the ASTROGRAPH



VOLUME 5 NO. 4 FEBRUARY MARCH 1974

THE ASTROGRAPH

Editors Note: The statement concerning postage on page 34 of the last issue is incorrect. The ASTROGRAPH is mailed via a bulk postal permit Our apologies for the lateness of the last issue as we were trying to determine the most economical means of mailing, and investigating a 2nd class permit.



COVER PHOTOGRAPH

Comet Kohoutek

Photographer	Robert C. Price
Date	January 13, 1974
Telescope	12.5 inch F/6 reflector
Exposure	4 minutes
F No.	Prime Focus F/6
Film	103a 0
Developing Time	4 minutes
Developer	D-19
Temperature	68°F
Enlarging Paper	Agfa Brovira #5

Volume V No. IV

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FEATURES

Photographs of Kohoutek 51

Expedition to Columbia - Annular Eclipse 53

Planetary Photographs 55

DEPARTMENTS

Astrophotography for February and March 58

Leo 58

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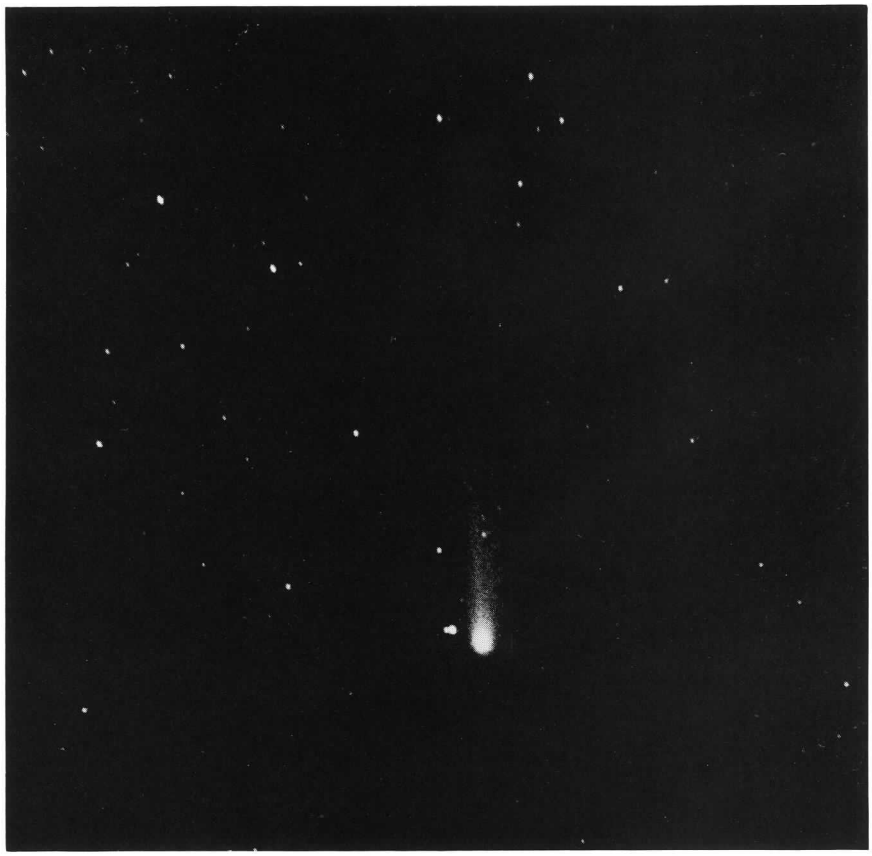
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PHOTOGRAPHS OF COMET KOHOUTEK

On the 12th, 13th, and 15th of January, I was able to obtain photographs of Kohoutek using both a 12.5 inch F/6 reflector and 135mm F/3.5 telephoto lens. The Comet appeared to have its brightest tail on the 13th when I obtained the photograph on the cover. By the 15th, the Comet had really dimmed. No streamers were photographed coming from its tail. On each of these three days, the Comet was just visible to the unaided eye as a faint glow in the sky. A tail of several degrees was easily visible in a 20 power finder.

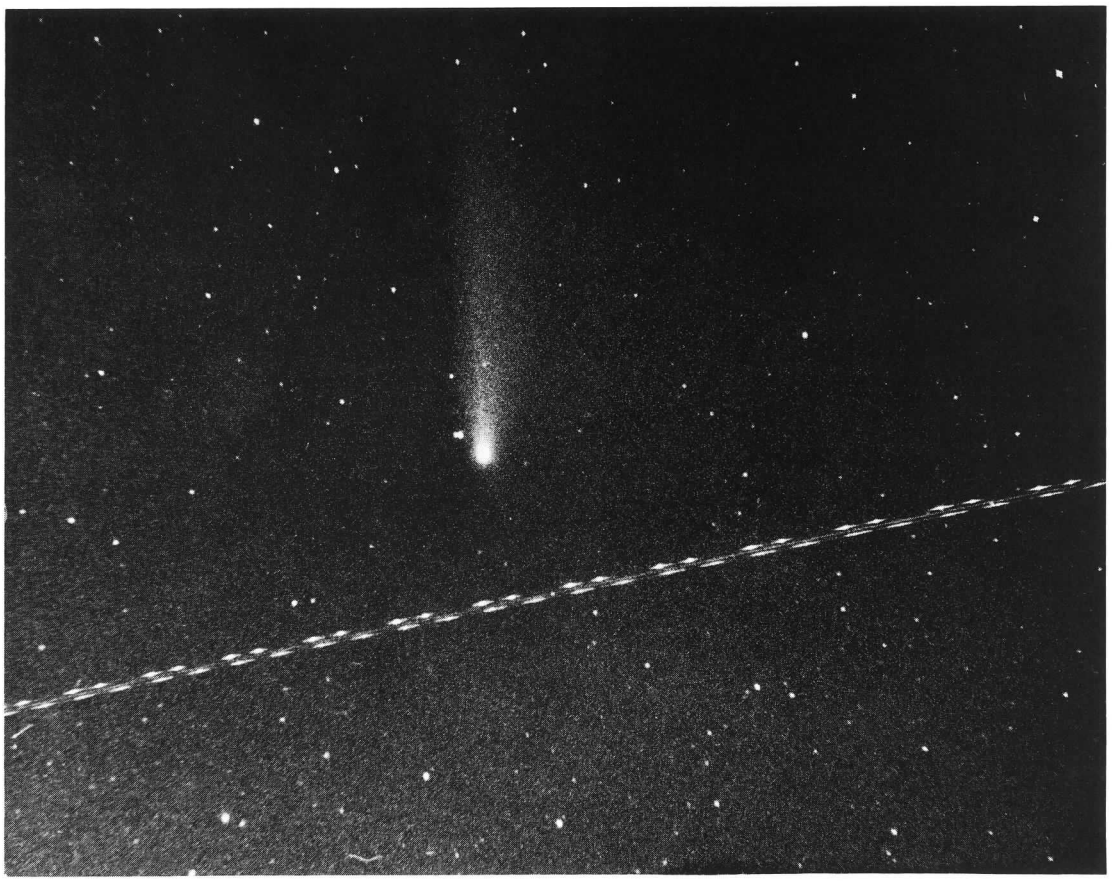
Besides using black and white film, I also tried my favorite color film for deep sky work, Ansco 500. Although a part of Kohoutek's tail was captured with both the 12.5 inch and 135mm telephoto, there was no real color or detail to be had.

