COMMISSION 27 OF THE I.A.U.

INFORMATION BULLETIN ON VARIABLE STARS

Nos. 1301 - 1400
1977 July - 1978 March

EDITOR: B. SZEIDL, KONKOLY OBSERVATORY

1525 BUDAPEST, Box 67, Hungary

CONTENTS

1315 PRELIMINARY ELEMENTS FOR BV 1621 CMa = HD 56429
ELEMENTS FOR BV 840 Cen, BV 1172 Cen, BV 1444 Ara, V449 Cen AND V603 Cen
U. Hopp, M. Kiehl
3 August 1977

1316 PHOTOELECTRIC MINIMA OF W UMa
J. Bones, H.K. Myrabo
4 August 1977

1317 HD 20301: AN ECLIPSING, DOUBLE-LINED EARLY G GIANT
E.H. Olsen
4 August 1977

1318 A RECONSIDERATION OF THE ORBITAL PERIOD OF AZ Cas
A.P. Cowley, J.B. Hutchings
8 August 1977

1319 DATA ON THE VARIABLE STAR STUDIES IN THE USSR DURING 1972-1975
B.V. Kukarkin
9 August 1977

1320 ON THE VARIABLE STAR UU SAGITTAE
V.P. Tsessevich
10 August 1977

1321 ECLIPSE TIMINGS OF CATACLYSMIC VARIABLES
G.S. Mumford
10 August 1977

1322 SPECTROSCOPIC OBSERVATIONS OF V389 CYGNI
C.T. Bolton
10 August 1977

1323 DUPLICITY AND SPECTRAL TYPES OF HV 10814
G.H. Herbig
11 August 1977

1324 A NEW VARIABLE Be STAR: HD 218393
P. Harmanec, J. Horn, P. Koubsky, S. Kriz, Z. Ivanovic, K. Pavlovski
11 August 1977

1325 XX CEPHEI: NEW TIMES OF MINIMUM AND A STUDY OF THE PERIOD
P. Battistini, A. Bonifazi, A. Guarnieri
12 August 1977

1326 THE LINEAR POLARIZATION OF u HERCULIS
R.H. Koch, R.J. Pfeiffer
15 August 1977

1327 SPECTROSCOPY OF HM SAGITTAE, A POSSIBLE EMBRYONIC PLANETARY NEBULA
B.W. Bopp
16 August 1977

1328 Sigma 75 Gem: A BRIGHT VARIABLE SIMILAR TO HK Lac
D.S. Hall, H.J. Landis, G.W. Henry
17 August 1977

1329 PHOTOGRAPHIC OBSERVATIONS OF DELTA CEPHEI VARIABLES
M. Kiehl, U. Hopp
18 August 1977

1330 NOTE ON V644 Cen = HD 306989 (B3)
U. Hopp, M. Kiehl
18 August 1977

1331 A BRIGHT NOVA IN THE SURROUNDINGS OF THE ANDROMEDA NEBULA
L. Meinunger
22 August 1977

1332 ON THE PROBABLE VARIABILITY OF HR 1861
E.H. Olsen
1 September 1977

1333 REVISED PERIODS FOR TWO RR LYRAE STARS: VARIABLE 24 IN NGC 6171 AND VARIABLE 23 IN NGC 6656
Ch. Coutts Clement, H. Sawyer Hogg
1 September 1977

1334 RS Cha: A DELTA SCUTI VARIABLE
C.J. McInally, R.D. Austin
7 September 1977

1335 MINIMA OF ECLIPSING VARIABLES
L.P. Surkova
8 September 1977

1336 FO VIRGINIS
E. Poretti
9 September 1977

1337 NEW PHOTOELECTRIC OBSERVATIONS OF THE DELTA SCUTI STAR HD 73576 (KW 207)
M. Bossi, G. Guerrero, L. Mantegazza
9 September 1977

1338 VZ CANCRI
B. Cester, G. Giuricin, F. Mardirossian, M. Mezzetti, M. Pucillo
15 September 1977

1339 POSSIBLE RELATION BETWEEN THE PULSATION CONSTANT AND THE PERIOD IN DELTA SCUTI VARIABLES
E. Antonello, M. Fracassini, L.E. Pasinetti
16 September 1977

1340 THE BELATED DISCOVERY OF NOVA Sgr 1968 AND NOVA Oph 1969
D.J. MacConnell
19 September 1977

1341 Omicron ANDROMEDAE: RADIAL VELOCITIES AND PROBABLE LONG PERIOD VARIATIONS
M. Fracassini, L.E. Pasinetti
23 September 1977

1342 HD 5303: A NEW SOUTHERN RS CANUM VENATICORUM BINARY
J.B. Hearnshaw, J.P. Oliver
26 September 1977

1343 NOTES ON SIX LONG-PERIOD VARIABLE STARS
U. Hopp, M. Kiehl
26 September 1977

1344 LIGHT VARIATION OF THE NUCLEUS OF MARKARJAN GALAXY 358
M. Lovas
27 September 1977

1345 A NEW FLARE STAR IN CANCER
M. Lovas
3 October 1977

1346 Gl 851.1 - ANOTHER BY Dra-TYPE STAR?
K. Krisciunas
6 October 1977

1347 PRACTICAL FORMULAE TO SEARCH PERIODICITIES IN VARIABLE STARS
S. Ferraz-Mello
10 October 1977

1348 A VARIABLE LIGHT CURVE IN AU MONOCEROTIS
M. Cerruti-Sola, L. Lorenzi
11 October 1977

1349 CHARTS AND UPDATED RESULTS FOR TWELVE SAGITTARIUS VARIABLES
Dorrit Hoffleit
11 October 1977

1350 MINIMA OF ECLIPSING BINARY STARS
Ch.P. Stephan
17 October 1977

1351 NOVA SAGITTARII 1975 No 2
I. Lundstrom, B. Stenholm
17 October 1977

1352 HR 4665: A NEWER, BRIGHTER RS CVn BINARY
B.W. Bopp, F. Fekel, Jr., D.S. Hall, G.W. Henry, H.J. Landis
19 October 1977

1353 PHOTOELECTRIC OBSERVATIONS OF 44i BOOTIS
U. Hopp, S. Witzigmann, M. Kiehl
21 October 1977

1354 PHOTOELECTRIC OBSERVATIONS OF THE FLARE STAR BD +13d2618 IN 1973, 1974
G. Kareklidis, F. Mahmoud, L.N. Mavridis, D. Stavridis,
H. Zervaki-Zoerou
24 October 1977

