FROM

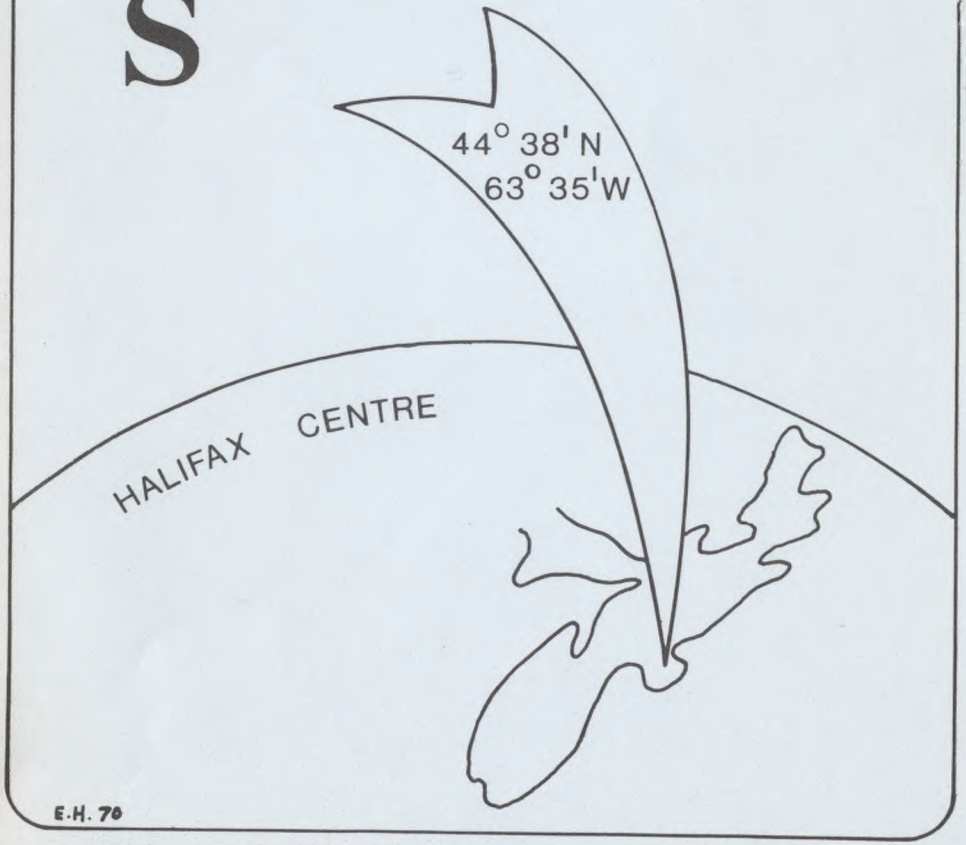
HALIFAX CENTRE R.A.S.C.
1747 SUMMER ST.
HALIFAX, N.S.

Apr 74

TO

ROYAL ASTRONOMICAL SOCIETY,
252 COLLEGE ST.,
TORONTO, ONTARIO.

NOVA NOTES



AVON

N O T I C E of M E E T I N G

HALIFAX CENTRE

R.A.S.C.

Date: April 26th, 1974
(Note; This is the 4th Friday!)

Place: Room 101
Sir James Dunn Science Building
Dalhousie University
Halifax, N.S.

Time: 8·00 PM Sharp!

Topic: "Early Days at the David Dunlap Observatory"

Speaker: Dr.R.M.Cunningham
Victoria General Hospital,
and Dalhousie University

A N D

Topic: "Dating the Early Solar System"

Speaker: Dr.P.H.Reynolds
Department of Physics
Dalhousie University

PLEASE NOTE: the change in DATE and PLACE !

All members and guests are most welcome !

Nova Notes are printed, thanks to the goodwill of the Nova Scotia Museum.

Editor's Page

I've now got 22 Postal Code Cards back,but there are still another 60 or so to come. Where are they? Would it help if I make a deadline for you? How about the May Meeting?...

Have you heard the trouble that the Postal workers are having over these new codes? Appearently they fear layoffs because of the automation. In Toronto,I understand,they boycotted any "Postal Coded" parcels. For this reason I will be delaying the request for our new addressograph plates.