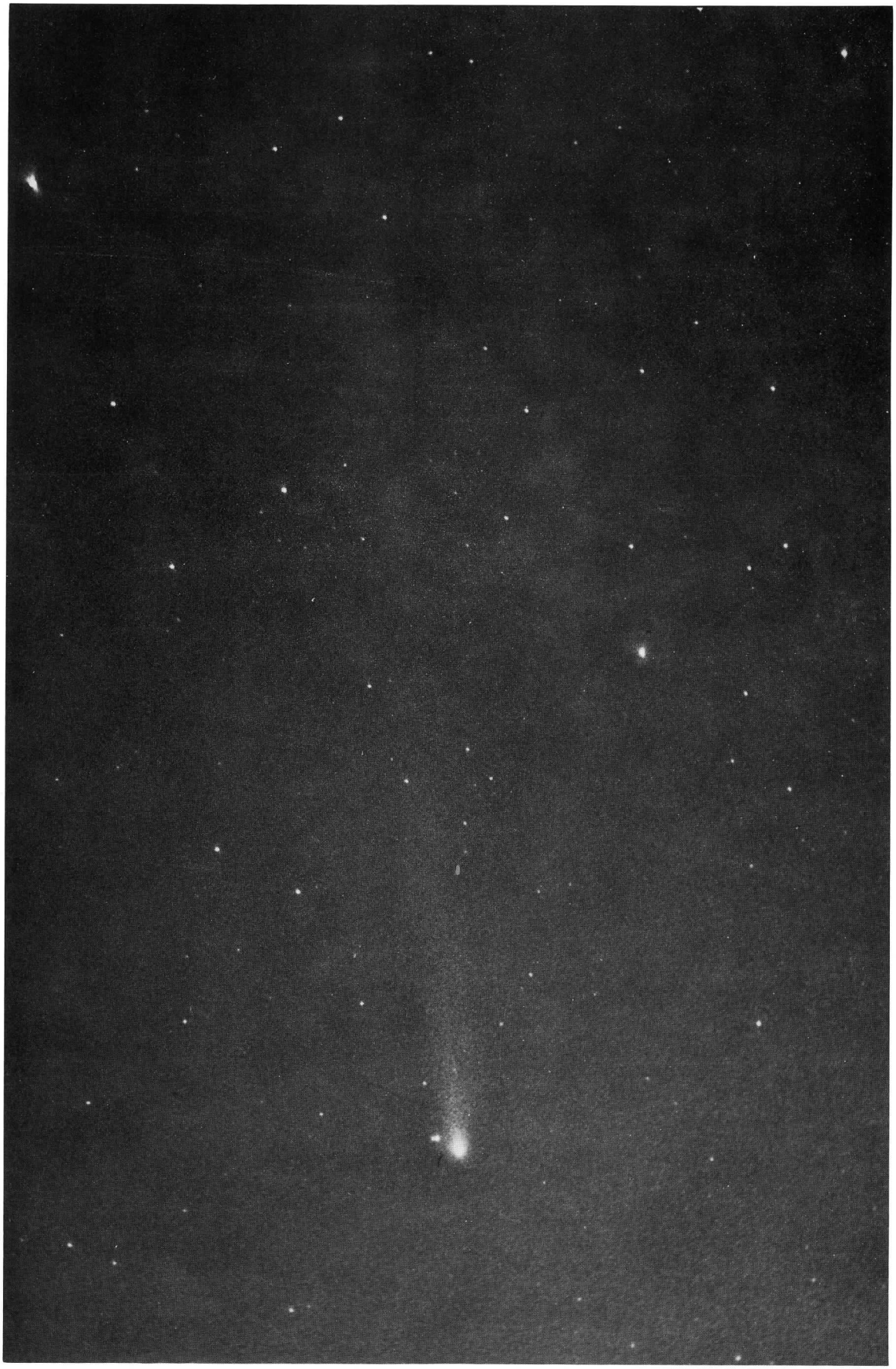
Robert C. Price



RIGHT: Comet Kohoutek photographed by R.L. Hull on January 12, 1974, using a 300mm F/5 telephoto lens guided with a 7 inch F/15 refractor. Film was Tri-X (ASA 1400) developed in D-11 for 7 minutes.

BOTTOM: Another photograph of Kohoutek and an unwanted airplane which passed through the field (notice the trail caused by the blinking lights of the plane). Data same as Mr. Hull's other photograph.





ABOVE: Comet Kohoutek photographed by John Phillips on January 12, 1974, using a 12 inch Focal length AERO-EKTAR Lens. Exposure was 5 minutes on Tri-X 4x5 sheet film developed 6 minutes in D-19 at 68°F.

ANNULAR ECLIPSE IN COLUMBIA

Six Florida Amateur astronomers traveled to Columbia to observe Comet Kohoutek and the December 24, 1973, annular eclipse of the Sun. Patricia Rogers, Karl Simmons, Richard Sweetsir, and Chuck Vaughn from Jacksonville, Norman McLeod from Punta Gorda, and Kathryn McJunkin-Brown from Ft. Lauderdale participated.

The expedition went first to Bogota. Here the population had been informed of the Comet and eclipse by the newspapers and Bogota Planetarium for weeks. The planetarium had shown a special Kohoutek program to sell-out crowds. The National Observatory and Bogota Planetarium organized an eclipse observing session from nearby Monserrate Park, reached by cable car. It was well attended and lectures were given by local astronomers and Klaus Mahler, one of Mr. Kohoutek's colleagues at Hamburg Observatory. Besides Mahler and the Florida group, a Boston tour group was also in Bogota for the eclipse.

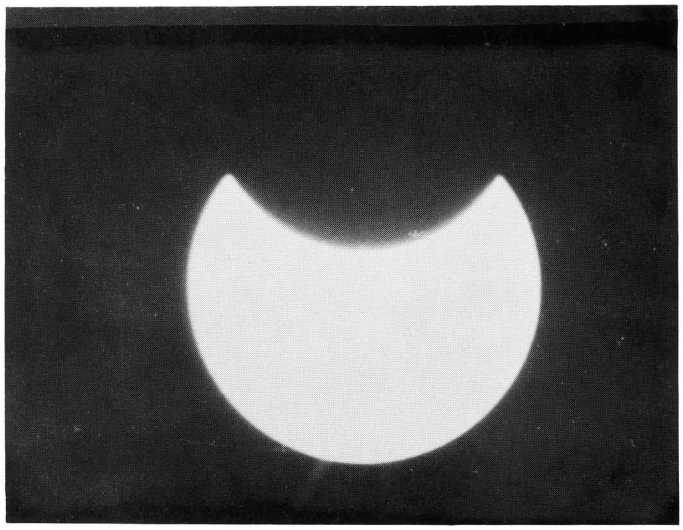
To observe the eclipse, the Florida expedition travelled to the mountains east of Bogota by taxi. Taxis were cheap; two dollars an hour. Cumulus clouds from the Amazon basin build up in the morning hours and it was hoped that a high altitude observing site would keep the cloud problem to a minimum. A 11,000' cloud-free observing site was found at Cruz Verde, eight miles east of Bogota. It was cold. The temperature was in the fifties with a thirty mile per hour wind blowing.

The partial phases of the eclipse were photographed with an Indian family looking on. It became noticeably cooler as the eclipse progressed. During the nine minutes and forty-eight seconds of annular phase, Comet Kohoutek was searched for unsuccessfully with 7 x 50 binoculars and naked eye.

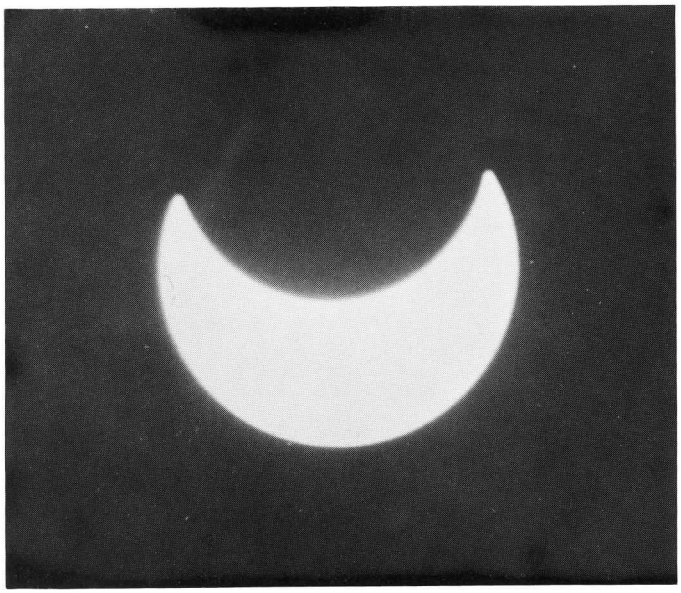
The $4\frac{1}{4}$ inch RFT was set on the Comet's predicted position using setting circles, but no Comet was seen. The landscape was lit by a yellow hue during the annular phase, and shadows became less defined. Clouds interferred increasingly during the second half of the eclipse and by fourth contact the sky had become overcast. No one in the Bogota area was able to see Comet Kohoutek during the eclipse.

