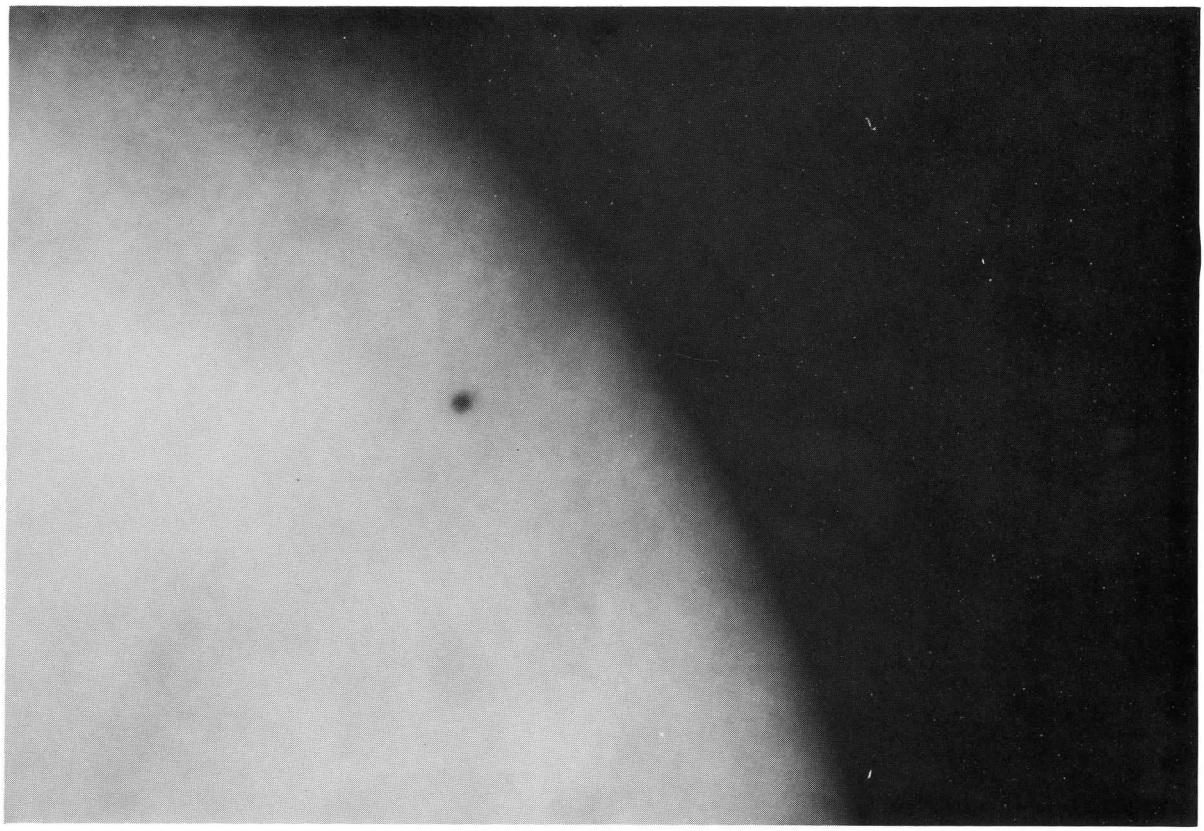


The Pleiades photographed by John Sanford using a 5.5 inch aperature 9 inch focus F/1.65 Celestron Schmidt camera. Exposure was 5 minutes on Plus-X Pan film developed in Microdol-X. North is to the left.

