the ASTROGRAPH



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THE ASTROGRAPH



Volume V No. V

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COVER PHOTOGRAPH

Comet Kohoutek

Photographer	Herman M. Heyn
Date	January 12, 1974
Lens	55mm
Exposure	15 seconds
F No.	2
Film	Ilford HP-4(ASA-800)
Site	20 miles north of Baltimore

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PHOTOGRAPHS OF KOHOUTEK

The ASTROGRAPH received just as many photographs of Kohoutek after Vol. 5 No. 4 went to press as before. Ben Mayer obtained an interesting series of photographs on January 27 with a Celestron Schmidt 225mm F/1.65. His photographs show the movement of Kohoutek in a space of two hours.

Steven Fahnenstiel took a number of excellent photographs, two of which appear in this issue. Concerning last issue's cover, Mr. Fahnenstiel writes:

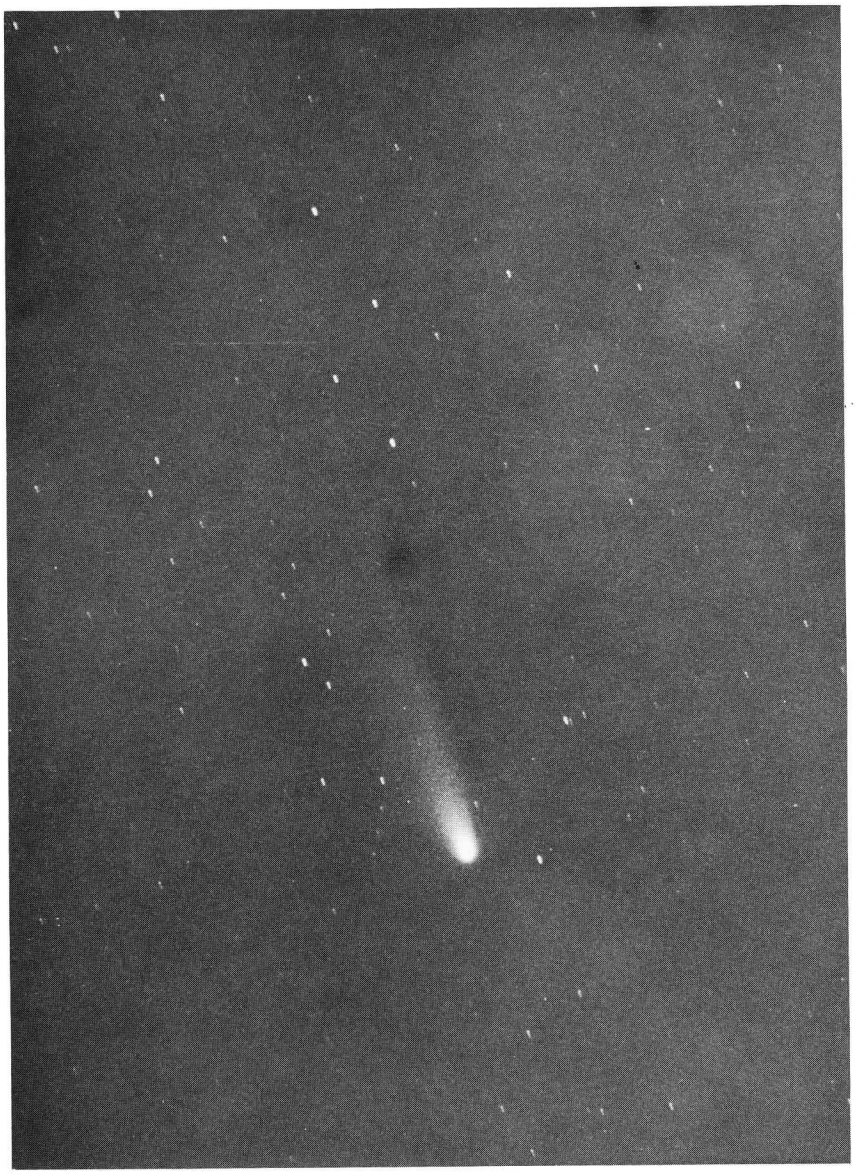
"Your photo is one of the few published so far which shows the streamers coming from the head, and the only one I've seen of such high quality taken by an amateur. However, I must take issue with the statement that "By the 15th... no streamers were photographed coming from its tail." The enclosed photo was taken on Jan. 18 with a 10 inch F/5 reflector at my Orion Observatory in Colorado.

After a series of snow storms and cloudiness, I first photographed Kohoutek with a 30mm F/2.8 lens. The tail was approx. 9° long visually, and the camera caught it out to $11^{\circ}45^{m}$.

Continued on Page 78

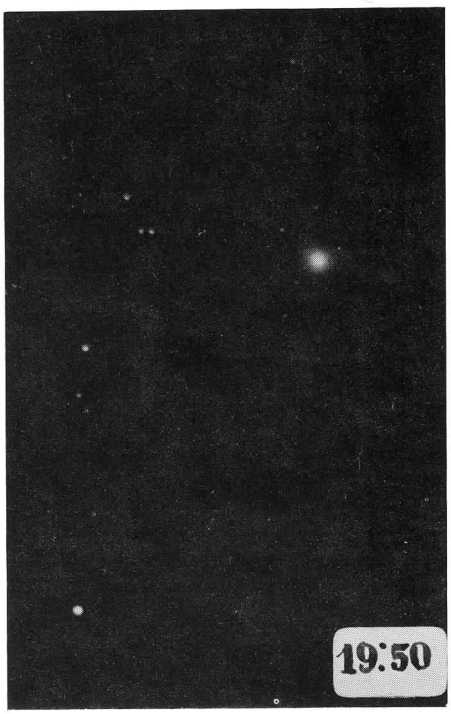
RIGHT: Comet Kohoutek photographed by Steven Fahnenstiel using a 10 inch F/5 reflector for this thirteen minute exposure on 103aF film developed for five minutes at 69°F in D-19. Seeing was rated at 7 (scale of 1-10) on January 18, 1974 at 7:10 (MST) when the photograph was taken. The negative was printed on Agfa #6 double weight (DW) paper.