How about some articles for next month? At the March Meeting Dr. Bishop,down from Avonport,told us about an Occultation of Saturn on March 2nd. Mary King sent us all the particulars on the Occultation,but unfortunately,I only recieved it after the occultation. The BIG thing about this occultation is that the southern limit was around Truro. Dr. Bishop was almost 30 miles south of that,and it appears,from photos,that out in Bedford,Saturn was occulted,some 60 miles south of the southern limit!! I urgently request,by or before the Apr.26th Meeting,any observational data of this event! I have recieved requests for such information by various interested members. Invariablely,the sources they wanted were Mary King, Roy Bishop, and the Fr.Burke-Gaffney Observatory. I have recieved some info from Dr. Bishop,but I would appreciate receiving Miss. King's and SMU's comments on this matter for printing next month....

Because of examinations,"Featured Constellation of the Month" will not appear in this issue,(too bad!). Look for its return next month...."CHEER!! Hurrah! Oh Goodie!"

Peter Edwards
The Editor

Minutes of the March Meeting

Hi! it's your favorite Editor,sitting in for W.Z. this month!

Dr. David DuPuy,as V.P. opened the March Meeting of the Halifax Centre,R.A.S.C. . He called for any announcements,at which time your Editor (your's truly) explained why those pictures from last month were not yet availible. The delay was the difficulty in printing one, and the impossibility of printing the other!

Mr. Randall Brooks was asked about the Junior Astronomy Club's prosperity. He replied that a report would soon appear in Nova Notes,but any help,by way of personal assistance,or suggestions,would certainly be welcomed.

Now,what was this mysterious topic,"Fun with Astronomy" all about? Dr. DuPuy brought one of his astronomy labs up to the meeting. The lab dealt with stellar classification. Don't let that scare you,it was more fun than an average night at the telescope! We were each given a lab sheet,on which was a photo of a star field taken with a full objective prism. The result was a page full of stellar spectra. On another page was the spectra of each classification of stellar spectra. We all got into groups of 5 or6 to compare the spectrum of particular stars. Points were awarded in decending value with decending accuracy. The highest points were 27 and the lowest (my group)was 20 points. A party atmosphere prevailed and everyone marveled at how fun astronomy could be!

Following this,Roy Bishop addressed the group of 30 + ,telling us of Comet Bradfield,1974b. This comet,in the evening sky is every bit as good as Kohoutek,in mid to late Jan.'74! Dr.Bishop also reported on the Occultation of Saturn,some 30 miles south of the southern limit.

Sherman Williams,then,described a very colorful slide show of his, taken over the last few years.

Refreshments were served;and the meeting ajourned at 10:30 P.M.

P.E.

"ABOUT THAT COMET BRADFIELD"

Circular No. 2633

CENTRAL BUREAU FOR ASTRONOMICAL TELEGRAMS
INTERNATIONAL ASTRONOMICAL UNION

POSTAL ADDRESS CENTRAL BUREAU FOR ASTRONOMICAL TELEGRAMS, SMITHSONIAN ASTROPHYSICAL OBSERVATORY CAMBRIDGE, MASS 02138, USA
CABLE ADDRESS SATELLITES NEWYORK - WESTERN UNION RAPID SATELLITE CAMBMASS

COMET BRADFIELD (1974b)

Cablegrams received from Australia report observations of a new comet discovered by William A. Bradfield, as follows:

1974 UT	α_{1950}	δ_{1950}	m_1	Observer
Feb. 12.49	$23^h37^m.6$	-33°42'	9	Bradfield
13.47	23 40.5	-33 28	9	"
14.417	23 43.6	-33 15	9	Thompson
14.51597	23 43 $58^s.20$	-33 09 49".5	7	Gans & Candy

W. A. Bradfield (Dernancourt, near Adelaide). Comet diffuse without condensation.
G. Thompson (Brisbane). Comet diffuse without condensation. Communicated by V. L. Matchett.
D. Gans and M. P. Candy (Perth Observatory, Bickley). Comet diffuse with condensation, tail < 1°.