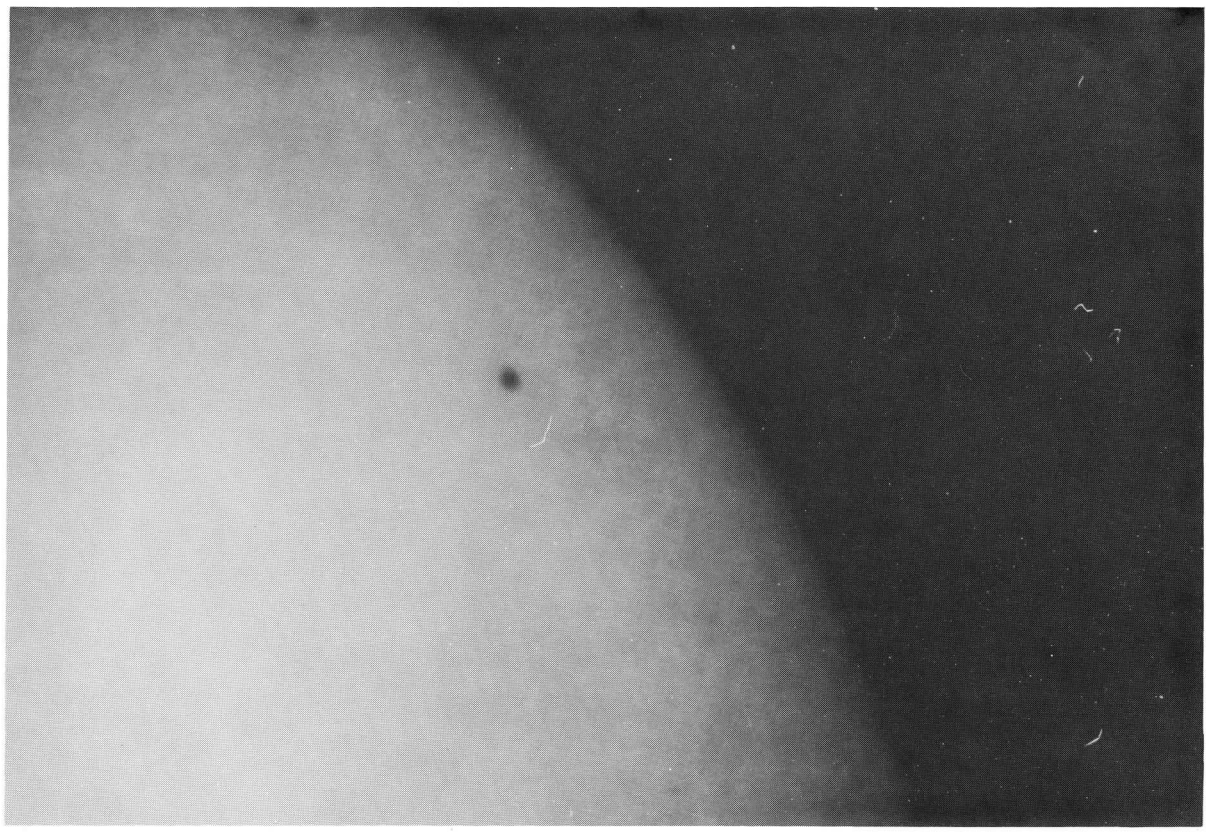

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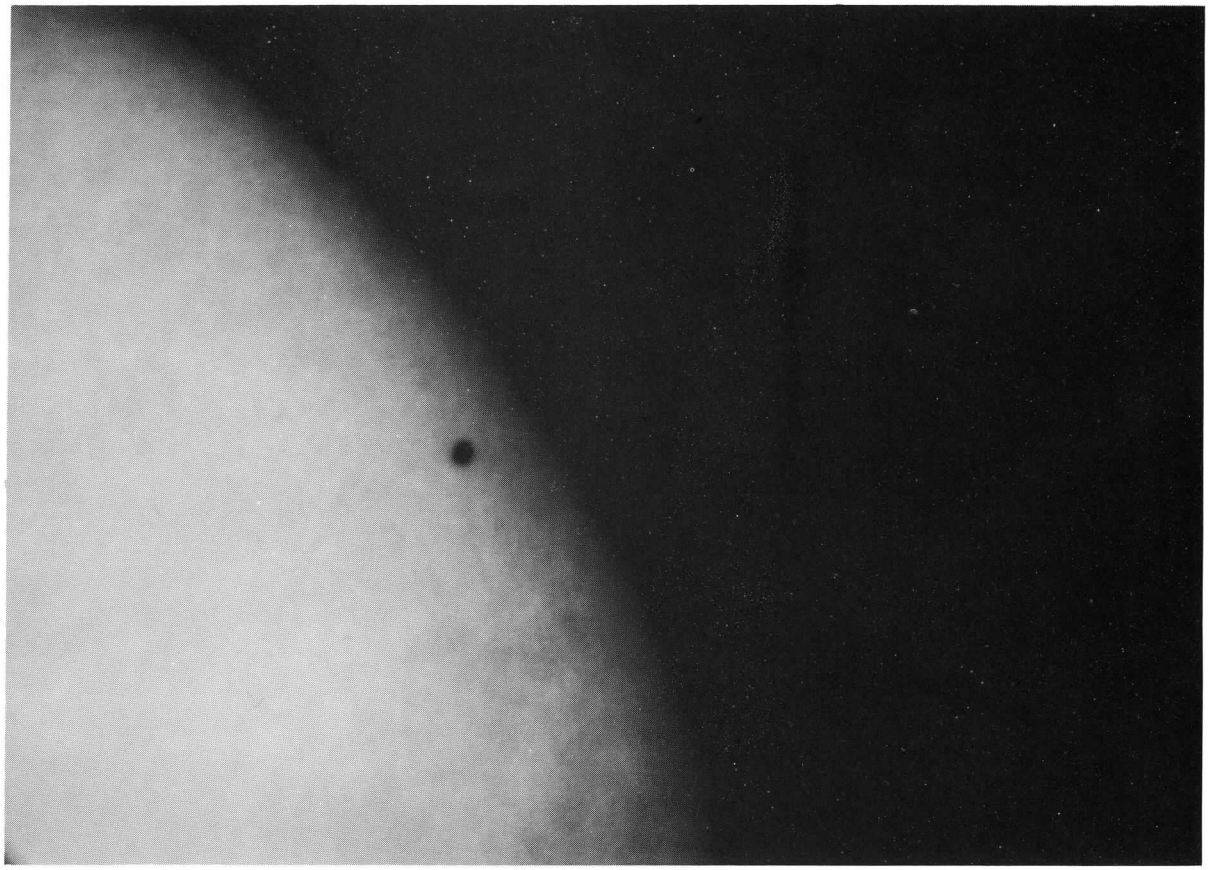
Taurus photographed by John Sanford using a 50mm Hexar F/1.9 lense at F/2.8. Exposure was 5 minutes on Tri-X Pan developed in Microdol-X. Photo is full frame print. Negative print appears on opposite page.