After the eclipse P. Rogers, K Simmons, R. Sweetsir, and C. Vaughn spent the 26th through 30th in Leticia, Columbia on the Amazon River. With the Southerly latitude of -5° the Comet should have been easily visible. It was searched for unsuccessfully in the daytime during perihelion on the 28th of December. On the 29th, while everyone else was ill and confined to bed, Richard Sweetsir saw nothing brighter than second magnitude down to the western horizon. No Comet Kohoutek or tail was seen from Leticia. While in Leticia, everyone had their first glimpse of the Magelleanic Clouds. Skies were extremely dark. The nearest population center was eight hundred miles away. An interesting highlight of one observing session were the chairs and table an engineer supplied us with when he discovered us in the dark antenna field next to the Leticia radio communications station.

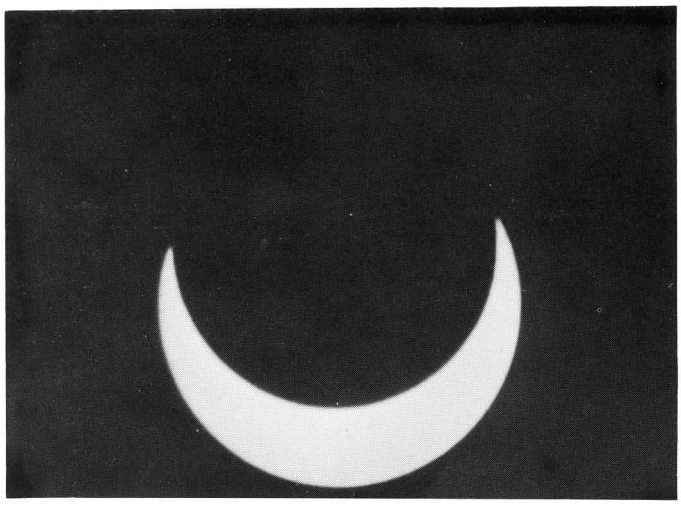
Karl Simmons



ABOVE: Annular Eclipse photographed by K. Simmons on December 24, 1973, 1243 U.T. in Bogota, Columbia. Exposure was 1/1000 second on Panatomic-X, using a $4\frac{1}{4}$ inch F/5 RFL and Nikon FTN.



ABOVE: Annular Eclipse at 1304 U.T., data same as above photograph.

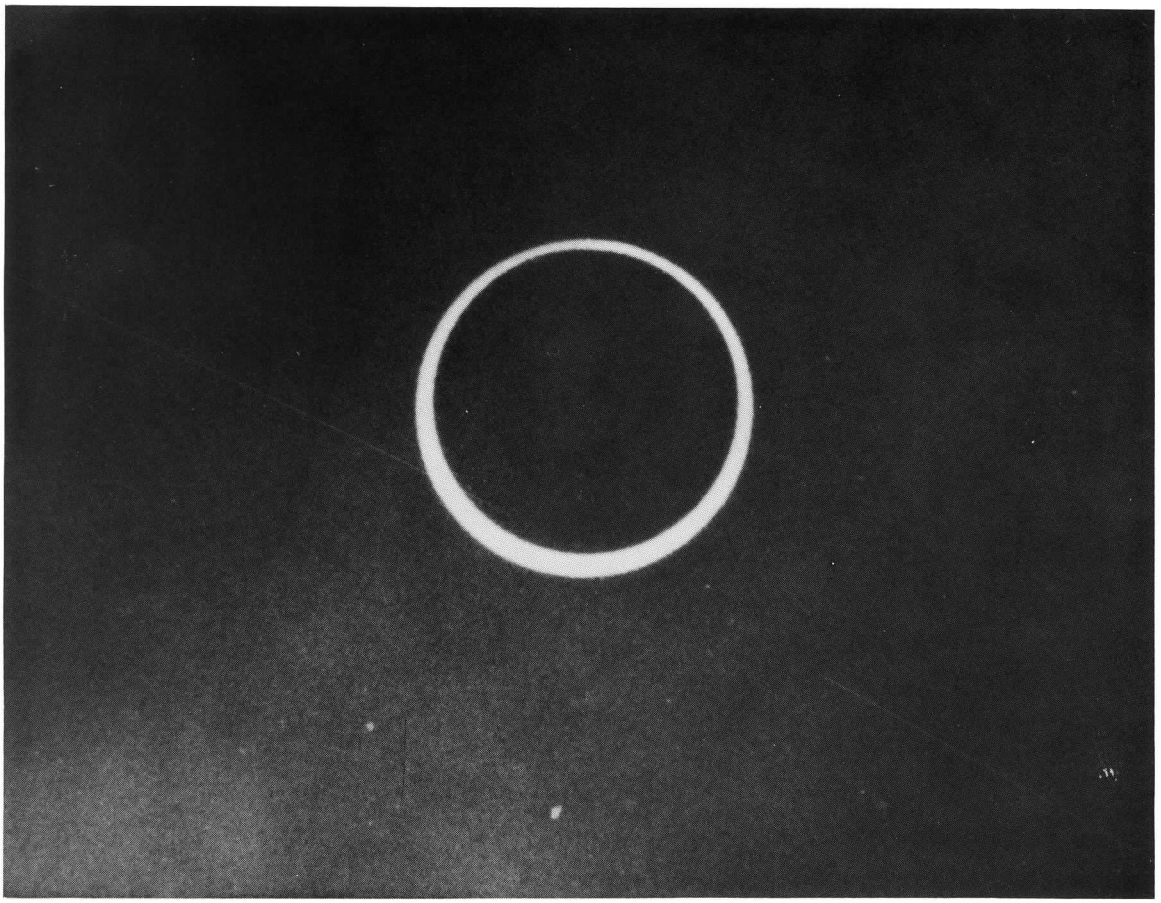


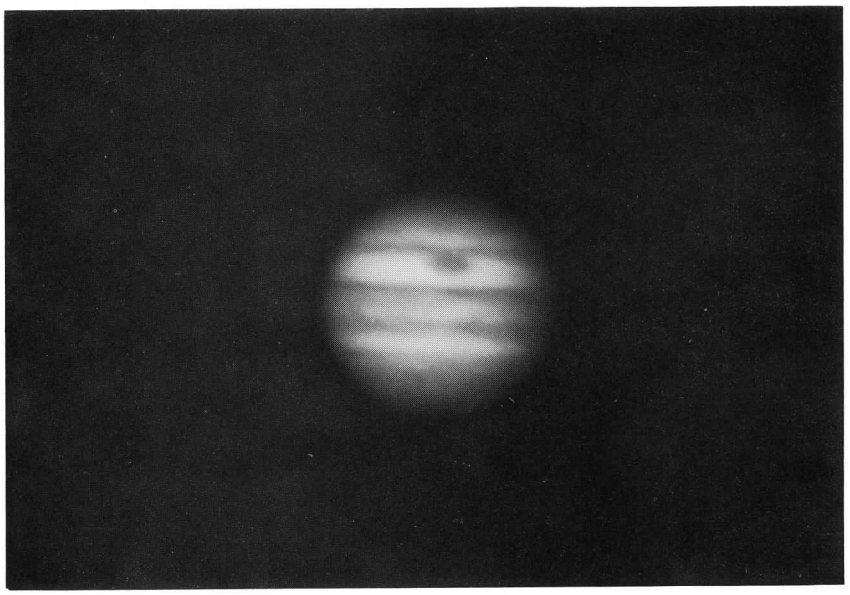
ABOVE: Annular Eclipse at 1321 U.T., data same as above photograph.



RIGHT: Annular Eclipse on December 24, 1973. Photographed by K. Simmons at 1331 U.T. Exposure was 1/1000 second using a $4\frac{1}{4}$ inch F/5 RFL on Panatomic-X film.