1355 PHOTOELECTRIC OBSERVATIONS OF THE FLARE STAR BD +16d2708 IN 1973, 1974
G. Kareklidis, F. Mahmoud, L.N. Mavridis, D. Stavridis,
H. Zervaki-Zoerou
24 October 1977

1356 PHOTOELECTRIC OBSERVATIONS OF THE FLARE STAR BD +55d1823 IN 1974
G. Kareklidis, L.N. Mavridis, D.C. Stavridis
24 October 1977

1357 A PROBABLE ECLIPSE IN HD 165590
C.D. Scarfe
25 October 1977

1358 PHOTOELECTRIC MINIMA OF ECLIPSING BINARIES
E. Pohl, A. Kizilirmak
27 October 1977

1359 B AND V PHOTOMETRY OF X PERSEI (= 2U 0352 +30 ?)
P. Kalv
4 November 1977

1360 AN RR LYRAE STAR IN NGC 288
Linda M. Hollingsworth, Martha H. Liller
4 November 1977

1361 SIX NEW RR LYRAE STARS IN NGC 1261
A. Wehlau, T. Flemming, S. Demers, C. Bartolini
7 November 1977

1362 ETOILES PROCHES SUSPECTEES DE VARIABILITE
M. Petit
18 November 1977

1363 Omicron ANDROMEDAE: ANOTHER RECURRENT PHENOMENON?
M. Fracassini, L.E. Pasinetti
CORRECTION TO IBVS No. 1348
18 November 1977

1364 HR 239 AND HR 8676: TWO DELTA SCUTI-TYPE VARIABLES
W.W. Weiss
21 November 1977

1365 OBSERVATIONS OF THE STAR GAMMA BOOTIS AND OF THE NEW VARIABLE STAR HR 5441
M. Auvergne, J.M. le Contel, J.P. Sareyan, J.C. Valtier, J. Daguillon
25 November 1977

1366 SUPPLEMENTARY PROGRAMME OF COOPERATIVE FLARE STAR OBSERVATIONS FOR 1977
L.N. Mavridis
1 December 1977

1367 CPD -55d5216: A COOL Ap STAR SHOWING EXTREMELY LARGE VARIATIONS AT 4100 Angstrom
E.H. Olsen
5 December 1977

1368 PHOTOELECTRIC MINIMA OF U Oph, AB And AND X Tri
Zeki Tufekcioglu
7 December 1977

1369 ON ECLIPSING BINARY CSV 5384 = HV 10663
V. Tsessevich
19 December 1977

1370 ON FIVE RR LYRAE-TYPE STARS
V. Tsessevich
19 December 1977

1371 ON TWO SEMIREGULAR VARIABLE STARS RS SAGITTAE AND RZ VULPECULAE
V. Tsessevich
19 December 1977

1372 ON THE VARIABLE STAR BE HERCULIS
B. Pochinok
19 December 1977

1373 PHOTOMETRIC VARIATIONS OF THE B6 STAR HR 3440
P. Renson, C. Sterken
23 December 1977

1374 THE LIGHT CURVE OF i BOOTIS IN FEBRUARY 1975
F. Gieseking
23 December 1977

1375 PROGRAMME OF COOPERATIVE FLARE STAR OBSERVATIONS FOR 1978
L.N. Mavridis
27 December 1977

1376 AN APPARENT ERUPTIVE VARIABLE STAR IN SCORPIUS
N. Sanduleak, C.B. Stephenson, D.J. MacConnell
2 January 1978

1377 PHOTOMETRY OF HD 193793
J.D. Fernie
3 January 1978

1378 Alpha SCULPTORIS - A LONG PERIOD BINARY
O. Vilhu
6 January 1978

1379 TIMES OF MINIMA OF ECLIPSING VARIABLES
C.D. Scarfe, D.J. Barlow
9 January 1978

1380 A NEW VARIABLE STAR IN NGC 5139
C.R. Fourcade, J.R. Laborde, E. Yurquina
11 January 1978

1381 UV Psc - A SHORT PERIOD RS CVn STAR
A.R. Sadik
18 January 1978

1382 SOME COMMENTS ON AB Cas
B.N. Irkaev, M.S. Frolov, O.A. Chekanikhina
30 January 1978

1383 PHOTOELECTRIC MINIMA OF ECLIPSING VARIABLE VW CEPHEI
C. Cristescu
6 February 1978

1384 ON THE PERIOD OF THE Ap VARIABLE HR 8861
Cengiz Sezer
7 February 1978

1385 118 DAY OPTICAL VARIATIONS IN VV Cep
G.P. McCook, E.F. Guinan
8 February 1978