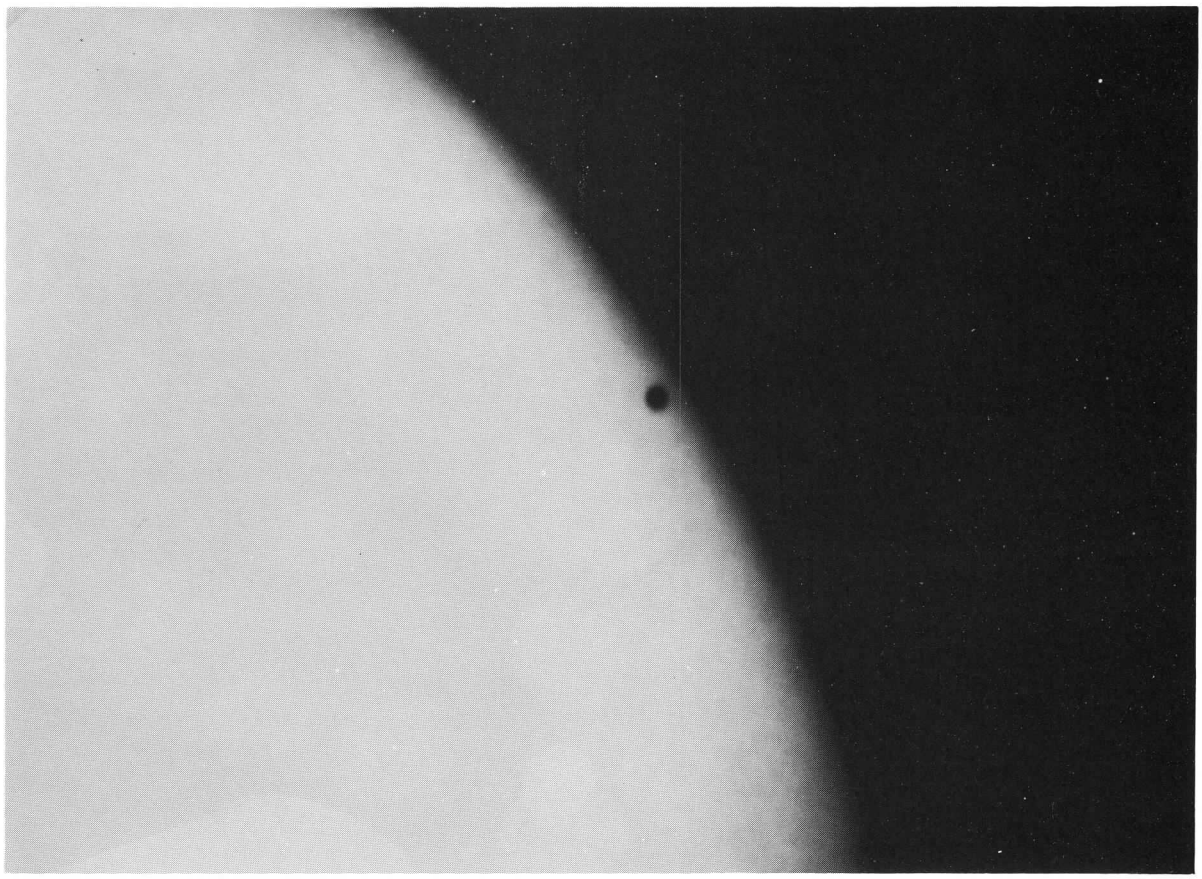
Mr. John Korintus photographed the transit of Mercury on the morning of November 10, 1973. He used a 10 inch F/8 reflector and eyepiece projection using a 12mm ocular giving a F value of 162. He used a 9 inch Bausch & Lomb solar filter with a density of 5.0. Film was high contrast copy film developed in D-19 at 68° for six minutes. Enlargements were made on Agfa Brovira grade 6 paper developed in Printofine for 3 minutes at 68°. The photograph above was a 1/4 second exposure at 7 hr. 58 minutes EST.



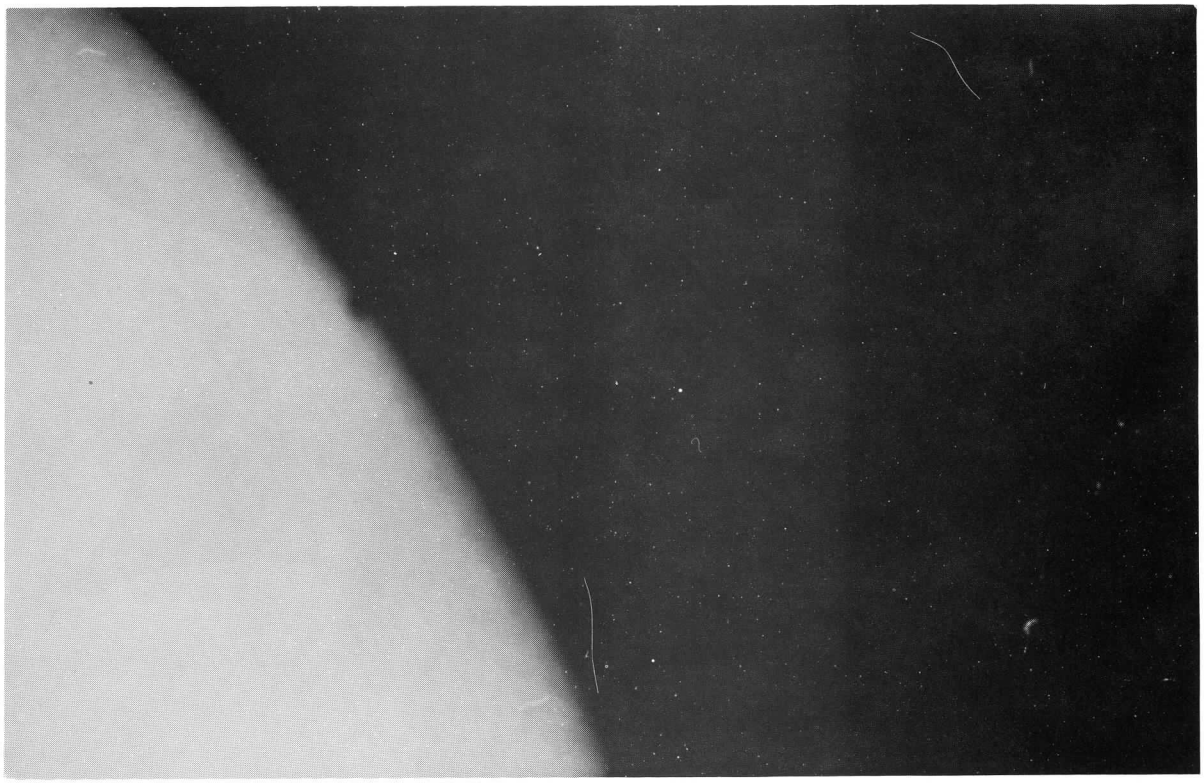
Mr. John Korintus took this photograph at 7 hr. 59 minutes EST. Exposure was 1/8 second.