LEFT: Comet Brafield photographed by the amateurs Jim Filipski, John Sabia, Ken Mason, and Jerry Zawislak on March 25, 1974. This photograph was a four minute exposure on Plus-X (ASA 500) developed in HC-100 Dilution B. The 400mm F/6.3 telephoto lens used for this photograph was mounted on the Alvin Clark refractor.

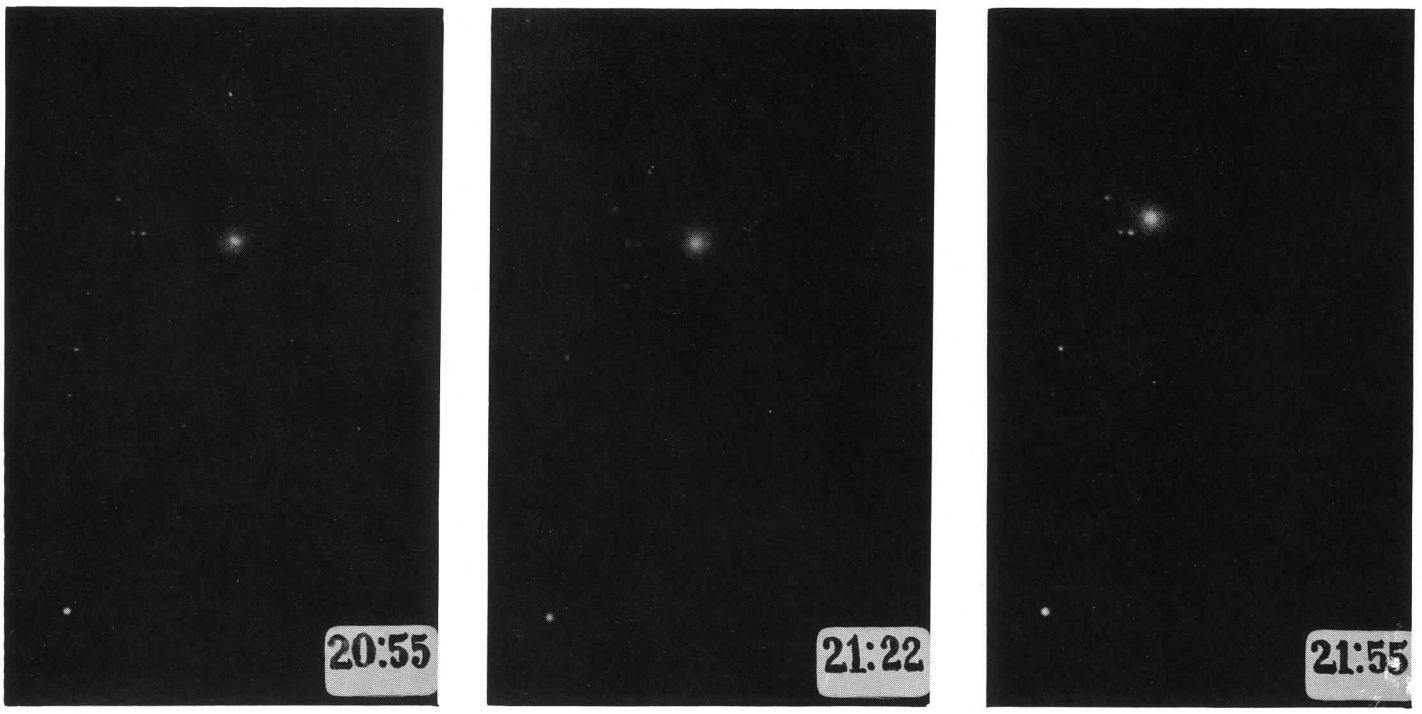
RIGHT: Ben Mayer took this series of photographs of Kohoutek on January 27, 1974. Mr. Mayer used a 225mm F.L. F/1.65 Celestron-Schmidt for these three minute exposures on H&W film developed at 21°C. Each photograph covers an area 30' wide by 45' high.







ABOVE: Comet Bradfield by the amateurs at Keystone Observatory. An eight inch F/1.5 Schmidt camera was used on March 25, 1974 for this 1.5 minute exposure on Tri-X film (ASA 16000) developed in HC-110 Dilution A.





ABOVE: Comet Kohoutek photographed on January 11, 1974 at 7:00 (MST) by Steven Fahnenstiel who used a 30mm F/2.8 lens for this seven minute exposure on 103aF film which was developed in D-19 for five minutes at 70°F. The photographic site was the Orion Observatory 7,750 feet above sea level. Bergen Peak at 10,000 feet is in the background.



LEFT: Comet Bradfield photographed by amateur astronomers, Jim Filipski, John Sabia, Ken Mason, and Jerry Zawislak at Keystone Observatory on March 23, 1974. They used an F/4.2 telescope reduction system on a 9" Alvin Clark F/15 refractor. This one minute exposure was on Tri-X (ASA-1600) film developed in HC-110A.

LETTERS

"Dear Sirs: I have received your last two issues (Vol. 5, Nos. 1 and 2) and believe in time your magazine could become the amateur astrophotographer's bible. Since your magazine is the only amateur magazine devoted entirely to astrophotography, I feel every amateur astrophotographer should subscribe. "

Martin C. Germano

"Dear Mr. Price: I received my first issue of the ASTROGRAPH and have enjoyed reading it. You can be proud of a job well done."

E. Ken Owen
Oklahoma City, Oklahoma

"As a recent subscriber to the ASTROGRAPH, I must compliment you on your new enlarged format and your extremely fact-filled articles. Just what we needed!"