1386 ON THE PERIOD CHANGE OF THE Beta CMa VARIABLE BW Vul
Zeynel Tunca
10 February 1978

1387 LIGHT VARIATIONS OF THE H AND K EMISSION STAR HD 206860
C. Blanco, S. Catalano, E. Marilli
13 February 1978

1388 THE BEAT PERIOD OF CY AQUARII
A. Figer
13 February 1978

1389 A SUSPECTED SYMBIOTIC STAR IN THE REGION OF THE SMALL MAGELLANIC CLOUD
N. Sanduleak
22 February 1978

1390 COORDINATED CAMPAIGN FOR OBSERVATIONS OF RX CASSIOPEIAE. ANNOUNCEMENT
D.Ya. Martynov
1 March 1978

1391 NOUVELLE RECHERCHE DE PERIODES D'ETOILES Ap OBSERVEES A L'ESO-I
P. Renson
2 March 1978

1392 ON THE LIGHT VARIABILITY OF THE MAGNETIC STAR HD 192678
K. Panov
6 March 1978

1393 A COMMENT ON THE SLOW NOVA IN SCORPIUS
I. Lundstrom, B. Stenholm
10 March 1978

1394 PHOTOELECTRIC OBSERVATIONS OF V711 TAURI
P. Flin, M. Sztajno
17 March 1978

1395 OBSERVATIONS OF HDE 245770 DURING THE RECENT X-RAY FLARE-UP OF ITS COUNTERPART A0535+26
S. Rossiger
21 March 1978

1396 KO Aur
Th. Berthold
22 March 1978

1397 ELEMENTS OF CSV 260
H. Busch
22 March 1978

1398 PHOTOELECTRIC PHOTOMETRY OF THE MULTIPLE STAR SYSTEM Eta ORIONIS
C.R. Chambliss
23 March 1978

1399 AS 239: THE DECLINING PHASE OF A SLOW NOVA?
D.A. Allen
28 March 1978

1400 HD 11285 AND HD 14940: TWO NEW PULSATING VARIABLES
W.W. Weiss
28 March 1978

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1301

Konkoly Observatory
Budapest
1977 July 5

PHOTOMETRIC VARIABILITY OF THE NONRADIAL PULSATOR 53 PERSEI

It has been shown recently (Smith 1977) that line profile variations in many sharp-lined early to mid B-type stars (Petrie and Pearce, 1962, Smith and Karp 1976) can be mimicked easily and quantitatively by a traveling wave velocity field which is characteristic of a nonradial pulsation. The photometric behaviour of these stars (see also Percy 1970) is of interest because it gives information on the surface temperature variation during the wave cycle. This note reports evidence for a small light variability in 53 Persei (HR 1350, B4.5V; M_V=4.88) which exhibits large amplitude profile variations. Smith and McCall (1978) have observed the star over several months and concluded that it exhibits a complex, time dependent period spectrum, with usually one period present with a value of from 3.6 to 14.45 hours.

Differential photometry in the Strömgren v-filter was carried out on the nights of December 23 and 24, 1976 on the 30-inch telescope of McDonald Observatory. The Strömgren v-filter was used as a compromise between the requirements of a larger expected amplitude in the ultraviolet and the more stable extinction properties in the blue wavelength region. Each "observation" consists of an average of six ten-second star-sky integrations. The average r.m.s. error was computed by averaging through the night the r.m.s. from the individual integrations in an observation. For the three stars figures are ± 0.0023 (night 1) and ± 0.0011 (night 2). Observations were not continued past 1.6 air masses.

Our standard observing sequence consists of a Standard 1, Program Star, Standard 2 cycle. We chose as standards λ Per

(HR 1261, B9V) and HR 1482 (AOV) two stars with no known history of variability and in a nonvariable region of the H-R Diagram.

The results are depicted in Figure 1, displayed both in terms of the difference between two standards (Figs. 1b and 1d) and of the program star minus the average of the two standards (Figs. 1a and 1c). From the first night one can conclude that a decrease of 0.01 mag. occurs in about four hours. This result is nearly identical to the July, 1976 results of Percy and Lane (1977) for this star, which may be a coincidence since it is not clear that the star exhibited the same period during both times. The observations of the second night show smaller scatter, but since the star was monitored for only two hours no variability is evident.

In Figure 2 we have drawn in a curve by means of an assumed 7.29 hour period (phase convention due to Osaki 1971) which was determined a few nights later (December 28-31) by Smith and McCall spectroscopically. At this point one can say only that our data are consistent with their period. It is also too early to decide whether the light curve is sinusoidal or not.

The unravelling of the complex period behavior in 53 Per (which may be due to nonlinear coupling between physically driven nonradial modes (Smith and McCall 1978)) is a long-term observational problem with fruitful rewards. When the excited nonradial modes can be identified correctly in this and other B stars it will be possible to isolate the region of the star which excites the oscillations. It is to be wholeheartedly recommended that 53 Per be put on photometric variability programs, particularly since photometricists with easily accessible small telescopes will be able to add vastly to the data pool for this object. However, they should be advised, first, that the periods for this class of objects appear to be about <u>twice</u> that of the β Cepheids (Smith, unpublished) and, second, that the photometric variations of the smaller amplitude line profile variable B stars may well escape detection.

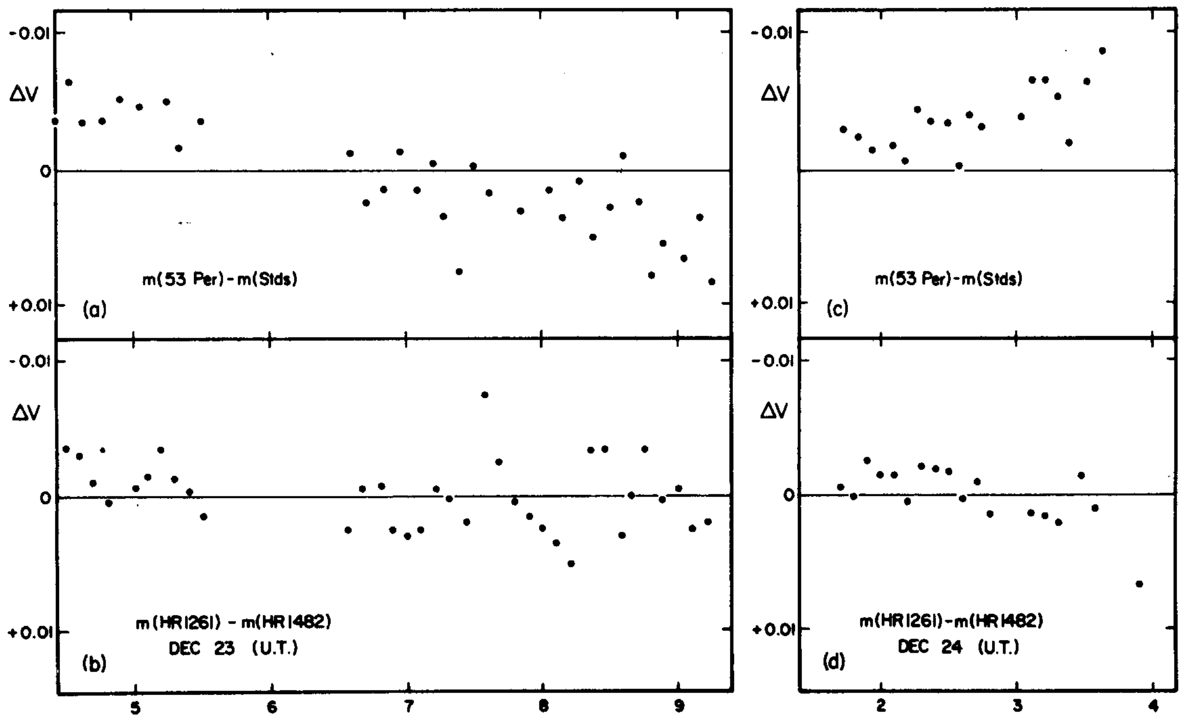


Fig.1 : Photometric results (Strömgren v-filter) for 53 Persei during December 23 and 24,1976. Panels (c) and (d) give the differences as a function of time of the apparent magnitudes between two standards, HR 1261 and HR 1482 (zero level is arbitrary). Panels (c) and (d) give the magnitude differences between 53 Persei and the average of the two standards; the zero level is determined from Figure 2.