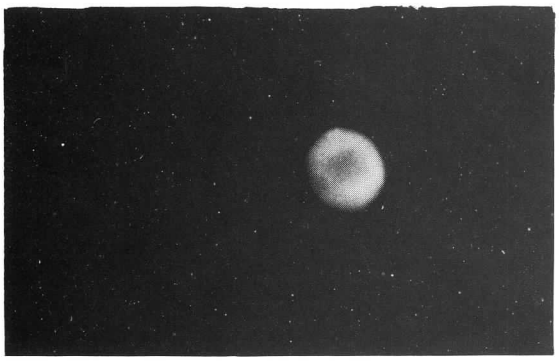
Mr. John Korintus took this 1/8 second exposure at 8 hr. 7 min. EST.

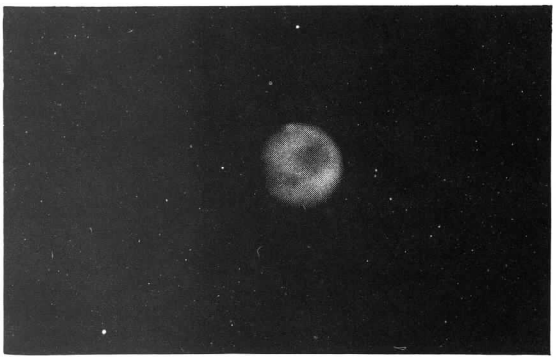


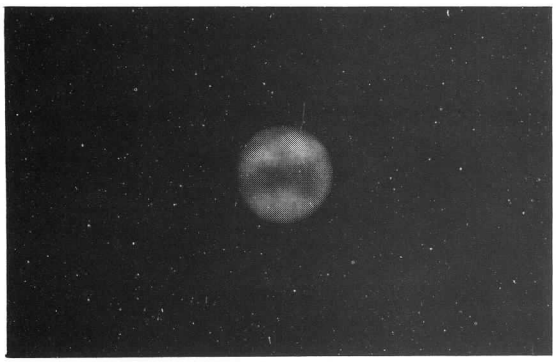
Mr. John Korintus took this 1/8 second exposure at 8 hr. 13 minutes EST just before 3rd contact which took place at 8 hr. 16 minutes 36.6 sec. EST.

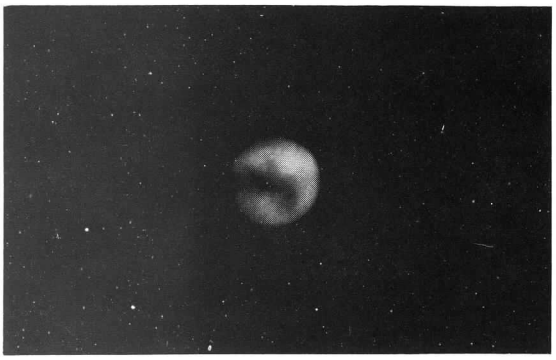


Mr. John Korintus took this 1/8 second exposure about 30 seconds after third contact. Fourth contact took place at 8 hr. 17 minutes 42 secs. EST.









The four photographs of Mars above were taken by Mr. August Schug. Data is as follows:

Above left: October 5, 1973, 2 second exposure on H&W control film at F/145. C.M. at 22°.

Above right: October 8, 1973, 2 second exposure on H&W control film at F/145.

Lower left: October 18, 1973, data same as other photographs except 23-A red filter used.

Lower right: October 18, 1973, using high contrast copy film at F/145.

Mr. Schug states that using extremely high focal ratios (F/100 to F/200) gives him excellent results especially with some of the newer film like H&W control.

LUNAR PHOTOGRAPHY

By the time the moon has reached its 21st day, all the features discussed in the last issue have disappeared except the craters Eudoxus and Aritoteles. Two areas I enjoy photographing at this lunar stage are the Mare Serenitatis and the rills in the area of the Rima Ariadaeus and the crater Triesnecker and the Hyginus rill. Such craters as Bessel, the largest in the Mare Serenitatis and Linne' are especially favorably located as the terminator divides the Mare Serenitatis.

By the 22nd day, the craters Eudoxus and Aritoteles have disappeared. The Hyginus rill and those around the crater Triesnecker are in very good photographic position. The areas of the craters Clavius and Tycho, the mountain-walled plain Deslandres, the straight wall, the area of the craters Arzachel, Alphonsus, Ptolemæus, Albategnius and Hipparchus, Copernicus and the area east of it, and lastly the Eastern Mare Imbrium including the Apennines, the Alps, and the craters Autolycus, Archimedes, Aristillus, and Plato; All these areas are in excellent photographic position around the 22nd day.

Clavius is the second largest mountain-walled plain on the visible face of the Moon. It is 137 miles in diameter and features four fairly large craters inside that form a "V". The two craters on the West are the smallest and just South of these two craters near the rim of Clavius are a number of small craters that are rather hard to completely resolve.

Northeast and northwest of Clavius are the mountain-walled plains Maginus and Longomontanus, both of which have a few small craters and mountains on their floor. Good photographic resolution is necessary to clearly resolve these features. The crater Tycho is like the mountain-walled plains just described. Up until a photograph resolution of 2-3 miles, the area seems rather devoid of sharp features. Photographs exceeding this resolution reveal a number of small craters and sharp jagged features begin to appear throughout the area but especially noticeable is the jagged features of Tycho itself and the small craters in Pictet and the area northeast of Tycho.

Lunar photography continued on page 14.

MARTIAN PHOTOGRAPHY

Mars crosses the meridian shortly after twilight ends on the first of January. Mars has been a relatively poor object photographically because of a dust storm which has obscured surface detail.

SATURN PHOTOGRAPHY

Saturn will reach one of its closest oppositions on December 22-23. Its ring system will almost be at its maximum open position. It is placed high on the ecliptic in Gemini and in excellent photographic position.