August Schug
Sylvania, Ohio

"Dear Mr. Price: Allow me to compliment you on the first two issues I have received of the ASTROGRAPH, to which I have just begun to subscribe. It is precisely the publication I need to help me with the work I'm doing in connection with some environmental projects in which my firm is doing considerable R&D."

Ben Mayer, ARCA, NSID

"I am so pleased with the "Astrograph" that here is my check for $3.00 for which please extend my subscription for another year."

Charles T. Anson.
West Hartford, Connecticut

"Dear Sir: Please renew my subscription to "THE ASTROGRAPH". Keep up the good work."

Philip J. Hilbert
Fairview, Penn.

"Dear Mr. Price: Your identification of the Cassiopeia photograph appearing in Vol. 5 No. 2 of the ASTROGRAPH was correct. Thank you for your careful review of the photographs. You are to be complemented on the fine quality of the reproduction photographs."

Charles Townsend
Oxnard, California

"Dear Sir: Have received my first issue of the "ASTROGRAPH" and find it excellent."

Howard W. Smith
Vestavia Hills, Ala.

"Dear Sir: I have received my first edition of the ASTROGRAPH recently and I am very impressed with the articles for the month, the photographs, and descriptions."

F. E. Morrell
Canada

New Subscription Rates (Effective June 1, 1974)

Normally we would not publish as many of the complimentary letters that we have received as we have published in this issue. We did it for one reason: to show our readers how much the ASTROGRAPH is needed and appreciated. Because the ASTROGRAPH is completely devoted to astrophotography, it can easily devote the space necessary to assure that photographs do not lose detail by being reduced.

If you read the inside cover carefully you noticed that we have raised our subscription rate for all future issues $1.00. We did this as we would like to keep on bringing our readers the quality and quantity that has been characteristic of the ASTROGRAPH beginning with the expanded version of Vol. 5 No. 1.

When we expanded the ASTROGRAPH, we did an analysis to determine the possible market potential for such a publication. We concluded that an optomistic number would be 5,500 subscribers in three years. At our current growth rate, we will have over 3,700 subscribers in three years. We still feel that our original estimate is valid, however, our analysis assumed that the rate of growth would be linear. As the ASTROGRAPH becomes better known, its growth will certainly accelerate; however, for now because we are still growing at a linear rate, we find it necessary to increase our subscription rate to $4.00 (U.S.) because the $3.00 rate was based on a linear growth rate to 5,500 subscribers and cannot support our growth rate at present. Because of the compliments we have received in publishing the ASTROGRAPH, we have decided to increase the subscription rate rather than reduce the quality, quantity or frequency of publication. We certainly did not want to reduce the quantity or frequency because we are receiving so many fine quality photographs as to have a backlog for several issues! We feel our readers will continue to support the ASTROGRAPH and invite their comments in this matter.

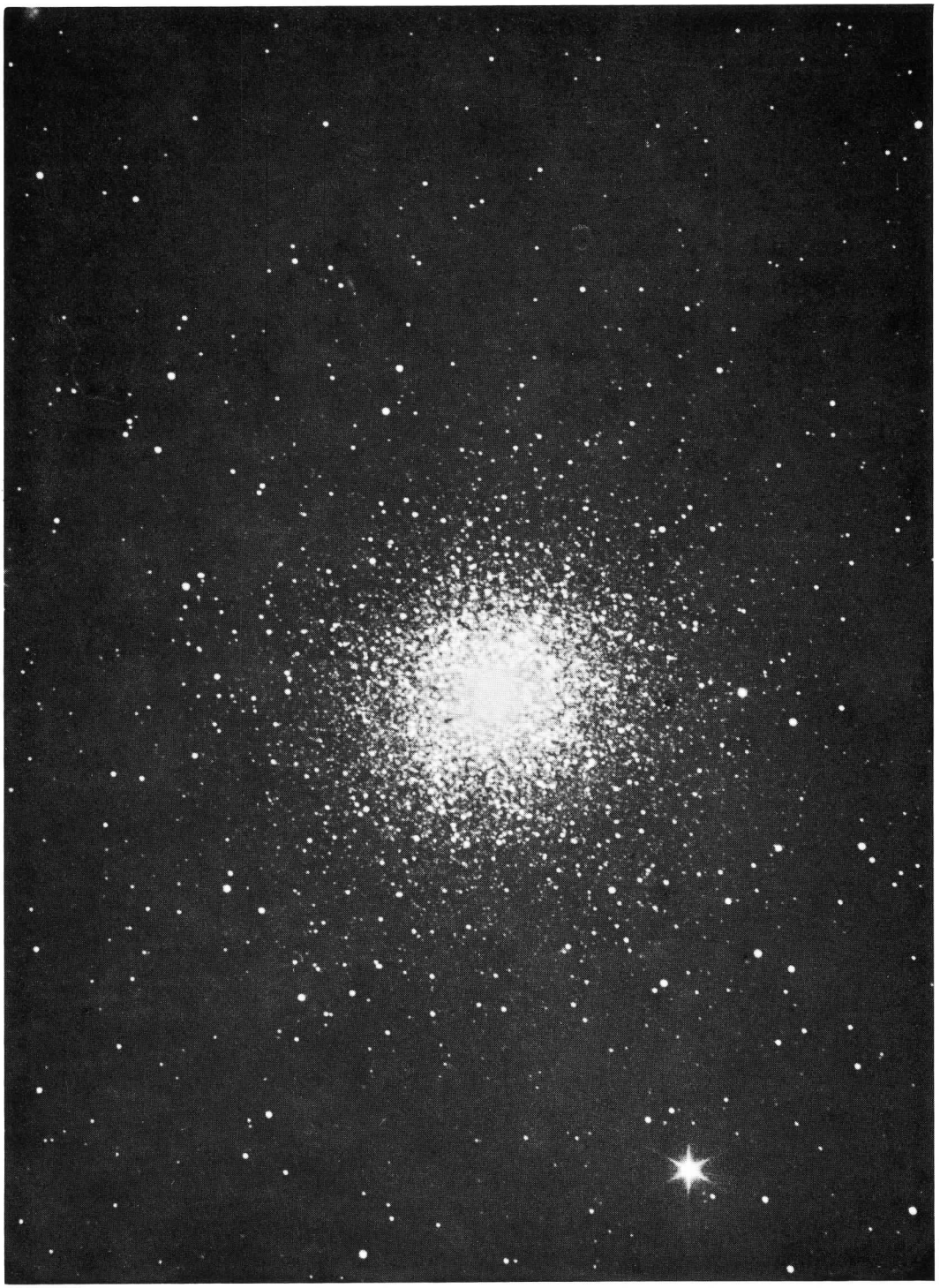
"My copy of Vol. 5 No. 4 arrived March 18th. Not much time to use the information in your fine journal for February and March. Hope you can improve on this."