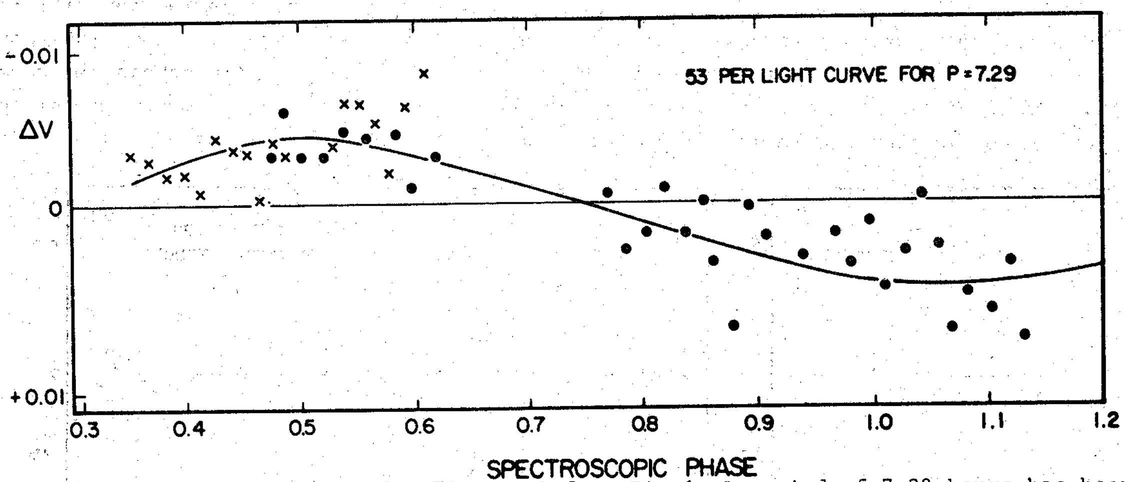


Fig. 2: Composite observations for 53 Persei from Fig.1. A period of 7.29 hours has been assumed, based on a separate spectroscopic study. The zero magnitude level is set at the average apparent magnitude.

JOHN AFRICANO
McDonald Observatory
Fort Davis, Texas 79734

References:

Osaki, Y. 1971, Pub.A.S.J., 23, 485
Percy, J.R. 1970, A.J., 75, 818
Percy, J.R., and Lane, M.J. 1977, A.J.
Petrie, R.M., and Pearce, J.A. 1962, Pub. D.A.O., 12, 1
Smith, M.A. and Karp, A.H. 1976, Los Alamos Conf. on Solar and Stellar Pulsation,Aug.3-5th,p.289
Smith, M.A., and McCall, M.L. 1978, Ap.J., in press
Smith, M.A. 1977, Ap.J., 215

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1302

Konkoly Observatory
Budapest
1977 July 8

NEW VARIABLE STARS IN THE FIELD OF γ CYGNI

The systematic photographic search of variable stars, in blue and infrared radiation, in 5 fields of some 25 $\square^{o}$ each (Maffei 1975) has been continued in a field centered on the star γ Cygni ($\alpha=20^{h}20^{m}26^{s}$; $\delta=40^{o}05'.7$) with the Schmidt telescope of 65/90 cm of the Osservatorio Astrofisico of Asiago. From 4th Aug. 1967 to 7 Dec. 1974 some 74 I-N (hypers.) + RG5 and few 103a-O + GG 13 or without filter were collected.

The examination of these plates leads to the discovery of 62 new variable stars, most of which visible in the infrared plates only. The plates were compared by means of the blink microscope of the Asiago Observatory. This operation was based on 13 pairs of selected plates. A few larger field with the same center was previously searched for variable stars in blue light by G.Romano, who was able to find 44 new variables (Romano 1969).

The main characteristics of the 62 variables are listed in Table I. The numeration of the variables, characterized by the prefix M, continues the one started in the field of M 16-M 17 (Maffei 1975). The lack of some numbers is due to the exclusion of a few variables, not confirmed during the investigation following the discovery. The positions were obtained by means of the measuring machine Zeiss-PEK2 of the Specola Vaticana of Castelgandolfo. The identification charts, most of the curves of light and a detailed account, will be published, in a short time, in a more extensive work.