887 ALINDA

The following precise positions have been reported:

1973/74 UT	α_{1950}	δ_{1950}	Mag.	Observer
Dec. 30.89510	$6^h42^m14^s.27$	+ 8°01'45".8		Petrovičová
30.90413	6 42 16.62	+ 8 02 24.0		"
Jan. 12.83478	7 45 47.89	+23 28 42.0		Mrkos
12.84034	7 45 49.47	+23 29 03.2		"
13.79905	7 50 32.68	+24 29 48.0		"
13.80165	7 50 33.50	+24 29 57.2		"
14.84178	7 55 36.73	+25 33 37.1		Petrovičová
14.84456	7 55 37.49	+25 33 47.9		"
25.35469	8 41 43.68	+33 44 29.8	12	Klemola
25.91188	8 43 52.40	+34 02 32.3		Mrkos
25.91575	8 43 53.15	+34 02 40.1		"
26.17292	8 44 53.14	+34 10 48.8		Klemola
26.86278	8 47 25.81	+34 31 59.1		Mrkos
26.86556	8 47 26.44	+34 32 04.0		"
27.15764	8 48 31.68	+34 40 41.8		Klemola
28.19583	8 52 14.30	+35 09 57.0		"
29.23958	8 55 50.36	+35 36 59.8		"

RŮžena Petrovičová and A. Mrkos (Kleť Observatory).
A. R. Klemola (Lick Observatory). 51-cm double astrograph.

1974 February 15 — Brian G. Marsden

Circular No. 2642

CENTRAL BUREAU FOR ASTRONOMICAL TELEGRAMS
INTERNATIONAL ASTRONOMICAL UNION

POSTAL ADDRESS CENTRAL BUREAU FOR ASTRONOMICAL TELEGRAMS, SMITHSONIAN ASTROPHYSICAL OBSERVATORY CAMBRIDGE, MASS 02138, USA
CABLE ADDRESS SATELLITES NEWYORK - WESTERN UNION RAPID SATELLITE CAMBMASS

COMET BRADFIELD (1974b)

Dr. W. Liller provides the following photoelectric magnitudes, measured by him at Cerro Tololo Interamerican Observatory:

1974 UT	V	1974 UT	V	1974 UT	V
Feb. 17.0	10.21	Feb. 21.0	9.03	Feb. 25.0	9.18
18.0	9.31	22.0	8.99	26.0	9.14
19.0	9.38	23.0	9.05	27.0	8.91
20.0	9.18	24.0	9.23	28.0	8.82

The measurements up to and including that of Feb. 23.0 were made using a 41-cm reflector and 95" diaphragm, while the others were with a 91-cm reflector and 42" diaphragm. Sky conditions were excellent every night, and the estimated mean errors average 0.05 magnitude. On Feb. 28.0 visual estimates by Liller, N. Walborn and R. Salmon with a finder telescope averaged V = 8.2. A narrow plasma tail approximately 2° long appears on a blue plate taken by N. Irvine with the Curtis Schmidt telescope on Feb. 25.0; on the previous night a red plate shows the dust tail as poorly defined and no more than 15' long.

The following precise positions were obtained at the Perth Observatory, Bickley, with the 33-cm astrograph:

1974 UT	α_{1950}	δ_{1950}	Observer
Feb. 16.52500	$23^h50^m44^s.27$	-32°33'27".2	C. Jekabsons
17.52292	23 54 11.23	-32 13 53.8	G. Lowe
18.51806	23 57 41.21	-31 53 20.7	M. P. Candy
20.50972	0 04 52.18	-31 08 36.1	C. Jekabsons
22.50486	0 12 18.21	-30 18 18.9	M. P. Candy
23.50208	0 16 06.44	-29 50 51.7	D. J. Gans
25.50069	0 23 54.09	-28 50 30.0	M. P. Candy
26.51528	0 27 56.38	-28 16 48.8	D. J. Gans

Mr. Candy also sends the following improved parabolic elements. He notes that the images of the comet are strong and remarkably well condensed on the Perth plates. We have, however, adjusted his predicted magnitudes to conform more to visual observations.

T = 1974 Mar. 18.3433 ET
q = 0.503166 AU
ω = 333°1178
Ω = 143.0503
i = 61.2935
} 1950.0

1974 ET	α_{1950}	δ_{1950}	Δ	r	m_1
Mar. 6	$0^h59^m.11$	-22°44'.2	1.076	0.583	6.8
8	1 07.63	-20 42.3			
10	1 16.11	-18 22.0	0.976	0.542	6.3
12	1 24.44	-15 41.0			
14	1 32.51	-12 36.7	0.881	0.514	5.8
16	1 40.20	- 9 07.2			
18	1 47.41	- 5 11.4	0.797	0.503	5.5
20	1 54.05	- 0 49.5			
22	2 00.03	+ 3 56.5	0.730	0.511	5.4
24	2 05.34	+ 9 02.9			
26	2 09.97	+14 24.0	0.687	0.536	5.5
28	2 13.93	+19 52.7			
30	2 17.29	+25 21.6	0.671	0.575	5.7
Apr. 1	2 20.09	+30 43.6			
3	2 22.41	+35 53.1	0.679	0.626	6.1
5	2 24.32	+40 45.7			
7	2 25.88	+45 19.0	0.706	0.683	6.6
9	2 27.17	+49 32.2			
11	2 28.25	+53 25.5	0.747	0.746	7.1
13	2 29.12	+56 59.7			
15	2 30.00	+60 16.4	0.796	0.811	7.6
17	2 30.78	+63 17.2			
19	2 31.54	+66 03.9	0.851	0.879	8.1
21	2 32.35	+68 38.0			
23	2 33.2	+71 01.1	0.909	0.947	8.6