A. H. Feibel
Cincinnati, Ohio

Continued on Page 78



ABOVE: The great nebula in Orion, M 42, photographed by Kurt Rihm. This 50 minute exposure on 103a0 film was printed without dodging.



ABOVE: The great Globular cluster, M13 in Hercules photographed by Kurt Rihm. Mr. Rihm used a 50 minute exposure on 103a0 film for this fine photograph which when enlarged was exposed more at the center to bring out the center stars.



ABOVE: The well-known spiral galaxy, M 51 in Canes Venatici photographed by Kurt Rihm of West Germany with his 10 inch reflector. This is a black and white reproduction of a color photograph made by the three color process.

ASTROPHOTOGRAPHY FOR APRIL AND MAY

MERCURY reaches superior conjunction on May 4. It is not in good photographic position until mid May as it approaches an excellent Greatest Eastern elongation of 24° on June 4 when it will have an apparent declination of +25°. Mercury reaches inferior conjunction on June 30.

VENUS reaches a Greatest Western elongation of 46° on April 4, when it will have an apparent declination of -11°, not a favorable one photographically. At the end of May its Gibbous phase will be +9° in declination. Venus reaches conjunction with Jupiter on April 15.

THE MOON reaches its highest declination on April 25, May 23, and June 19. It reaches perigee on April 2, April 27th, and May 24 and June 21. Lunar phases are as follows:

PHASE	DATE	DECLINATION	DIAMETER
Full	April 6 (21 hr.)	-11°	31' 42"
Last Quarter	April 14 (15 hr.)	-18°	29' 34"
New	April 22 (10 hr.)	+16°	31' 30"
First Quarter	April 29 (08 hr.)	+14°	32' 16"
Full	May 6 (09 hr.)	-19°	30' 48"
Last Quarter	May 14 (09 hr.)	-9°	29' 48"
New	May 21 (21 hr.)	+22°	32' 24"
First Quarter	May 28 (13 hr.)	+4°	32' 06"
Full	June 4 (22 hr.)	-23°	30' 04"
Last Quarter	June 13 (02 hr.)	+1°	30' 02"
New	June 20 (05 hr.)	+23°	33' 00"
First Quarter	June 26 (19 hr.)	-6°	31' 38"

As can be seen from the data, the first cresent Moon appears to be in excellent photographic position during April and May and it also is larger in diameter than usual.

MARS grows smaller and fainter (5.5 arc seconds and +1.5 magnitude at the beginning of April to 4.2 arc seconds and +1.9 magnitude at the end of May), as it moves from Taurus into Gemini.

JUPITER rises in the early morning in the constellation Aquarius. It grows from 31 arc seconds to 33 arc seconds in diameter, but is not favorably placed for photography, being -7° in declination at the end of May.

SATURN moves from Orion into Gemini in April. This +o.3 magnitude planet is placed high on the ecliptic, +23° in declination, in excellent photographic position. Its ball shrinks from 16.23 to 15.02 arc seconds in diameter. On April 20th Saturn is in conjunction with Mars.

URANUS reaches opposition on April 16 in Virgo at R. A. 13^h36^m Decl. -9° 23'. On the 16th, Uranus will be at magnitude 5.7. By the end of May Uranus will be located at R.A. 13^h30^m -8°48' and will be 4 arc seconds in diameter.

NEPTUNE reaches opposition on May 30th in Ophiuchus at R.A. $16^h\ 27^m$ Decl. -20° 04'. At this time it is of magnitude 7.7 and 2.5 arc seconds in diameter. On May 1st Neptune will be located at R. A. $16^h\ 30^m$ Decl. -20° 11'.

PLUTO is a 14th magnitude planet in Virgo. On May 1st it will be located at R.A. $12^h\ 43^m$ Decl. +13° 59'. On the 2nd of June, it will be located at $12^h\ 41^m$ Decl. +13°58'.

EVENTS

Saturn will be occulted on April 26th (15h) for an area N.E. of South America, the Mid-Atlantic and Central Africa areas.

Saturn will be occulted on May 24 (04h) for the areas of Australia, Asia, and South Pacific.

The Sun will be totally eclipsed on June 20 for an area of the Indian Ocean, Australia and Antarctica.

The Moon will be partially eclipsed on June 4 for areas of Australia, Asia, Africa, Europe, South America, and Antarctica.