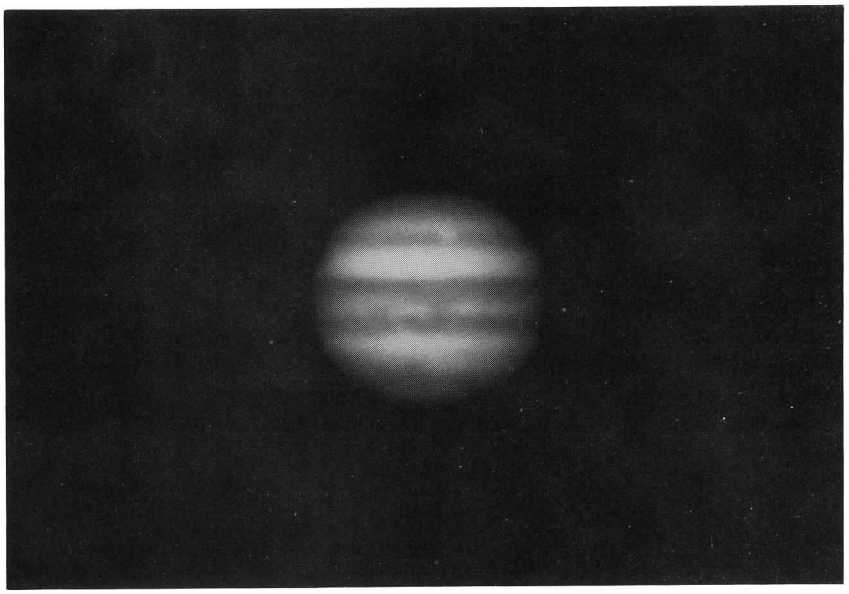
BELOW: Annular Eclipse on December 24, 1973, photographed by K. Simmons at 1336 U.T. using a 1/250 second exposure on Panatomic-X film. Camera was Nikon FTN and 135mm lens at F/4.





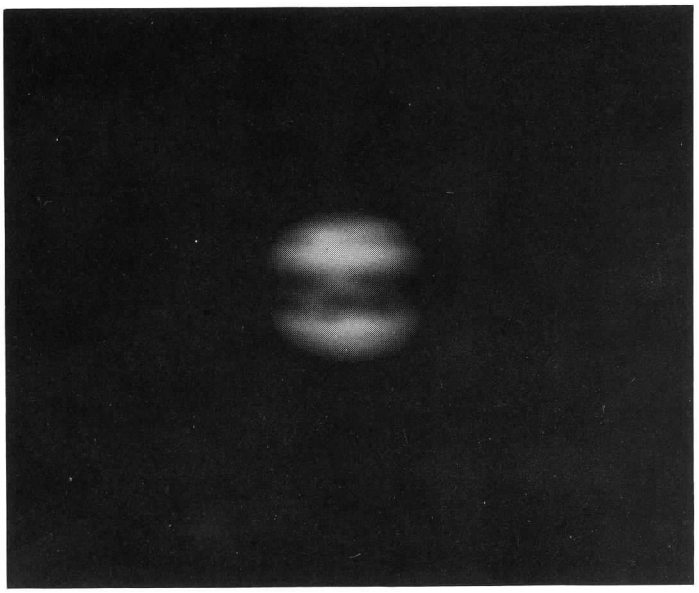
RIGHT: Jupiter and its Red Spot on Sept. 19, 1973. Jim Rouse's 8 inch F/7 reflector was used for this 6 second exposure with a 7mm projecting ocular to yield an effective focal ratio of 80. Film was H.C. Copy film developed in H&W Control Developer (15 ml. in 8.5 oz. for 10 minutes at 80°F), printed on #2 paper using two negatives sandwiched together.

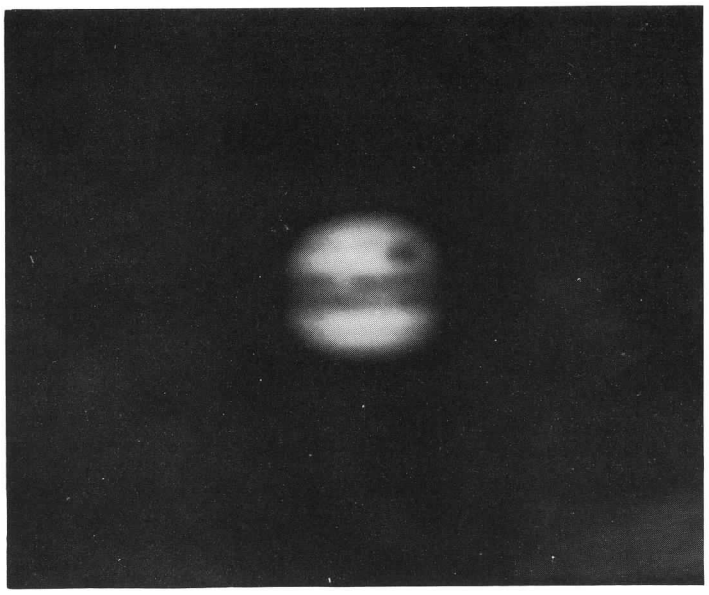
RIGHT: Jupiter on September 15, 1973. Data same as above except exposure was 5 seconds and one negative printed on #1 paper.

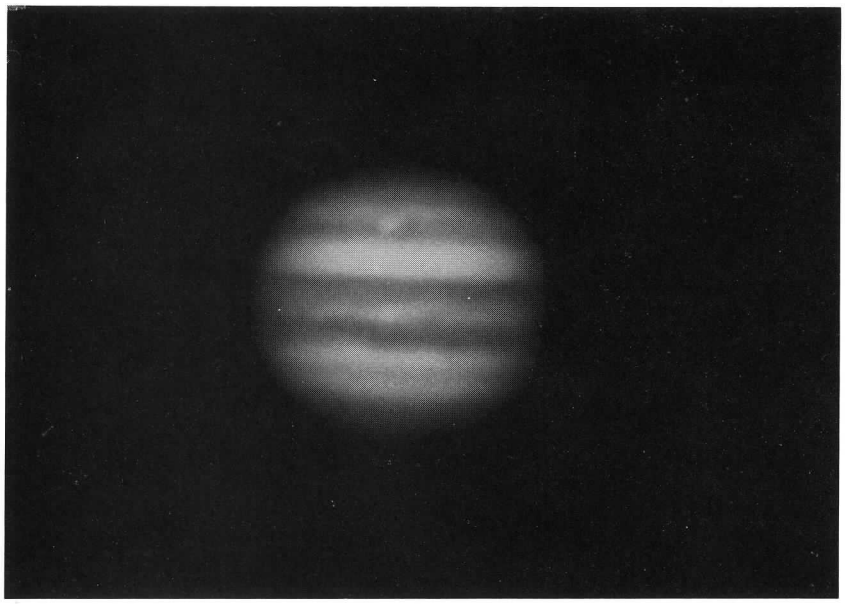


BELOW: Jupiter in the Summer of 1972. Jim Rouse used an 6 inch F/6.3 reflector at F/70. Exposure was 5 seconds in H.C. Copy film developed in FG-7 diluted 1:15 for 10 minutes at 75°F. Printed on Luminos #1 Paper.

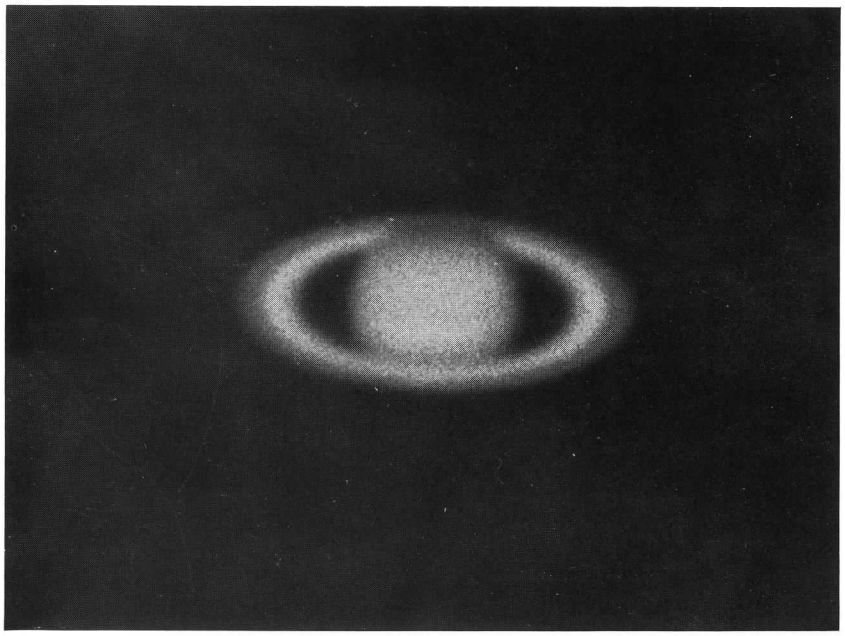
BELOW RIGHT: Jupiter in Summer of 1972, data same as photograph below.