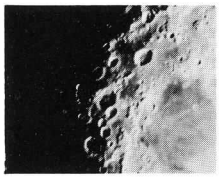
VENUS PHOTOGRAPHY

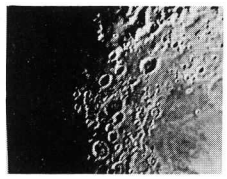
Venus is an exceptionally bright object in the evening sky. Unfortunately it is low in the ecliptic and is definitely not in good photographic position. Venus and Jupiter will form an interesting grouping with the first cresent moon during late December.

LUNAR PHOTOGRAPHY

The waxing Gibbous moon is favorably placed high on the ecliptic during December and January.

Ralph Proctor





IMPROVE PHOTOGRAPHIC PRINTS WITH A LINEAR RADIAL TRANSMISSION FILTER

Prints can now be made that clearly show all the detail on a negative! Here is an example of part of the moon photographed with a 16-inch telescope. At left is a high-contrast print made by conventional means, at right one with detail enhanced with the LRTF. In addition to enhancing, the LRTF can remove graininess!

A complete enhancing kit sells for $12.95. To order, state clear diameter of enlarger lens. For orders, or information, write:

LRTF Photographic Enhancement
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Newport News, Virginia 23601

NOW AVAILABLE

Kodak IV-E Spectrographic Film

This film is now available in 100 foot rolls. Use it for both deep sky or lunar and planetary photography. The editor of the Astrograph uses it exclusively for lunar photography (see cover of August-September 1973 issue and page 30 of the October-November issue) and on numerous occasions for deep sky photography (see page 4 and 10 August-September issue). For Martian photography with IV-E film, see page 20 April-June issue of the Celestial Observer and for lunar photography, see pages 124-125, February 1972 issue of Sky & Telescope. Cost of $28.50 per 100 foot roll includes air shipment.

Send checks to The Astrograph, Box 34, Woodbridge, Virginia 22125

BACK ISSUES OF THE ASTROGRAPH

Last month we stated that we would make an inventory of the Astrograph, Vol. I through Vol. IV. These volumes of the Astrograph are in the old format and when compared to the Astrograph in its current format would certainly be a disappointment. The Astrograph was published monthly as a three-paged mimeographed magazine with one page of photo offsets from July 1962 (Vol. I, No. I) to June 1966 (Vol. IV, No. XII).

For those interested in obtaining back issues the following are available at a cost of 25 cents each:

1963 November and December
1964 All except July
1965 All except August
1966 January through June (June is the last issue of the old format)

Back issues of the Astrograph in its current format are available for 75 cents each.

Currently available is the August-September issue.

NGC OBJECTS IN CASSIOPEIA

In the October-November issue I stated that the galaxies NGC 147, 185 and 278 were not visiable on the photograph which appeared on page 31. I postulated that one reason might be that these objects were at the corner of the 4 x 5 inch negative and since the lense was being used at full aperature F/25, there was considerable coma. Figure 1 is an enlargement of the area in which these galaxcies are located.

Figure 2 is an enlargement of the 45 minute exposure of this same area (slightly lower) on axis using the same F stop and film. The uppermost bright star of the three stars in the center is o Cassiopeia. The lower star is π Cassiopeia. Close examination of the negative of Figure 2 did not reveal these galaxcies. NGC 185 is the brightest of these three galaxcies photographically at magnitude 10.3. It is 2.2 by 2.2 minutes in area and magnitude 11.7 visually. It is located at R.A. $0^h\ 36^m.1$, Decl. $+48^o04'$. The Editor, Mr. Price, was easily able to detect NGC 185 visually in his 12.5 inch F/6 reflector and took Figure 3 which is an exposure of ten minutes on 103aF with this same instrument. Using this photograph to pinpoint the location of NGC 185 on the 4x5 inch negative, I was able to find the galaxcy but it still could not be distinguished from a star of similar brightness.

NGC 278 is slightly brighter visually at magnitude 11.3 but not photographically at magnitude 11.5. It is quite small, 1.3 x 1.3 minutes of arc in area and is located at R.A. $0^h\ 49^m.2$, Decl. $47^o18'$.

NGC 147 is of magnitude 12.1 photographically and is 4.5 x 2.5 arc minutes in area centered at R.A. $0^h\ 30^m.4$, Decl. $48^o\ 14'$.

On the same negative as Figure 2 was located the Andromeda Galaxy. Figure 4 is an enlargement to the same scale as Figure 2. Note just north of M32 is the companion eliptical galaxy NGC 205, located at R.A. $0^h\ 37^m.6$, Decl. $41^o25'$, it is 10.0 x 4.5 arc minutes in area and has a photographic magnitude of 8.9 and a visual magnitude of 9.4. Looking at the appearance of NGC 205 it is easy to see why NGC 185 was impossible to identify, being 1.4 magnitudes dimmer and nearly a factor of ten less in area

John Phillips

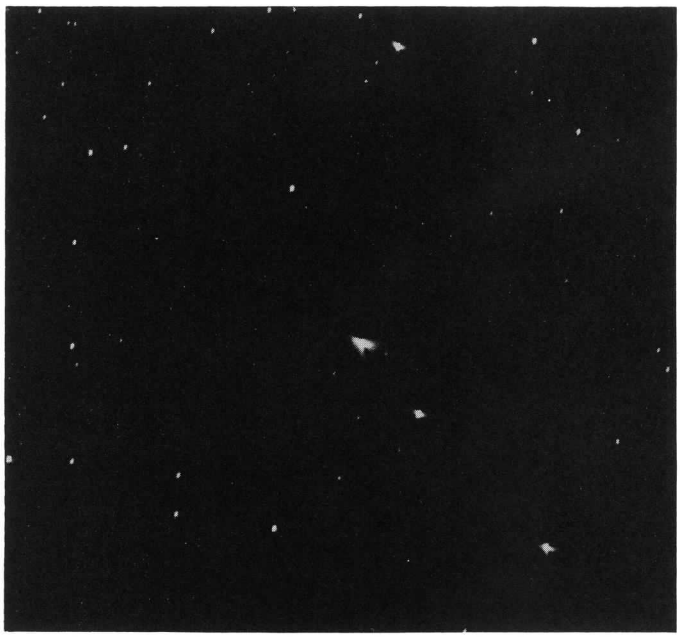


Figure 1: Enlargement of an area that is off the bottom right hand edge of the photograph on page 31 of the October-November 1973 issue. Note coma caused by image being in the corner of a 4 x 5 inch negative. Exposure was 30 minutes or Tri-X Pan sheet film at F/2.5.