MINOR PLANETS

Minor Planets	Magnitude	Position May 1, 1974	Position June 1, 1974
Ceres	8.5-8.0	22^h33^m -17°45'	23^h05^m-16°30'
Pallas	9.9-9.5	20^h10^m +14°57'	20^h13^m+18°41'
Juno	10.4-9.5	22^h03^m -3° 43'	22^h38^m-0° 30'
Vesta	5.9-6.2	12^h34^m +9° 14'	12^h31^m+7° 07'

COMET BRADFIELD (1974b) POSITIONS

DATE	R.A.	DECL.	MAG.
April 3	2^h29^m	+33°.7	5.1
April 8	2^h35^m	+45°.5	5.7
April 13	2^h40^m	+55°.3	6.3
April 18	2^h45^m	+63°.3	6.9
April 23	2^h50^m	+69°.9	7.5
April 28	2^h59^m	+75°.4	8.0
May 3	3^h12^m	+80°.1	8.5

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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 issue of 1973 and page 30 of the October-November 1973 issue) and on numerous occasions for deep sky photography (see page 4 and 10 of the 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 issue 1972 of SKY AND TELESCOPE. Cost of $28.50 per 100 foot roll includes air shipment.

Send checks to the Astrograph, Box 34, Woodbridge, Virginia 22125.

Photographing the Planets Uranus, Neptune and Pluto

Uranus reaches opposition on April 16 in Virgo, Neptune reaches opposition on May 30th in Ophiuchus, and Pluto is favorably located in Virgo.

All three planets are essentially stars when photographed with telescopes whose focal length is under 100 inches. Uranus is essentially a 6th magnitude star, Neptune is an 8th magnitude star and Pluto a 14th magnitude star.

Photographing the disk of Uranus is not an easy task. The disk is only 4 arc seconds in diameter and is some ten to twenty times dimmer than Saturn, the dimmest of the other planets. Visually its disk has a slightly greenish appearance. If one attempts to photograph Uranus' disk, I recommend that when working at F/80 and using 400 ASA film, one try an exposure range of 18-36 seconds. A drift of only one arc second can be tolerated if the disk is to be captured clearly.

Uranus is remarkable because the axis of rotation lies almost in the plane of its orbit. At times the poles of the planet will face the earth. All of Uranus' Moons are very faint.

Data for the Moons are as follows:

As can been seen in the table, several of Uranus' moons are within the photographic capabilities of the 10 and 12 inch telescopes. The trick to photographing the moons is to use a focal length sufficiently long enough so that the spread of the image of Uranus does not interfere with the image of the moon being photographed. With short focal ratios magnitifications of a few times may be necessary.

Neptune is just a little smaller than Uranus. Its disk has a greenish-blue color and is only 2.5 arc seconds in diameter, too faint and small for photography by small telescopes. It has two moons, Triton and Nereid. Triton is over 1,000 miles in diameter and is variable in magnitude. Its brightest at opposition is 13.6. Its period is $5^d21^h03^m$, short enough to show its revolution on photographs taken a day apart. Nereid, at magnitude 18.7 is beyond the photographic capability of amateur instruments.

Pluto is of course the farther and fainter of all the planets known at this time. Since the 15th magnitude center star of the Ring Nebula is within the capability of an 8 inch telescope, Pluto is probably within the capability of 6 inch telescopes when Pluto reaches opposition and is a 14th magnitude object.

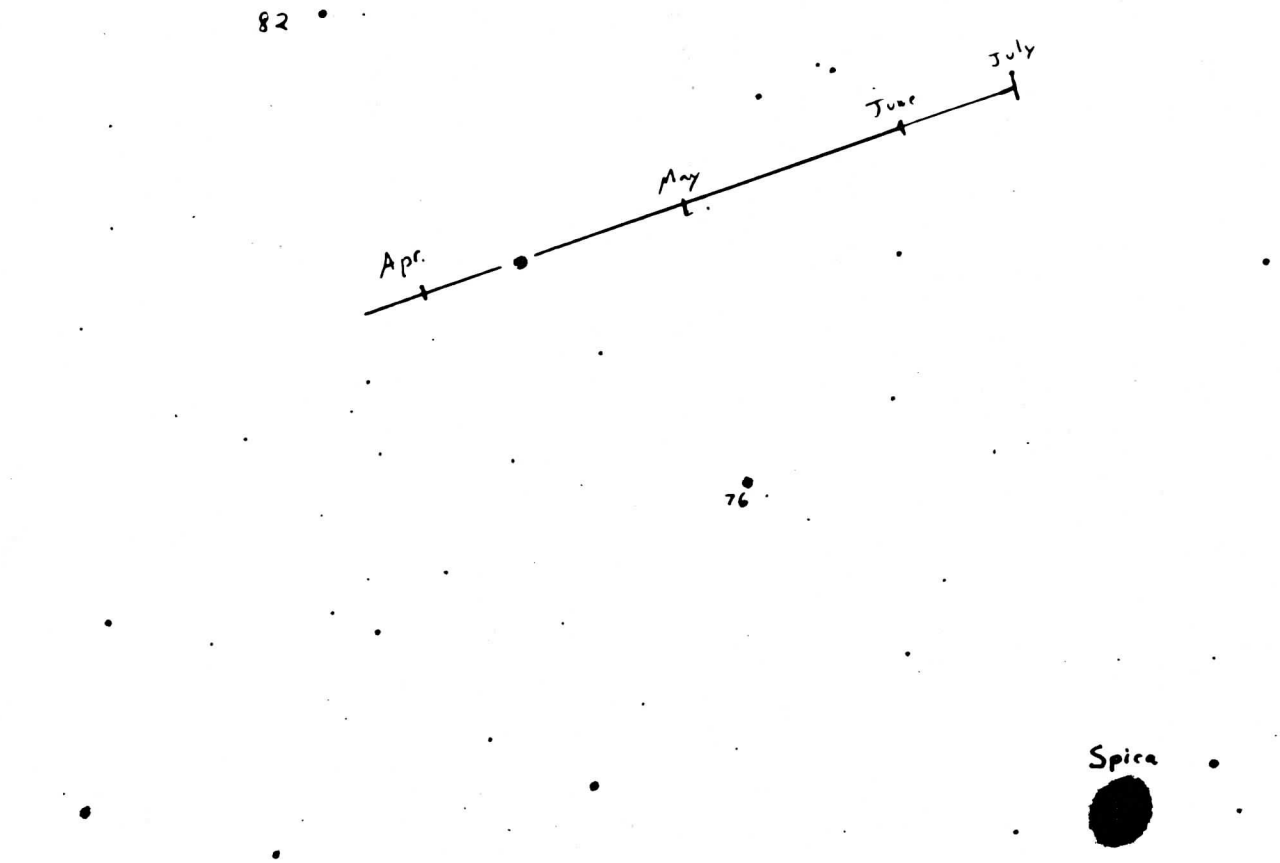
The most difficult feature of photographing Pluto is the fact that it is not easily identified in a star field. With large FOV refractors or Richfield telescopes this does not present a problem because the large field can easily compensate for any small errors that may result from the use of setting circles. With large reflectors, whose field is only one half degree or so, some problems may be encountered in trying to position the telescope so that Pluto is within the field. When using large reflectors I recommend several exposures, each being repositioned using the closest reference object whose coordinates are known. For Pluto I recommend either M60 ($12^h41.1^m$, $+11^o49'$) or NGC 4654 ($12^h41.4^m$, $+13^o23'$) which should be within the field (about $\frac{1}{2}^o$ south of Pluto) in June.