Table I

Var. N.	A.R.(1950.0)	Dec.	m_{ir}		Type	P	E 24.....
M 210	$20^h27^m16^s.1$	$39^\circ32'41''$	12.1	15.4	M	770	40578
M 211	29 12.2	41 35 02	13.0	15.7	M	420	40062
M 212	21 11.0	41 07 19	14.7	15.7	SR	450:	
M 213	19 41.2	41 23 00	13.5	15.6	M	312:	40680
M 214	19 52.7	41 27 24	14.8	16.0			
M 215	21 11.0	41 41 23	14.1	16.0	SR or M	400:	39844:
M 216	23 41.0	42 16 37	11.1	14.5	M	382	39904
M 217	23 35.1	42 22 29	11.5	14.1	M	308	40380
M 218	21 54.5	42 40 57	14.4	15.6	SR or M	308::	40096:
M 219	20 47.4	42 39 54	11.3	14.2	RV	285	40056
M 220	18 20.5	42 53 23	13.0	14.2	SR	400::	41060::
M 221	16 08.0	42 22 19	14.7	15.9	SR	280:	40480:
M 222	16 50.8	41 58 46	13.4	15.6	M	383	41100
M 223	19 50.4	42 16 24	14.2	15.9	SR or M	484:	40580::
M 224	17 23.9	41 37 24	14.8	15.7	SR	290::	41196::
M 225	13 51.5	42 12 43	15.0	15.8	SR		
M 226	27 51.9	38 55 59	15.0	15.7			
M 228	23 33.3	38 32 44	12.0	14.8	M	462	39864
M 229	23 45.6	38 09 17	13.0	15.1	M	310	40500
M 230	21 13.4	38 54 34	13.3	15.4	M:	385:	40138
M 233	18 54.1	39 13 05	10.4	12.2	M	335	40560
M 234	20 30.1	40 33 33	10.1	14.4	M	268:	40815:
M 235	16 42.1	40 24 41	12.5	15.0	M	442	40140
M 236	11 19.2	40 43 11	12.8	14.6	SR	416	40450
M 237	11 07.1	40 54 01	12.7	14.5	SR	410	40834
M 238	10 16.6	40 51 19	12.3	14.7	SR	318	40520
M 239	09 07.0	41 06 57	12.1	14.5	M	261	40818
M 240	08 46.6	41 13 47	12.6	14.4	M	300	40884:
M 241	10 25.6	41 13 19	12.4	13.5	L::		
M 242	10 34.5	41 16 20	12.5	13.4	I		
M 243	10 07.2	41 23 51	11.5	13.6	M	430	41160
M 244	10 08.9	41 27 02	12.5	13.4	E		
M 245	10 59.6	41 26 57	10.7	14.2	M	322	40504
M 246	10 36.0	41 42 45	11.9	13.7	M	251	39640
M 247	13 21.8	41 08 25	12.8	13.8	C::		
M 248	14 49.4	41 25 48	13.6	14.8	SR or M	334:	40494
M 249	21 55.2	38 20 18	7.2	8.6	L::		
M 251	19 29.7	38 53 19	14.4	15.3			
M 252	16 49.7	39 08 22	9.3	11.3	M	395	40172
M 253	16 09.6	38 57 36	13.6	15.2	M	300	40104
M 254	17 15.1	38 45 10	14.4	15.6			
M 256	17 24.9	38 21 32	13.2	15.2	M	565:	40570
M 257	13 50.6	38 16 23	8.7	11.4	M	400	41020
M 258	12 31.1	38 18 35	11.1	14.6	M	297	40474
M 259	13 32.9	39 49 32	12.4	15.5	M:	388	40176
M 260	13 10.2	39 47 00	13.2	14.8	E:		
M 261	12 00.6	40 13 10	13.1	14.8	M	290	40072
M 263	09 31.5	40 55 35	13.8	14.9	SR	460:	40280::
M 264	09 33.9	40 43 28	12.4	13.8	M	415	39804:
M 265	07 41.0	40 34 53	12.2	14.5	SR:		
M 266	05 47.6	40 34 59	10.4	14.3	M	350	40480
M 267	05 51.0	39 47 49	11.9	15.0	M	310	40150

Table I (cont.)

Var. N.	A.R. (1950.0)	Dec.	m_{ir}		Type	P	E 24.....
M 268	$20^h07^m55^s.0$	39 37 18	12.9	15.1	SR::	400	
M 269	07 01.4	39 04 04	13.4	14.2	L::		
M 270	10 20.6	39 27 47	8.7	11.3	M	404	40365
M 271	11 36.1	39 17 52	12.7	15.4	M	412	42300
M 272	12 50.6	39 04 01	12.3	15.0	M	380	40798
M 273	10 46.4	38 53 27	12.4	15.1	M	400	39800
M 274	11 59.7	38 29 00	13.1	15.4	SR or M	584::	41198::
M 275	11 34.4	38 29 39	11.9	15.2	M	360	39980
M 276	11 37.7	38 25 24	12.4	14.4	E		
M 277	17 36.5	40 46 43	13.2	14.7	I		

Of the 62 new variables, 32 have been classified as Mira type stars, 11 as SR and 5 doubtful (SR or M). Before this research only 8 Mira and 13 SR were known in the field searched in blue light by Romano.

This result confirms the strong increase of the number of Mira type stars when the observations are made by means of the infrared technique. However in the field of γ Cygni this increase is not so dramatic as in the field of M 16 - M 17 previously reported.

Many thanks are due to Fth. P.Treanor, Director of the Specola Vaticana and to Fth. E. De Graeve for the great help before and after the measurement.

PAOLO MAFFEI
Osservatorio Astrofisico
Catania,Italia

References:

Maffei, P. 1975, Comm. 27 IAU.Inf.Bull.Var.Stars No. 985

Romano, G. 1969, Mem.Soc.Astron.Ital. 40, 375

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1303

Konkoly Observatory
Budapest
1977 July 11

ON THE PERIOD OF BS HERCULIS

BS Her was discovered by von Reinmuth (1930) on Heidelberg plates, its light variation ranging from $14\overset{m}{.}0$ to $16\overset{m}{.}5$ ph.In the Genral Catalogue of Variable Stars (Kukarkin et al., 1970) this star is classified as a possible Mira variable of M6e-type with light variation from $13\overset{m}{.}2$ to $16\overset{m}{.}5$ ph.

In the phases close to maximum (when the star is brighter than 14^{m} ph) the light of BS Her was estimated from 228 photographic and 25 photovisual sky photographs of the Plate Depository of Odessa Astronomical Observatory. The comparison stars used are shown in the chart of BS Her (Fig.1). Their photographic magnitudes $a=11\overset{m}{.}84$, $b=12\overset{m}{.}27$, $c=12\overset{m}{.}56$, $d=12\overset{m}{.}83$, $f=13\overset{m}{.}26$,$k=13\overset{m}{.}50$, $l=13\overset{m}{.}84$, $m=14\overset{m}{.}04$ were determined with reference to the magnitudes of stars of area III in the "Catalogue of photographic, photovisual and photored magnitudes of 22 000 stars"(Voroshilov et al., 1962).Measurements were made with the MΦ-2 photometer. As the variable star and the standards are considerably spaced apart, the zero-point of magnitudes of comparison stars may be shifted.

Observations of 12 observational seasons are shown in Figure 2.

The moments of maxima have been observed as well:

Max J.D.	m_{ph}	E	O-C
2436108	13.00	-1	+18.3
36444	12.00	0	- 7.2
36804	13.02	+1	- 8.6
37168	12.92	+2	- 6.1
37530	12.39	+3	- 5.8
37892	12.70	+4	- 5.4
38266	12.72	+5	+ 7.2
38628	13.05	+6	+ 7.5
38986	12.72	+7	+ 4.0
39702*	-	+9	- 3.2

Photovisual maximum is marked by an asterisk. A certain part of the light curve is plotted to the photovisual degree scale: $y=0.^{st}0$, $z=5\overset{st}{.}9$, $t=10\overset{st}{.}7$, $b=17\overset{st}{.}6$, $c=24\overset{st}{.}6$, $f=31\overset{st}{.}6$.