Figure 2: Enlargement of an area slightly lower than that in Figure 1. Note the three bright stars in the center in a line running from the top left to the bottom right. The upper star is o Cassiopeia, the lower star is π Cassiopeia. NGC 185 is located in between the dashed lines. Exposure was 45 minutes on Tri-X Pan 4 x 5 sheet film developed 6 minutes in FG-7 1:3 at 75^oF. John Phillips used a 12 inch F.L. F/2.5 lense.



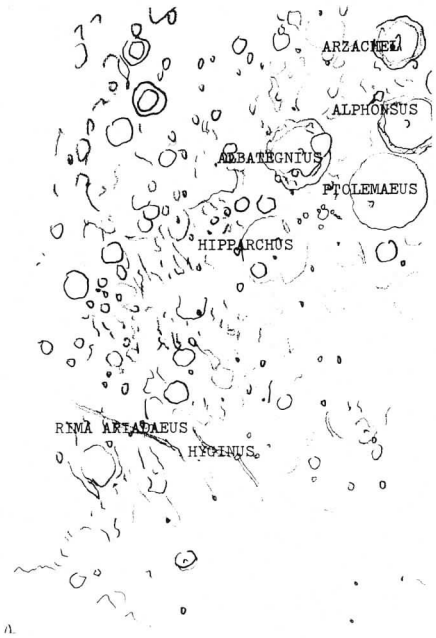
Figure 4: Enlargement of area of M31 on the same negative as that of Figure 2. The scale is also the same.

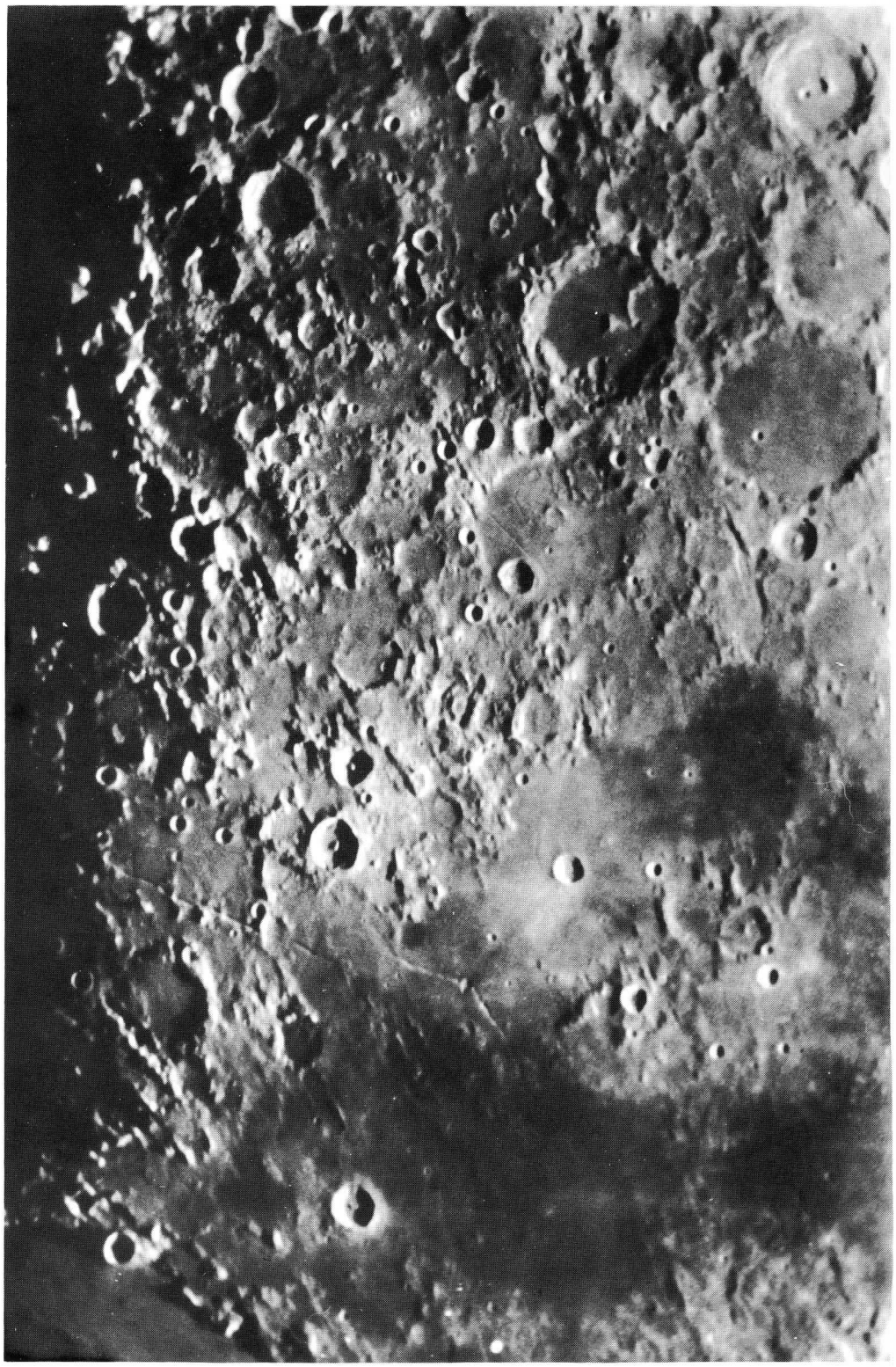


Figure 3: NGC 185 photographed by R. C. Price with a 12 inch F/6 reflector. Ten minute exposure was on 103aF film.