John Phillips

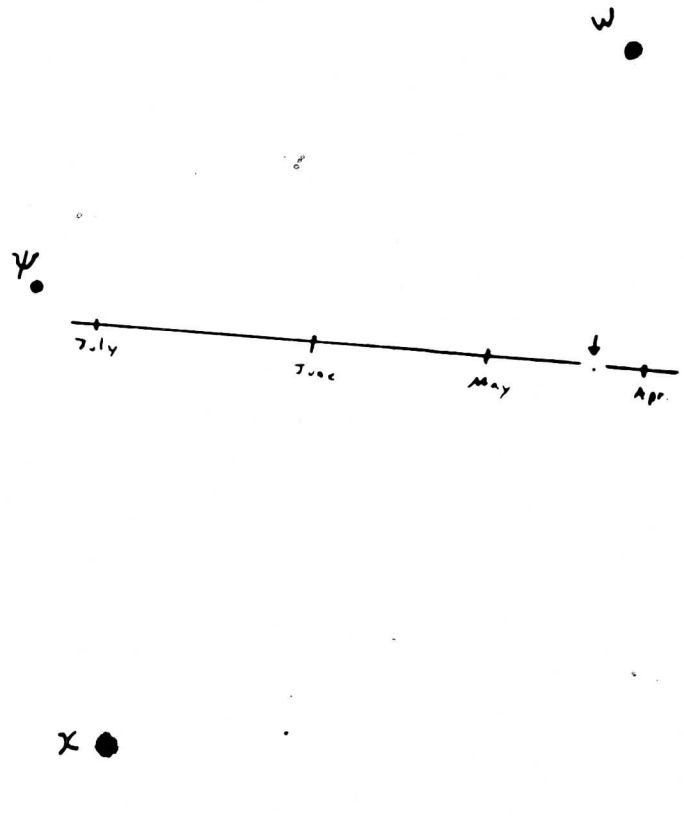
CORRECTIONS

On page 63 of the February-March issue, the name of the mountain is Mt. Pinos (not Pines). Also the exposure for the back cover photo was $2\frac{1}{2}$ seconds.

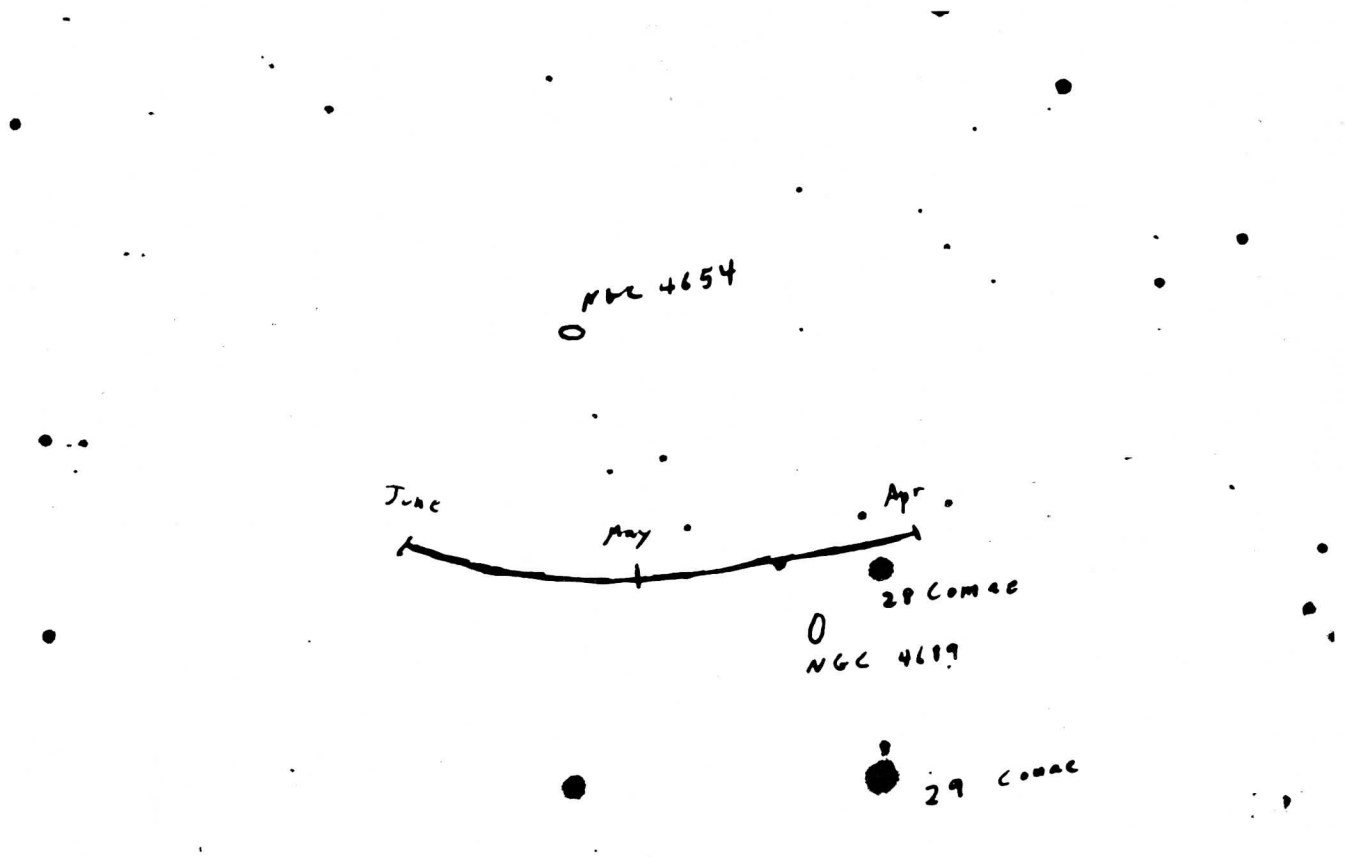
MOON	DISTANCE	ROTATION	VISUAL MAGNITUDE	APPROX. RADIUS	DISCOVERY
Ariel	120,000	$2^d12^h29^m$	14.4	250	Cassell 1851
Umbriel	160,000	$4^d03^h38^m$	15.3	175	Cassell 1851
Titania	272,000	$8^d16^h56^m$	14.0	300	Herschel 1787
Oberon	304,000	$13^d11^h07^m$	14.2	250	Herschel 1787
Miranda	81,000	$1^d09^h56^m$	16.5	93	Kuiper 1948