COMET HECK-SAUSE (1972 VIII)

Dr. A. Heck, Institut d'Astrophysique, Liège, provides the following precise position, which he has measured from a plate taken by J. Manfroid, G. Sause, A. M. Rousseau, M. Degueldre and himself with the 60-cm Liège Schmidt telescope at the Haute Provence Observatory:

1974 UT	α_{1950}	δ_{1950}	m_2
Jan. 21.94722	$6^h21^m26^s.3$	+71°00'58".5	19

R CORONAE BOREALIS

M. Seeds and J. Michael, Joseph R. Grundy Observatory, Franklin and Marshall College, communicate the following photoelectric observations, made on Feb. 22.3 UT with a 40-cm telescope: V = 11.22 ± 0.01, B - V = +0.98 ± 0.02, U - B = -0.08 ± 0.02.

1974 March 6 — Brian G. Marsden

Contributed by Dr. Roy Bishop

PRESENT IDEAS ON BETA LYRAE Part 3 R. C. Brooks

Fig. 4 found in Part 2 showed light curves of β Lyrae obtained by the OAO spacecraft. Wilson suggested that a gas or dust cloud surrounding the secondary which selectively absorbs or scatters photons at the longer wavelengths yet transmits the photons at 1380 Å and 1500 Å, would explain the curves. A cloud with such properties is purely speculative however. Other explainations could be 2) If a small area of the secondary (or circumstellar gas cloud about the secondary) is heated to 10^5 - 10^6K, then the effect of the eclipse of this area becomes more pronounced in the far ultraviolet yet because it contributes a small fraction of the light at longer wavelengths compared to the total light of the system, its effect on the eclipse depths is insignificant. 3) Line blanketing effects can lead to changes in the ultraviolet spectral energy distribution of a star. If such an effect were operating selectively on the primary component, the roles of the two components could be reversed in the ultraviolet.

From the previous parts you will have noticed that there are as many theories about the nature of β Lyrae and the processes taking place as papers written on this system. Clearly further observational work is necessary in new wavelength regions which brings me to briefly mention the radio observations reported by Wade and Hjellming in early 1972. These were interferometer observations made at 2,695 MHz and 8,085 MHz and show evidence of variability but no period search for radio eclipses has been reported to date. If the emissions arise from an optically thick cloud of ionized gases at a temperature of 10^4°k, then the typical flux density observed at 8,085 MHz corresponds to an angular diameter of 0.2 arc sec. The distance to β Lyrae is about 500 pc and, thus, the linear diameter of the source is 100 AU. This value is many times the separation of the binary. This would predict that nebular emission lines should be observed at all times in the optical spectra and would be neither Doppler shifted nor variable. This is contrary to present models, but indicates the presence of a probably non-thermal radio source which is the result of some unusually high energy process.

It was suggested in Part 1 that the components in β Lyrae have exchanged roles (ie. the original primary is now the secondary)due to mass transfer. Such transfers of mass cause orbital angular momentum to be translated to rotational angular momentum in the accreting star. Because of tidal forces due to the companion, the upper layers of the star will slow down while the denser core will be less retarded resulting in highly differential rotation. This results in reduced central temperatures and has

been theoretically shown to lower the luminosity and effective temperature. Differential rotational velocities of the order of 300 km s^{-1} can reduce the magnitude by 1^m or more. Strothers and Lucy suggest the secondary of β Lyrae is 2^m underluminous for this reason and, thus, conclude that it is unlikely to be a collapsar.