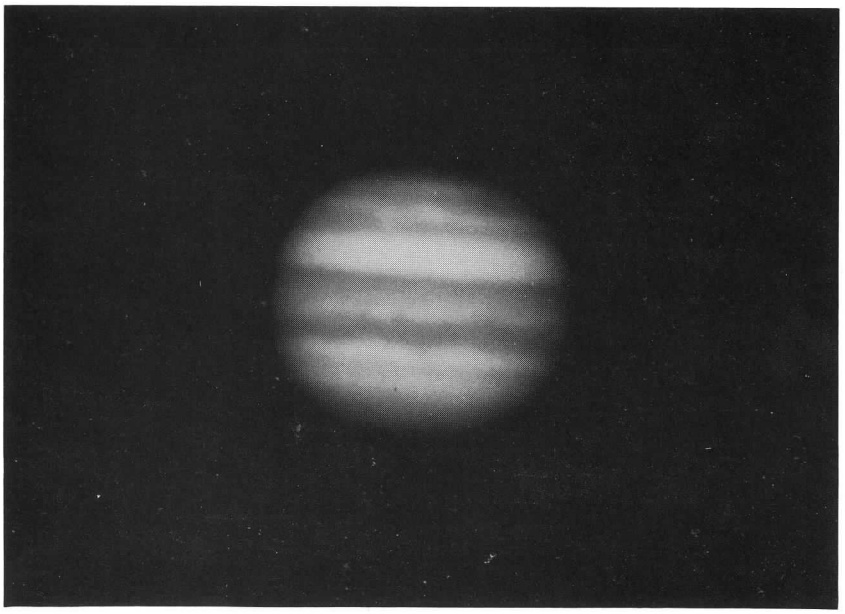




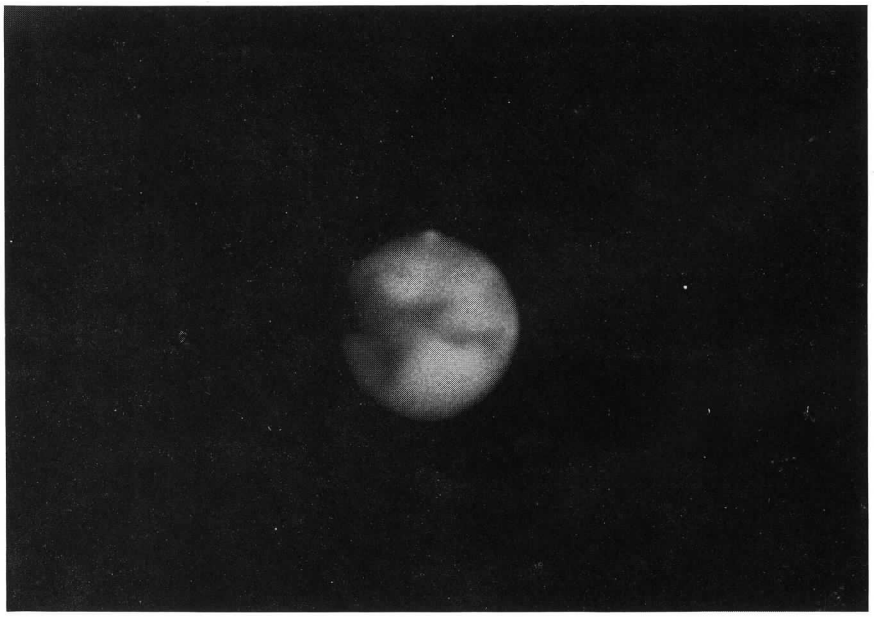
LEFT: Jupiter on August 3, 1973. Jim Rouse used his 8 inch F/7 reflector and 7mm ocular to yield F/80. Exposure was 5 secs. on High Contrast (H.C.) copy film developed in H&W Control Developer (15ml. in 8.5 oz.) for 10 minutes at 80°F. Printed on #1 paper. Seeing rated at 7/10.



LEFT: Saturn on January 3, 1973. Photographed using a 6 inch F/6.3 reflector using a 7mm ocular to yield F/135. Exposure was 4 seconds on Plus-X developed in FG-7 (1:15) for 10 minutes at 75°F. Printed on #4 paper, seeing 7/10. A Nikon F was used.



LEFT: Jupiter on August 16, 1973. Data same as top most photograph except printed on #2 paper.



RIGHT: Mars photographed on October 15, 1973. Jim Rouse used an 8 inch F/7 reflector and 7mm ocular to yield F/105. Exposure was 5 seconds on High Contrast Copy film developed in H&W Control Developer (15ml. in 8.5 oz.) for 10 minutes at 80°F. Printed on #4 paper.



RIGHT: Saturn photographed November 22, 1973. Jim Rouse used an 8 inch F/7 reflector and 7mm projecting ocular at F/80. Film was S.O. 410 developed in D-19 4 minutes at 73°F. Seeing was rated 8/10. Printed on #3 paper.



RIGHT: Mars photographed on October 10, 1973 at 0015 EDT. Data same as top most photograph.

ASTROPHOTOGRAPHY FOR FEBRUARY AND MARCH

MERCURY - Mercury reaches Greatest Eastern elongation on February 9th, Inferion conjunction on February 24th, and Grestest Western elongation on March 23rd. Greatest Eastern elongation is 18°, and Greatest Western elongation is 28°. Neither is very favorable being -8° in declination on February 9th and -11° on March 23rd.

VENUS - Venus reached Inferion conjunction on January 23rd and reaches Greatest Western elongation of 46° on April 4th. This elongation is not very favorable because Venus will appear at declination -11° on April 4th.

MOON - The moon reaches its highest declination on February 3rd, March 2nd, and March 29th. It reaches Perigee on February 6th and March 6th. Lunar phases are as follows:

Phase	Date	Declination	Diameter
Full	Feb. 6^d 23^h	$+11^\circ$ 50^m	33' 15"
Last Quarter	Feb. 14^d 0^h	-21° 37^m	30' 13"
New Moon	Feb. 22^d 05^h	-6° 07^m	29' 50"
First Quarter	Mar. 1^d 18^h	$+23^\circ$ 19^m	32' 03"
Full Moon	Mar. 8^d 10^h	$+2^\circ$ 24^m	32' 35"
Last Quarter	Mar. 15^d 19^h	-23° 16^m	29' 44"
New Moon	Mar. 23^d 21^h	$+5^\circ$ 35^m	30' 38"
First Quarter	Mar. 31^d 01^h	$+21^\circ$ 41^m	32' 14"

As can be seen from the data the February and March First Quarter Moon will be in excellent photographic position being high on the ecliptic and larger than usual in diameter.

MARS - Mars is high on the ecliptic (+18° declination on February 1st and +22° on March 1st) during February and March and growing smaller in diameter (from 8 arc seconds on February 1st to 6.6 arc seconds on March 1st to 5.5 arc seconds on April 1st). Its magnitude declines from +0.5° at the beginning of February to +1.4° at the end of March.

JUPITER - Jupiter does not reach opposition until September 5th. It is currently at Magnitude -1.5° and 10° East of the Sun on February 1st, 11° West of the Sun on March 1st and 35° West of the Sun on April 1st.

SATURN - Saturn at magnitude 0.0 is favorably placed for photography high on the ecliptic at $+22\frac{1}{2}^\circ$ in declination throughout February and March. Its ball decreases in size from 18 to 16 arc seconds from February 1st to the end of March.