ABOVE: Path of Uranus



ABOVE: Path of Neptune



ABOVE: Path of Pluto

From the Editor: We have asked several of our subscribers to let us know when their issue arrives. It looks like Bulk Postal mailings take from two to three weeks to cover a few hundred miles. We will be mailing forthcoming issues a few weeks earlier to insure that our readers receive their copy of the ASTROGRAPH the first week of the first month of publication. In the meantime, we will be extending astrophotography for the months of publication into the third month.

"Dear Sir....I am very impressed with my first issue (Dec.-Jan. 1973) and will recommend it to all of my friends. The quality of paper and reproductions is good. I hope that I will be able to contribute a photograph or two soon."

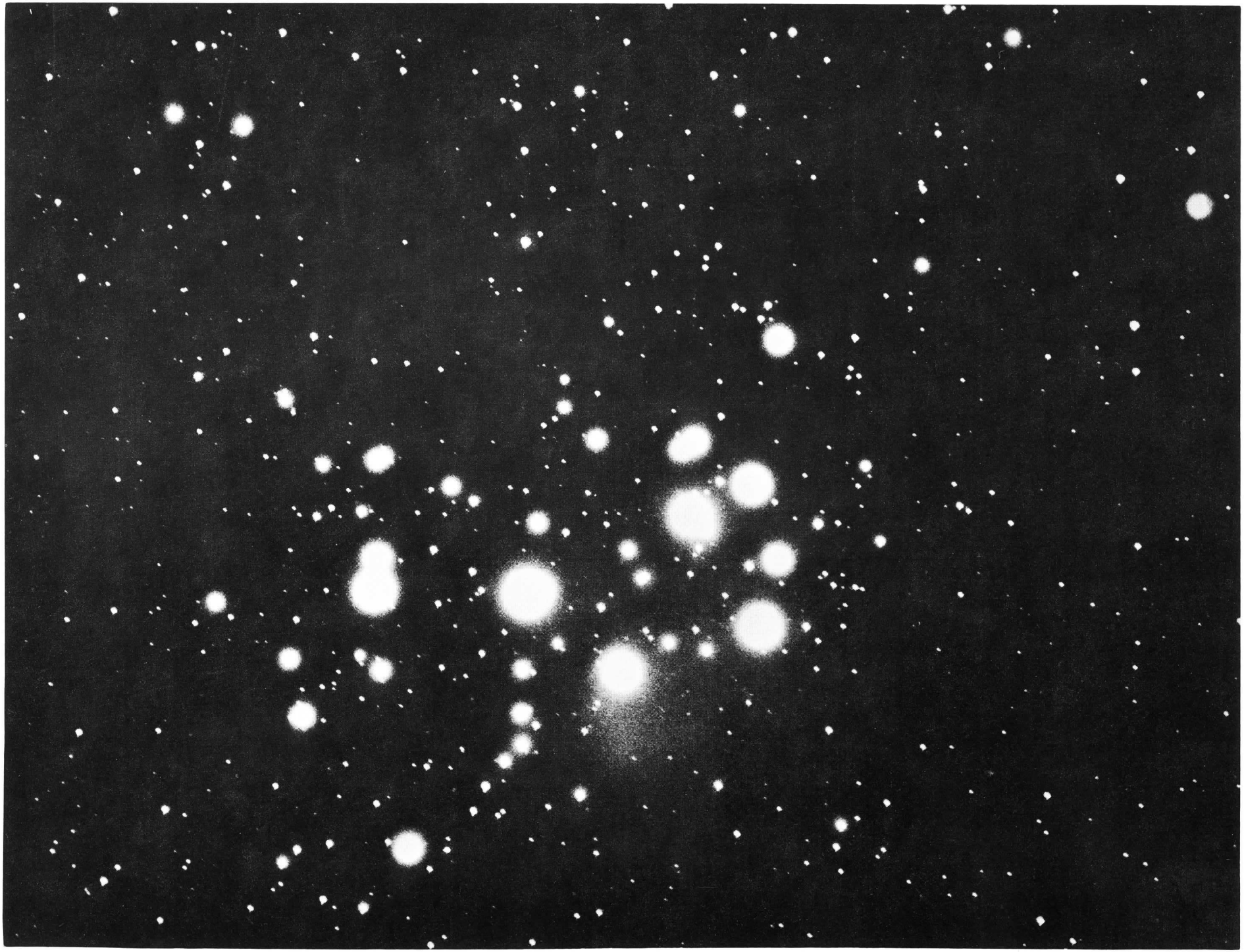
John Hanford
Reynoldsburg, Ohio

The ASTROGRAPH and its staff and Editor thank you all for your compliments on our publication. We think the upcoming issues will be even better than those of the past.