Deslandres is a 130 mile diamater mountain-walled plain. The crater Hell is the large crater located on the western floor. Its floor is a maze of small craters and other irregular random type features that really speak for its name "Deslandres". A really difficult photographic challenge is in the area of the straight wall. Just north of the crater Birt, is a shallow depression running parallel with the straight wall. This depression looks like a pebble rolled and ended up just of Birt.

The craters Arzachel and Alphonsus have a rill on the floor close to the Eastern wall. These rills are as difficult to photograph as the dozens of small craters on the floor of Ptolemaeus which seems to "appear" at photographic resolutions better than 2 miles. Albategnius has an extremely flat floor with just a few very small craters as small and as difficult to photograph as those on the floor as Ptolemaeus. Hipparchus has a number of irregular features that are considerably easier to photograph than those features just discussed.



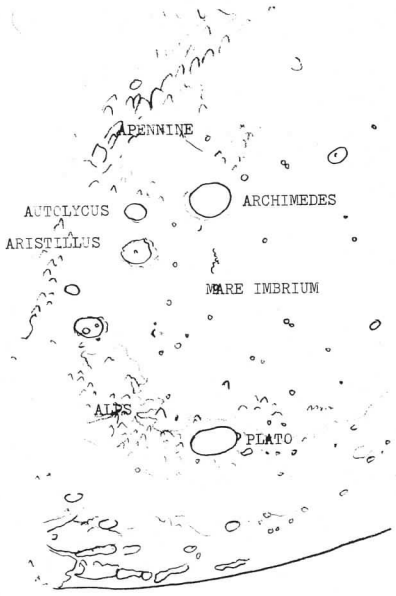


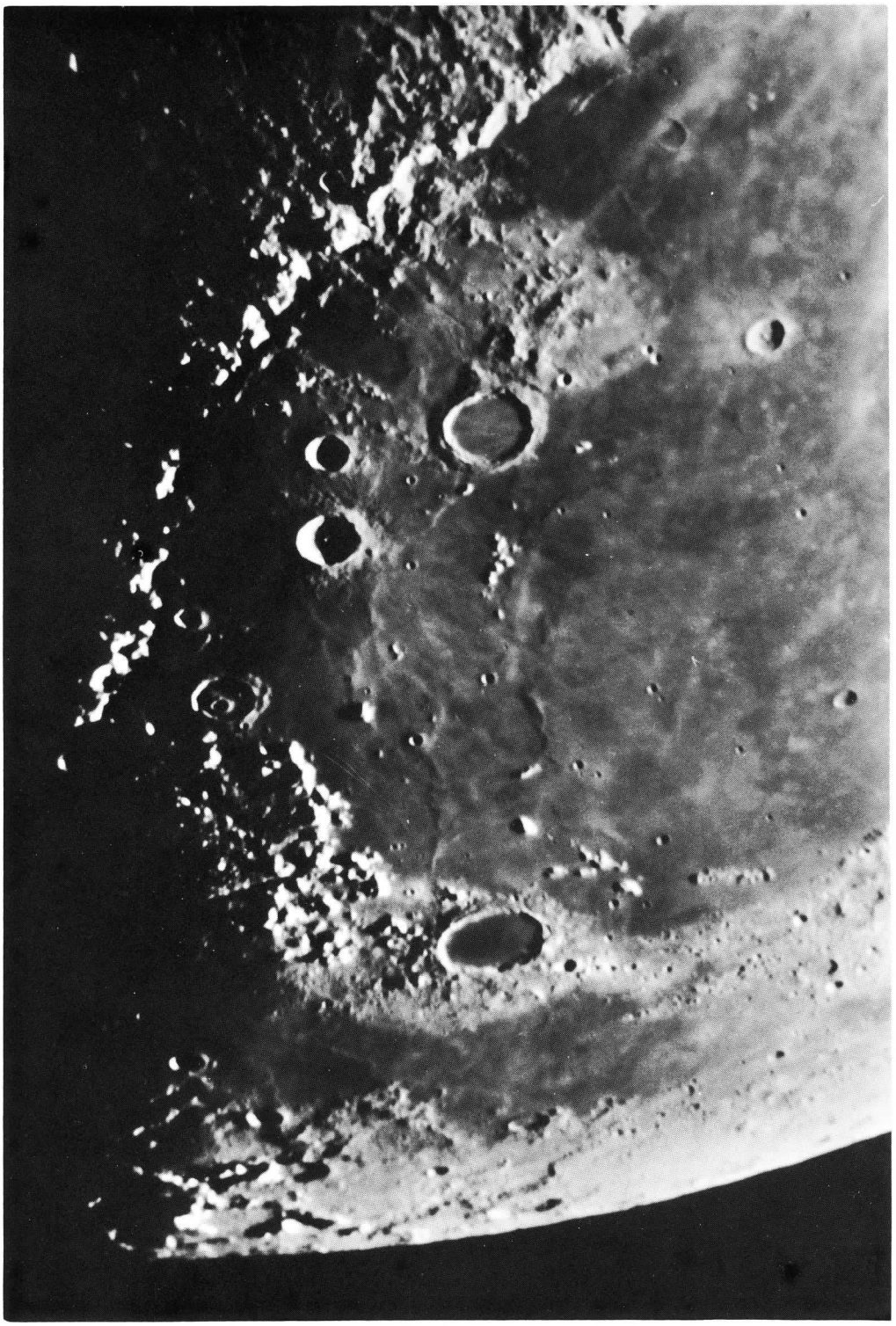
Right: Central area of the Moon near last quarter by E. Ken Owen on July 24, 1970. Mr. Owen used his 10 inch F/6.150 Newtonian and eye-piece projection (12mm Brandon) for this 4 second exposure at F/61 on KB-14 film and a #14 W. Yellow filter. Seeing was rated as 4. The film was developed in FG-7 and the negative was printed on Brovira #5 paper.