The elements are found:

Max.J.D. 2436451.2 + 361.6·E.

E and O-C are calculated with respect to these elements.

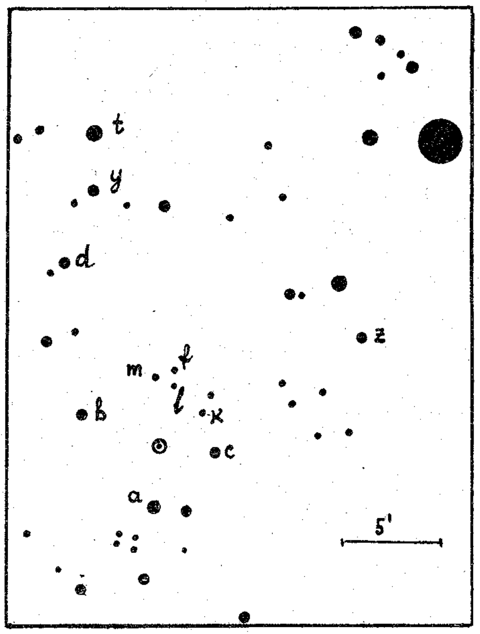


Fig.1

E.N. MAKARENKO
Odessa Astronomical
Observatory

References:

Kukarkin,B.V. et al.,1970, The General Catalogue of Variable Stars, Moscow

Reinmuth von, 1930, AN 238, 333

Voroshilov, V.I. et al., 1962, "Catalogue of photographic,photovisual and photored magnitudes of 22 000 stars", "Naukova dumka", Kiev

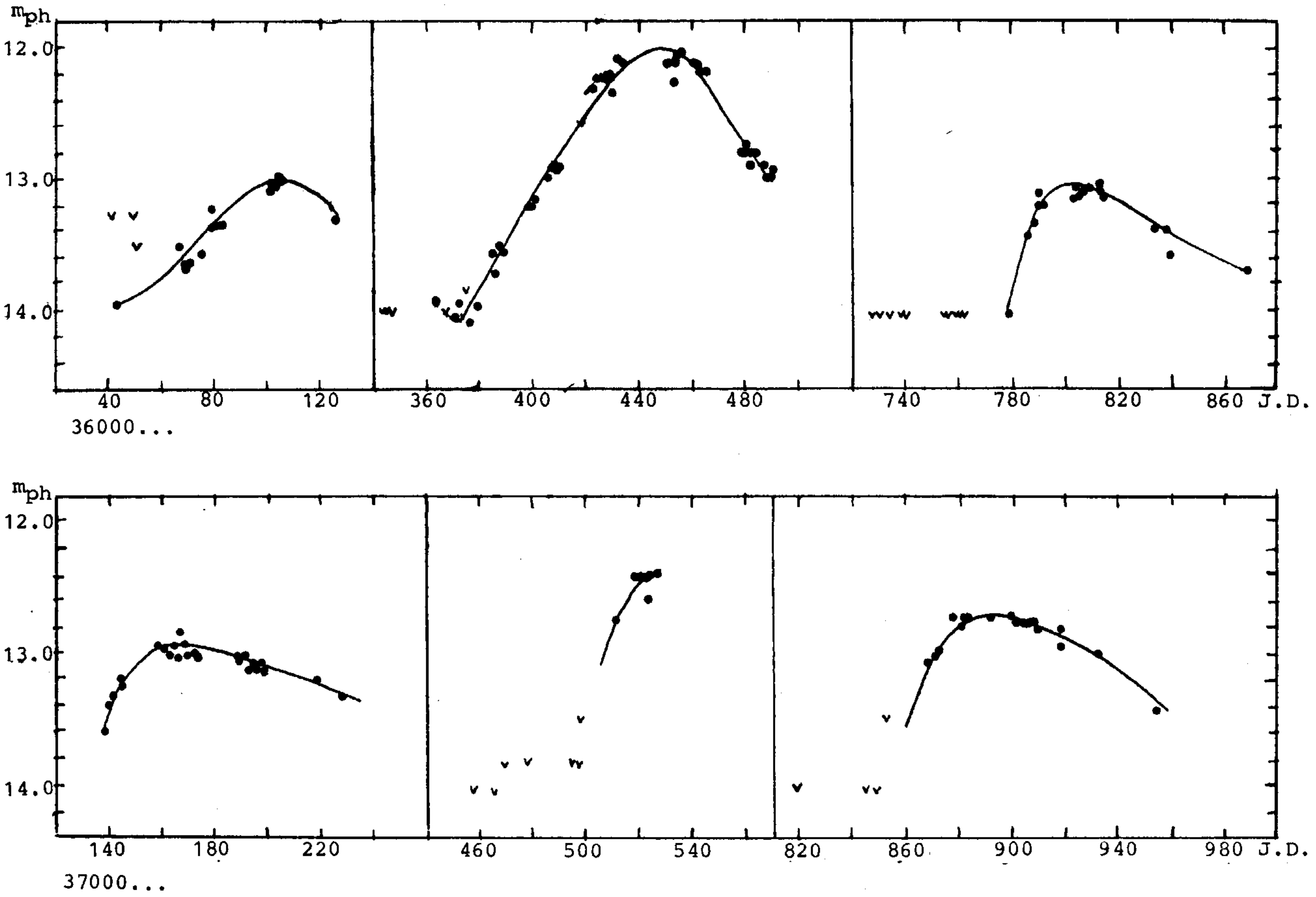

m_ph
12.0
13.0
14.0
40
80
120
360
400
440
480
740
780
820
860
J.D.
36000...
m_ph
12.0
13.0
14.0
140
180
220
460
500
540
820
860
900
940
980
J.D.
37000...