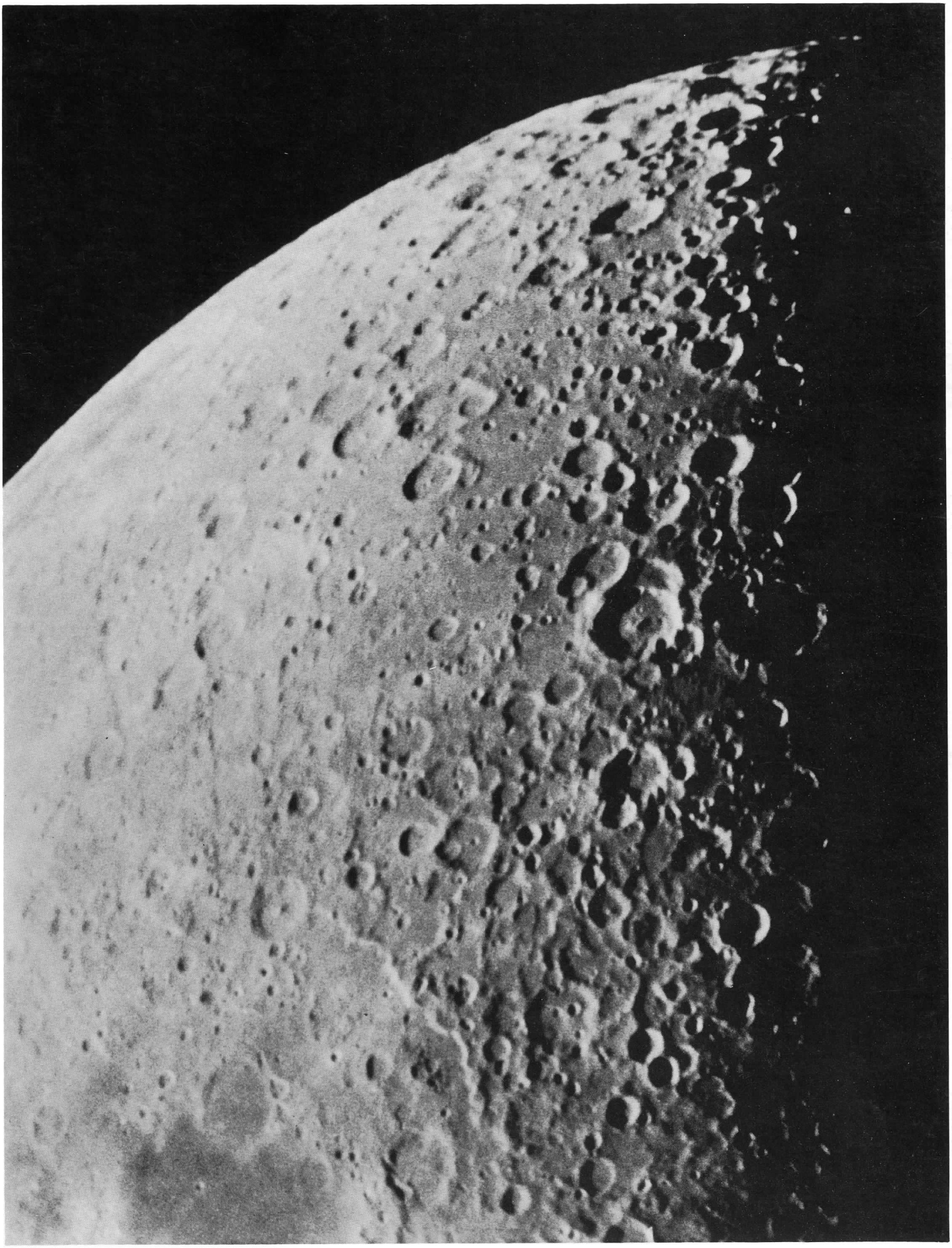
With this equipment, I was able to get pictures on 12 more nights until the end of January. With the dark skies at my 7750 ft. site, I was able to visually observe Kohoutek until Jan. 24.

But, because of pine trees and mountains, I was not able to obtain photographs with the 10 inch telescope until Jan. 15 For 7 nights thereafter, I photographed Kohoutek with the large telescope. Streamers and jet appeared on all negatives. On Jan. 26 (the last night a photo was taken with the 10"), the comet had a spherical head with one faint and very thin jet coming out."

After reviewing a number of photographs taken with instruments of various focal lengths, I have concluded that an important factor that enabled Mr. Fahnenstiel and myself to capture Kohoutek's streamers was that we were using large reflectors which gave generous image scales because of the long focal lengths (50 and 75 inches. Astrophotographers who used long focal length reflectors on Kohoutek are invited to comment on this conclusion and submit their results even if streamers were not photographed.



ABOVE: The Pleiades photographed by Charles L. Townsend on February 23, 1974. Mr. Townsend used a 500mm F.L. F/5.6 lens for this fifteen minute exposure on 103 F film developed in MMP-2 for nine minutes @ 68°F.



ABOVE: Southern portion of the First Quarter Moon photographed on April 23, 1969 by Mike Otis using a $4\frac{1}{4}$ inch F/11 reflector. This three times negative projection was made on Tri-X film and developed in DK-50.