The area of the crater Triesnecker and the rills just east of it are extremely difficult to resolve completely, as are the numerous small craters in the area between the craters Eratoshenes and Copernicus.

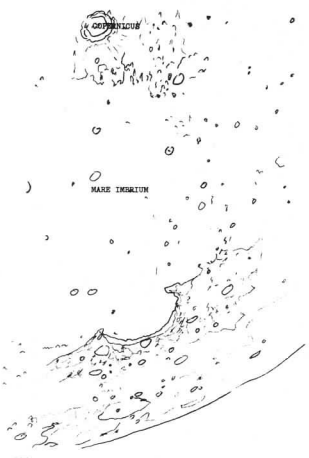
The area of the Appennine Mountains and the region north to the craters Archimedes and Autolycus is an area rich in mountainous peaks and rills, The crater Aristillus has outer slopes which are "wrinkled" as if weathered by erosion. Archimedes has a number of craters on its relatively smooth floor. All these features are excellent tests for photographic resolution. The most difficult I feel are the small craters on the floor of Plato. Not only are the craters small but the dark floor of Plato necessitates a slightly longer exposure to assure that the craters are captured.

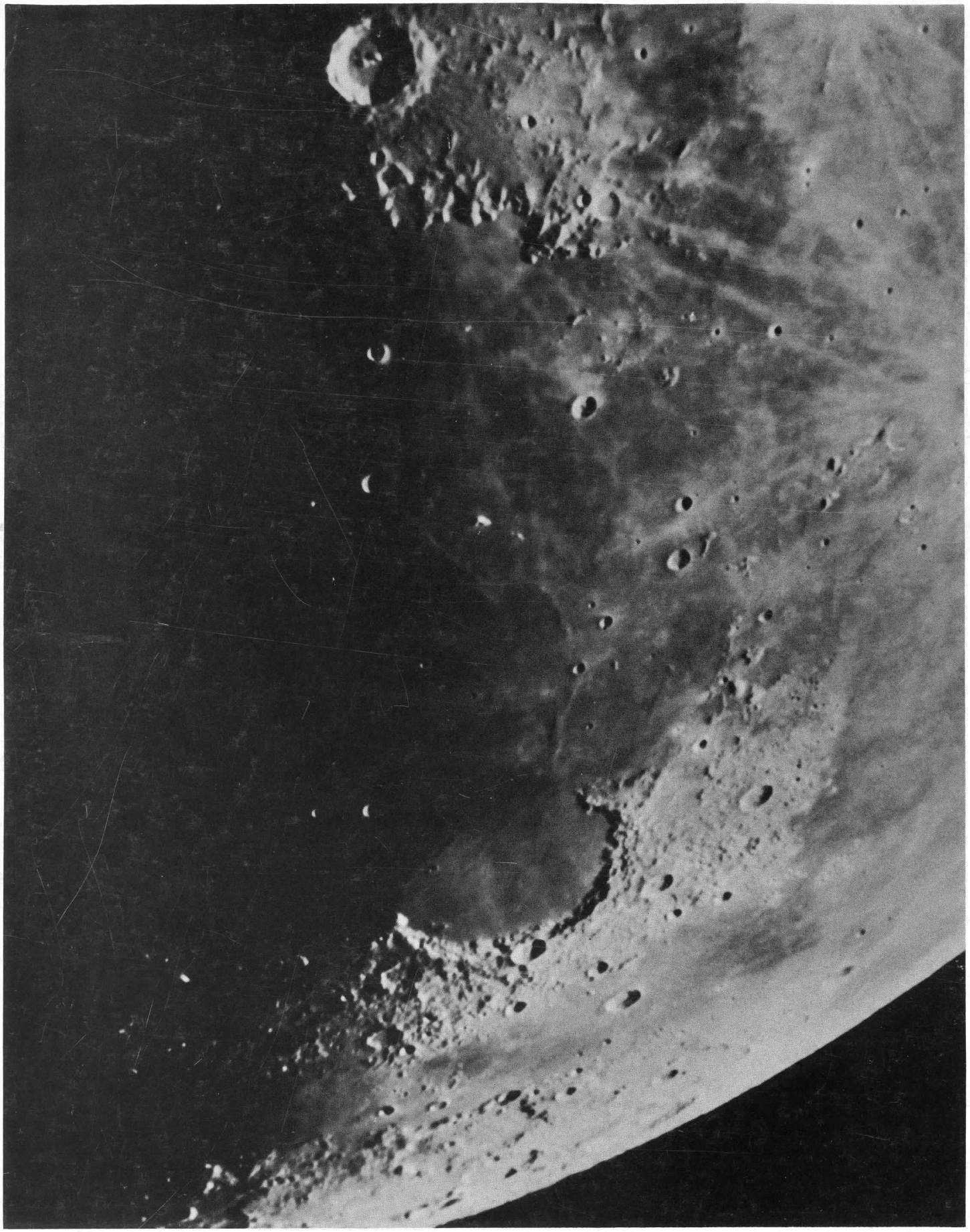
Ralph Proctor





Right: Northern last quarter of Moon photographed by E. Ken Owen on July 25, 1970. Other data same as photograph on left except no filter, seeing 3 and exposure 2 seconds.





Back Cover Photograph: Last quarter Moon in region of Mare Imbrium photographed by John Sanford on June 24, 1973 using an 8 inch F/10 Schmidt Cass. and 2x Telex and 7 inch projection for this two second exposure on SO410/EB film. Seeing was rated 4/5.