Fig.2

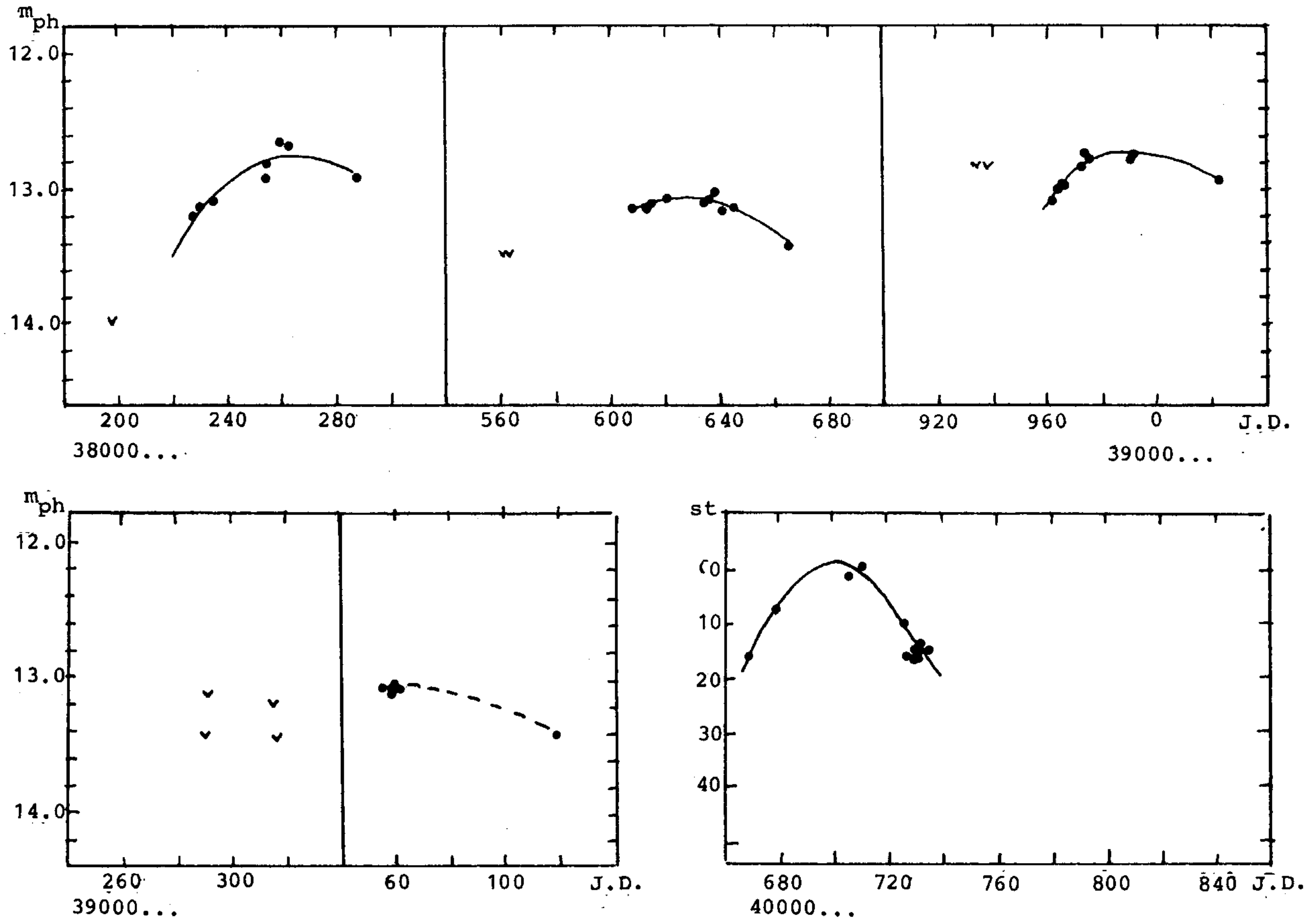

m
ph
12.0
13.0
14.0
200
240
280
560
600
640
680
920
960
0
J.D.
38000...
39000...
260
300
60
100
J.D.
39000...
st
(0
10
20
30
40
680
720
760
800
840
J.D.
40000...

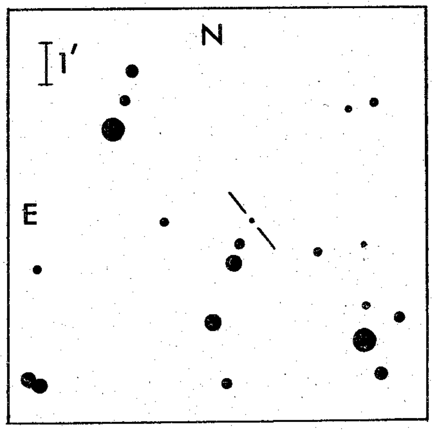
Fig.2 (cont.)

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1304

Konkoly Observatory
Budapest
1977 July 18

A SUSPECTED VARIABLE EMISSION-LINE OBJECT IN THE DIRECTION OF THE LARGE MAGELLANIC CLOUD

A new emission-line object ($\alpha = 5^h45^m.7$, $\delta = -71^\circ17'$, 1975), possibly associated with the Large Magellanic Cloud, appears to have shown strongly variable Hα emission. This object, for which we provide an identification chart, is not listed in the surveys of either Henize (Ap.J. Suppl. 2, 315, 1956) or Lindsay and Mullan (Irish A.J. 6, 51, 1963). However, on red-sensitive objective-prism plates, taken with the Curtis Schmidt telescope at the Cerro Tololo Inter-American Observatory on March 24, 1968 and Nov. 15, 1974, it shows a rather strong and sharp Hα emission line. No continuum is visible (i.e. V > 15 mag), giving the appearance of a planetary nebula. At our request, Dr. Henize kindly examined his original LMC survey plates, which have a limiting magnitude comparable to our own plates, and confirmed that emission at Hα was not evident at that epoch.



Images of this object appear on the charts in the Hodge-Wright atlas of the LMC and from these one can estimate $B\sim16.0$ and $V\sim16.0$. It is not listed among the Harvard variable stars. On deep blue-sensitive objective-prism plates, also taken with the Curtis telescope on March 20, 1968 and Jan. 7, 1975, the spectrum contains strong emission in the Balmer series and [OIII] λ5007 and λ4959. We also suspect variable emission at He II λ4686 and [OIII] λ4363. The suspected spectral variability would suggest that this is some type of eruptive variable star rather than a planetary nebula. However, the available data indicate a rather small range in light variability.

N. SANDULEAK
Warner and Swasey Observatory
E. Cleveland, Ohio, U.S.A.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1305

Konkoly Observatory
Budapest
1977 July 19

ON THE VARIABILITY OF HR 4511

HR 4511 (HD 101947; $\alpha_{1900} = 11^h38^m45^s$; $\delta_{1900} = -61°56'$) is a fifth magnitude supergiant of spectral type G0 Ia. It was pointed out earlier (Fernie 1976) that the star shows variability on a scale of about 0.1 mag in V with a period that is probably of the order of a month. The present note lists new observations that confirm this variability.