URANUS - Uranus reaches opposition on April 16, and is located in Virgo at R.A. 13^h 43^m Decl. -10° 0^m on March 1st, and R.A. 13^h 39^m Decl. -9° 37' on April 1st. This 6th magnitude planet is 4 arc seconds in diameter.

NEPTUNE - Neptune is an 8th magnitude planet in Ophiuchus. It is 2.4 arc seconds in diameter and located at R.A. 16^h 33^m Decl. -20° 19^m on March 1st and R.A. 16^h 32^m Decl. -20° 17^m on April 1st.

PLUTO - Pluto is a 14th magnitude planet in Virgo. It is one which will reach opposition March 26th. It is located at R.A. 12^h 49^m Decl $+13^\circ$ 23^m on March 2nd and R.A. 12° 46^m Decl. $+13^\circ$ 47^m on April 3rd.

EVENTS

Mars Occultation is during the early evening (East Coast) and late afternoon (west Coast) of February 28th. Mars will be occulted by the almost first quarter moon. This occultation will be visable North of a line extending from Southern California to North Carolina.

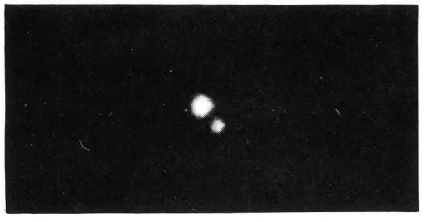
Saturn Occulation will occur on February 3rd for North Europe and North Asia, and on March 2nd for Northern North America. The Southern limit of the March 2nd occulation extends from a line of California to Nova Scotia. This occultation will occur in daylight except for Eastern Canada and Maine.

MINOR PLANETS

Vesta reaches opposition on March 31st. Position data is as follows:

Position	Declination	Date	Magnitude
13^h 13^m	$+2^\circ$ 02^m	Feb. 1	7.2
13^h 18^m	$+2^\circ$ 41^m	Feb. 15	7.0
13^h 18^m	$+3^\circ$ 55^m	Mar. 1	6.8
13^h 12^m	$+5^\circ$ 33^m	Mar. 15	6.6
12^h 59^m	$+7^\circ$ 29^m	Mar. 31	6.5

Ralph Proctor



LEFT: Double star Gamma Leonis by John Sanford

LEO

Leo, the harbinger of Spring, offers several deep sky objects of interest to the astrophotographer and visual observer. There are a number of double stars, the galaxies of Leo are its most notable possessions. Five were mentioned in Messier's and Mechain's lists, M65, M66, M95, M96, and M105, but there are others which are of equal interest to the observer. The principal star, Regulus, is of interest as it lies almost on the ecliptic. This means that it is often involved in occultations and conjunctions or appulses with planets. Pictures have been taken of Jupiter and Regulus and printed negatives have been made in register so that the movement of the planet produced three images of it and one of the stars.

Only a wide angle lens will cover the entire constellation if a whole view of Leo is desired and even a 35mm focal length leaves out a little at the top or bottom (see positive print). As space is penetrated beyond the naked eye stars, longer focal lengths become important, particularly if the format is 35mm film. Its resolution limitations

Continued on page 60



ABOVE: The Moon photographed by Gordon Moeller.

are critical since the whole frame must be enlarged at least 8 diameters just to get to approximately the 7 x 10 inches of a full frame print. The galaxies of Leo are relatively small, being about 5 to 10 minutes long in size photographically (except NGC 2903, which is 15' long).

It appears that about a 200mm focal length is the least which would begin to show structure in the brighter galaxies. The Schmidt picture is with the 225mm focal length Celestron Schmidt, and enlarged considerably over full frame. A 300 to 500mm focal length would be ideal in examining the groupings of galaxies in the center of Leo and those of the M 65-66 group. For individual objects, the longer the focal length the better, as far as amateur work is concerned, Kreimer being notably successful with his 12½" F/7 and the cooled emulsion camera. This kind of work demands the most critical alignment, steadiness, and guiding, and probably is more aggravating than worthwhile with a portable set-up. Since these are extended surfaces, the speed of recording galaxies on film will depend on the F/ratio of the optics as well as the film speed, so a fast F number will get the objects faster but of course, will be of less focal length than a slower, longer camera of the same aperture. Longer periods of guiding with the slower telescope/camera will result in superior photographs, providing one is prepared to pay the price.

Objects pictured from Leo: Examination and Explanation of how they are made

Gamma Leonis is a famous double star which is easily resolved in any telescope, providing enough magnification is used. The separation is listed as 4.4 seconds at 1973.0 and it is slowly widening since measurement by Wilhelm Struve in 1831 at 2.5". The magnitudes are 2.1 and 3.4 and the position angle 122°. The picture was taken during fairly good seeing with eyepiece projection into a tripod mounted camera with a 16.3 Galoc eyepiece, exposure 2 seconds with an 8 inch F/10 Schmidt-Cassegrain on Tri-X Pan developed 10 minutes at 70°F in Microdol-X. The camera was mounted off the telescope in order to avoid vibration from mirror-shutter operation. The technique only works if the camera is carefully aligned so that the image projected from the eyepiece is moving via telescope drive, either directly toward the film or in this case, directly away. A diagonal was used with the Cassegrain to obtain this motion. Observation on the ground glass should show no movement of the image across the film plane; all that happens is that it very slowly goes out of focus. The advantages are several: no counterweighting is needed, as many pictures as desired may be taken in quick succession with no possibility of vibration, etc. This picture was the best of about 12 frames exposed within approximately one minute .

The galaxies M65, M66, and NGC 3628 are perhaps the most widely observed of the Leo systems. The ten minute exposure with the Celestron 5.5" F/1.65 Schmidt camera was made at the site used by the Orange County Amateur Astronomers Association near Elsinore, California on March 11-12, 1972. The film was Kodak 103a-F (35mm) and development in D-76. There is another galaxy in the picture, NGC 3593, which is found about one low power field west of the middle star of the three bright stars to the right of M65-66. In an 8 inch (20cm) it is a small dim (11.7_v) glow. NGC 3628 is an interesting object, just north of M66. The galaxy is fairly faint (10.9_v) but large. The south edge appears to have a sharper edge than the north, and apparently this is due to a dark dust lane near the south side. I suspect detection of the arms of M66 visually with the 8" and averted vision, but this may be the influence of photographs on my perception. M65 is another Sb spiral but with much fainter arms.

Other telescopic objects in Leo which the amateur may attempt to photograph are given below:

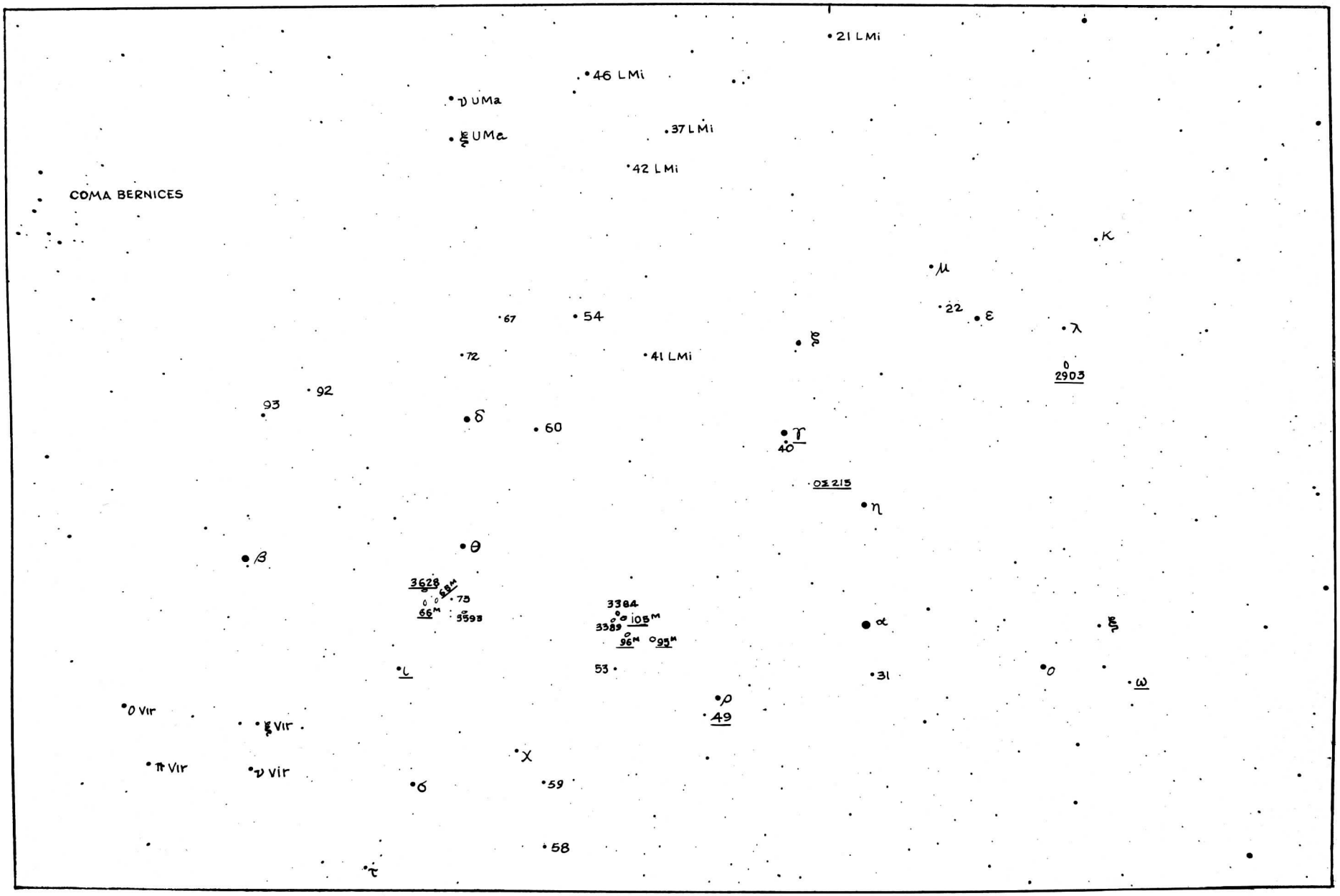
GALAXIES IN LEO

NGC		R.A.	DEC.	SIZE	MAG.$_v$	TYPE	REMARKS
2903		9h29.3	+21°44'	4.6'x 11'	9.1	Sb	Fine large long
3351	M95	10 41.3	+11 58	6.1 x 3.9	10.4	SBb	Nuc in round glow
3368	M96	10 44.2	+12 05	5.0 x 4.0	9.1	Sbp	Lane in pix.
3379	M105	10 45.2	+12 51	2.2 x 2.0	9.2	E1	Round
3384		10 45.7	+12 54	4.4 x 1.4	10.2	E7	In field w 3379 and 3389
3389		10 45.8	+12 48	2.3 x 1.0	12.5	Sc	
3593		11 12.0	+13 06	2.5 x .9	11.3	Sb	
3623	M65	11 16.3	+13 23	7.8 x 1.5	9.3	Sb	Lg. Dim. 10m star Sp.
3627	M66	11 17.6	+13 17	8.0 x 2.5	8.4	Sb	Bright.Arms
3628		11 17.7	+13 53	12.0 x 1.5	10.9	Sb	Lane south side

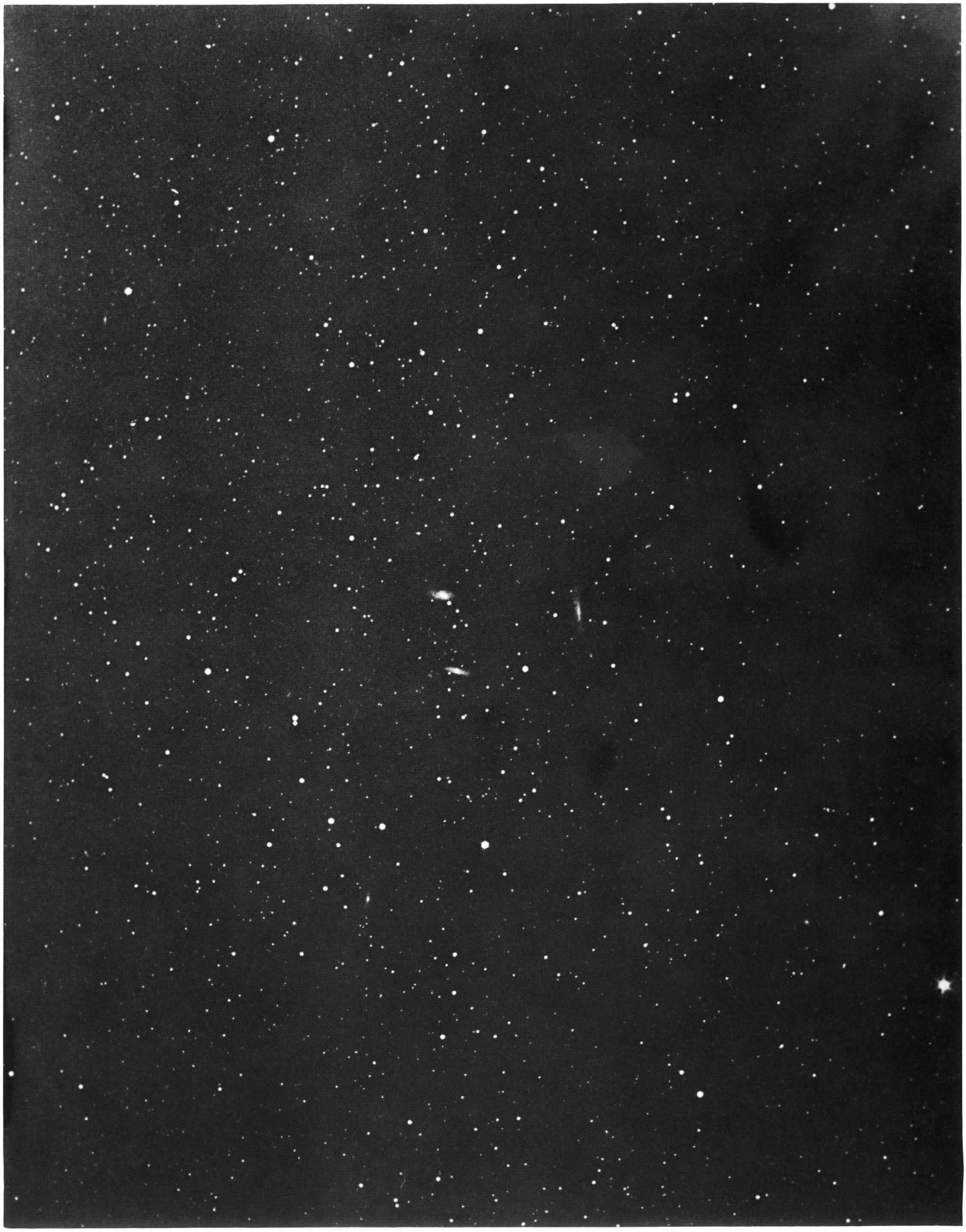
DOUBLE STARS IN LEO

STAR	R.A.	DEC.	MAGNITUDES	SEPARATION	P.A.	REMARKS
Omega	9h 25.8	+ 9° 17'	6.0-6.7	0.5"	315°	P=117 yr. widening
OΣ215	10 13.6	+17 59	7.2-7.4	1.2	187	Between γ and η
Gamma	10 17.2	+20 06	2.6-3.8	4.3	122	Yellow and Gold
49	10 32.4	+ 8 55	5.7-8.7	2.5	158	Comp. dull, 8" Celestron
54	10 52.9	+25 01	4.5-6.3	6.5	109	Easy
Iota	11 21.3	+10 48	4.1-6.8	1.0	225	Not def. seen 8"