Strothers then considered the possibility that underluminosity of the secondary might be due to magnetic fields but with negative results. The principle was to expose the inner regions of a star which lay inside the convective zone and which might have a strong magnetic field and theoretically determine the fate of a magnetic field. It is unlikely that decay or submersion of the field lines at the surface would occur over a period of time as short as 10^4 years (kelvin time). This is the probably elapsed period, (confirmed observationally and theoretically) since beginning of mass transfer in βLyrae. From their arguments they infer that the interior magnetic field in upper main-sequence stars is probably quite weak. However, whatever the strength of the field, it will be carried along by the ionized gas streaming and will permeate the entire system, although concentrated between the components. He suggests this might explain the radio observations and that it may be profitable to search for radio eclipses and flaring at the surface of the primary. However, it seems unlikely that accretion of mass will build up a strong internal magnetic field in the secondary since no strong field seems to be formed during the convective stages of the original star.

You will remember that Davidge concluded that the luminosity of the secondary is < 0.08 but Kriz thinks this is an underestimate (because the spectral lines are broadened due to rotation and hence difficult to detect) and suggests $L_2 < 0.25$ is a more realistic upper limit. Fig. 5 shows that the amplitude of the eclipse effects

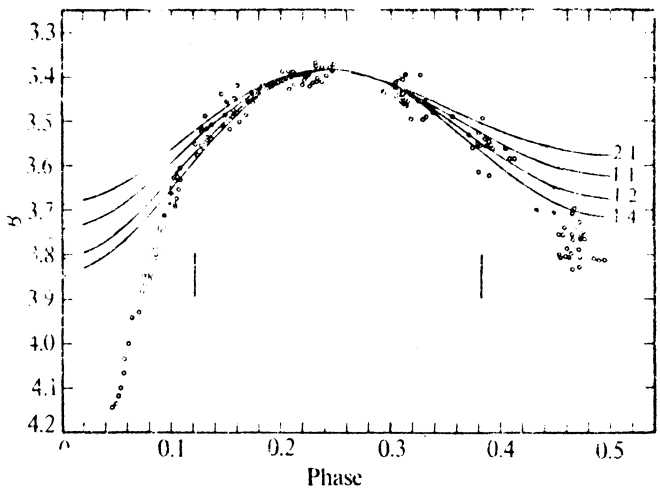


Fig. 5 The *B* light curve of Larsson-Leander with the theoretical curves as solid lines, given for labelled values of the mass ratio $M_{ART(BS)}/M_{EST(INV)}$. Other required parameters for the calculation are given in the text. The primary eclipse egress is shown and observations in the range of phases from 0.5 to 0.89 have been reflected about phase 0.5.

at secondary minimum (phase 0.5) is greater than $.1^m$. In the case of total eclipse of the secondary this corresponds roughly to $L_2 = 0.1$ and if partial eclipse L_2 must be larger, (therefore $0.1 < L_2 < 0.25$). Using this estimate with the masses of the components Kriz obtains data which is seen in Fig. 6. The box represents the

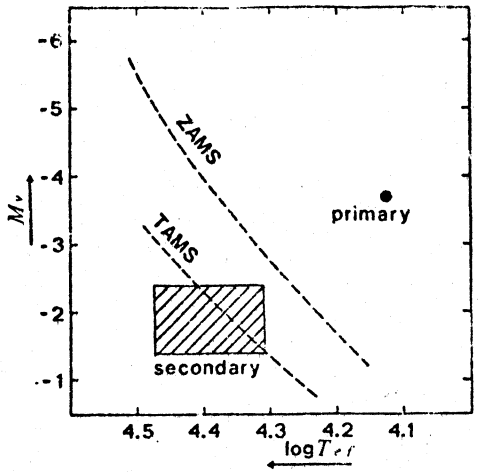


Fig. 6 Hertsprung-Russell diagram for β Lyr.

upper and lower estimates of the luminosity and effective temperatures. The primary is the B8 star observed by Struve but Kriz also suggests B0 - B2 is a more realistic classification for the secondary on the basis of the OAO observations. The previous A - F designation is meaningless he says, because it is based on the photometric brightness ratio between the two minima which are affected by the presence of the scattering disc. The B0 - B2 spectral type corresponds to a main sequence star of the estimated mass (10 - 14 $M_\odot$) of the secondary. The underluminosity of the B0 star can be easily explained by non-uniform rotation as discussed earlier. If his conjectures are true, the question is why is the primary overluminous? or why is the less massive component more evolved?--exactly the evolutionary paradox of ideal binaries. Theoretical models of evolving close binaries can predict an overluminosity in the primary for stars having masses similar to β Lyrae's while models incorporating a black hole cannot.