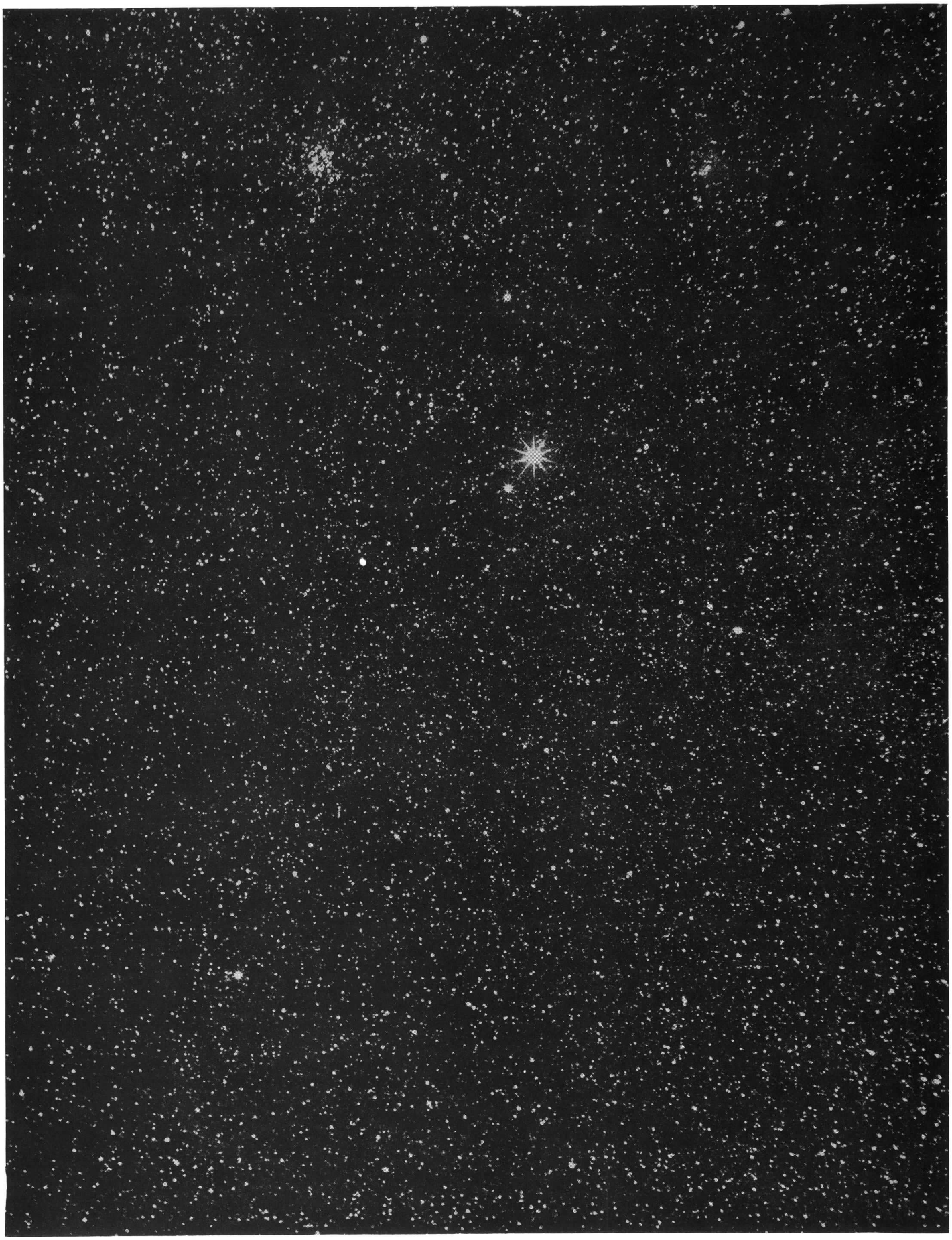
John Sanford



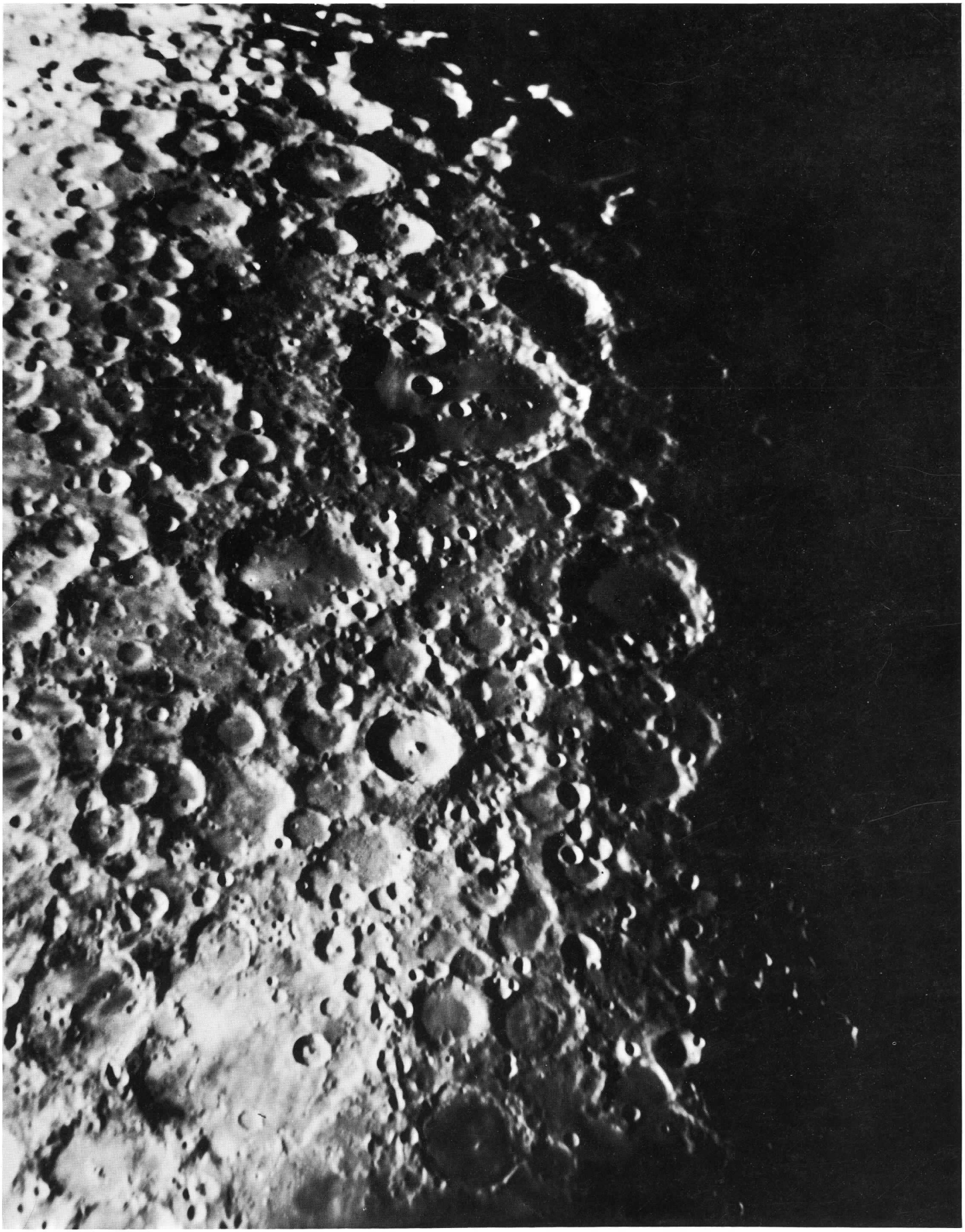
ABOVE: Constellation Leo by John Sanford.



ABOVE: Galaxies in Leo by John Sanford. Photograph of M65, M66, NGC 3628 and 3593. See article on Leo.



ABOVE: Deep sky photograph by Martin Germano of area near Saturn on October 28 (a.m.), 1973. This 14 minute 28 second exposure on 103aF was taken with a 135mm telephoto lens at F/5.6 and guided with a Celestron 8. Development was in D-19 for 4 minutes of constant agitation at 70°F. Printed on Unicolor Victoria #5. Photographed at Mt. Pines (Condon Observation site) California.



ABOVE: Moon photographed by Martin Germano on November 4, 1973 with a Celestron 8 and yellow filter. This half second exposure was taken on VTE Panatomic (80 ASA) film, developed in Actufine at 68°F for 4.5 minutes. Seeing was rated at 7/10. Paper was Unicolor Victoria #5.