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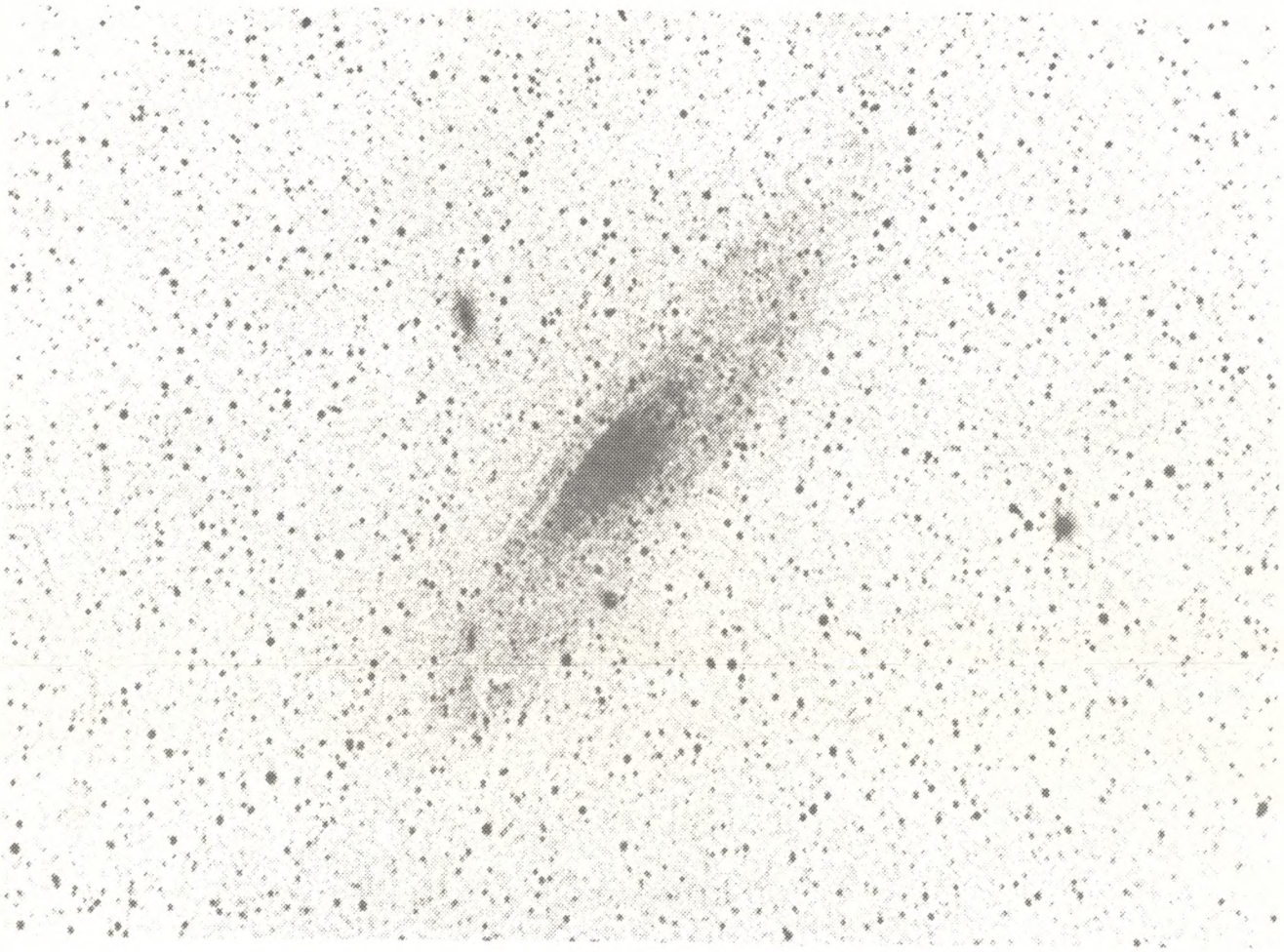
Nebulous just stopped by to give me a rough copy of his new article to debut soon in Nova Notes.....LIKE FUN IT WILL!!!

...ed.

Galaxies, Nebulae and Star Clusters



The most remarkable object in the constellation of Andromeda is the nebula M31. It appears as a dim patch of light slightly more than 1° in length. It was known to the Arabs, who could have no idea of its remarkable appearance as revealed by even a small telescope, let alone by long exposure photographs which show its much greater extent as well as structural details.