These observations are on the Johnson UBVRI system, and were obtained during June, 1976 with the University of Toronto's 61 cm telescope at the Las Campanas Observatory, Chile. HR 4475 (K1 III) and HR 4522 (G3 III) were used as comparison stars. Intercomparison of these two stars on seven nights gave no evidence of either being variable, and tie-ins to standard stars on those seven nights produced the following values:

	V	U-V	B-V	V-R	V-I
HR 4475:	5.137	2.183	1.101	0.820	1.365
	±.004	.002	.002	.004	.006
HR 4522:	4.103	1.462	0.892	0.677	1.110
	±.004	.003	.003	.003	.004

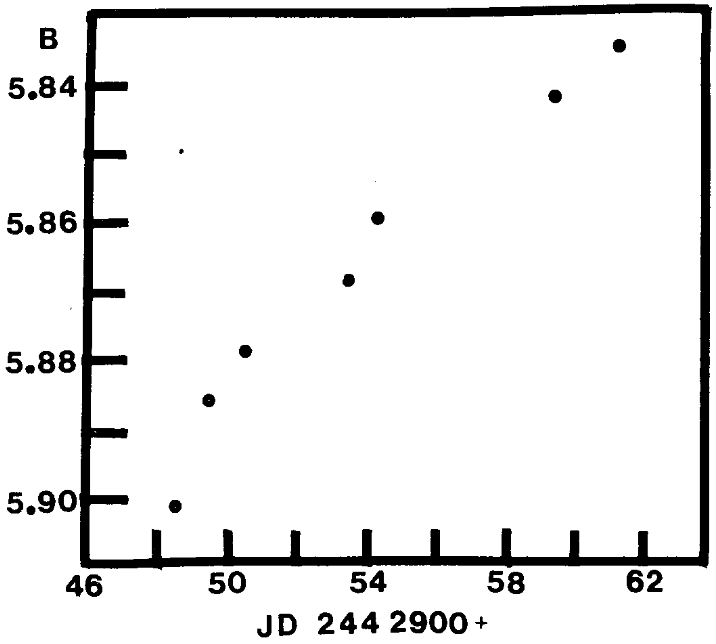
The quoted standard errors refer to the internal consistency of the observations only. Taking these values for HR 4522 as definitive for present purposes, differential observations between it and HR 4511 produced the following results for the latter:

JD	V	U-V	B-V	V-R	V-I
2442948.481	5.077	1.153	0.824	0.664	1.102
49.487	5.063	1.165	0.823	0.666	1.092
50.475	5.057	1.163	0.822	0.661	1.087
53.460	5.054	1.155	0.815	0.655	1.085
54.464	5.042	1.159	0.818	0.651	1.075
59.471	5.036	1.136	0.806	0.644	1.079
61.483	5.041	1.122	0.794	0.649	1.082

The precision of these observations is estimated to be about ±0.005 mag. A small but definite trend in the observations is discernible, with the star becoming brighter and bluer during the run. Purely by way of illustration, Figure 1 shows the change in the B magnitude. The V magnitudes suggest the star was approaching maximum in this bandpass near the end of the run, but the change in magnitude with time earlier in the run is entirely consistent with that found previously (Fernie 1976).

Bidelman, Sahade, and Frieboes-Conde (1963) have already pointed out that HR 4511 is variable in radial velocity, and suggest that it is a spectroscopic binary. It seems more likely, however, (or perhaps additionally) that it is a long-period, low-amplitude cepheid. The long period is consistent with the spectral type of GO Ia, and Bidelman et al. report Hα (only) emission present on one plate, again characteristic of a long-period cepheid. The trend towards increasing blueness with increasing brightness is also to be expected.

Since long-period, low-amplitude cepheids are extremely difficult to find, this star could be of particular importance in cepheid research.


B
5.84
5.86
5.88
5.90
46
50
54
58
62
JD 244 2900 +

For instance, Madore (1976) has pointed out that there is conflicting evidence as to whether low-amplitude cepheids occur towards the blueward edge or the redward edge of the instability strip. This star probably lies towards the redward edge, and since it is bright and of low colour excess ($E_{B-V} \simeq 0.1$) it would be a useful tool in this regard.

A proper study of the star, however, will require the availability of extended observing time in the southern hemisphere, and I urge observers there to undertake such a study.

It is a pleasure to thank Dr. Karl Kamper for obtaining the present observations.

J.D. FERNIE
David Dunlap Observatory
University of Toronto

References:

Bidelman, W.P., Sahade, J., and Frieboes-Conde, H. 1963, P.A.S.P., 75, 524.

Fernie, J.D. 1976, P.A.S.P., 88, 116.

Madore, B.F. 1976, The Observatory, 96, 245.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1306

Konkoly Observatory
Budapest
1977 July 21

PHOTOMETRY AND A PRELIMINARY ANALYSIS OF THE BETA-LYRAE LIKE SYSTEM HD 173 198

As a part of an observational program on binary systems of Beta-Lyrae type HD 173 198 was observed photoelectrically with UBV filters during the 1976 southern winter at the Abrahao de Moraes Observatory in Valinhos (Sao Paulo state-Br.).

The first observations on this system were reported by Leewen (1975). From the epoch of the principal minimum observed by us and from that given by Leewen, we have improved the period of the system, which is now given as follows

$$P = 1^{d}.364076 \pm 0^{d}.000001.$$

The observations reported presently were carried out with the 61 cm telescope of the Sao Paulo University at Valinhos, using photon counting techniques and a data acquisition system operated by a Nova computer. The observations were reduced following the standard techniques and Figure 1 shows the light curve in the B color.

The main comparison star was HD 173 003 (B5) whose colors, obtained from absolute photometry in two nights, are

$$V = 7^{m}.72 \pm 0^{m}.01; (B-V) = 0^{m}.43 \pm 0^{m}.01; (U-B) =-0^{m}.12 \pm 0^{m}.02.$$

As a check star, was used HD 172 850 (B9, $8^{m}.2$).

The light curves in B and V colors were rectified by the Russel and Merril (1952) method and we have followed Kopal (1959), taking into account the shape of the minima in order to determine the function $\chi(x,k,\alpha_o,n)$. We have considered an average value of χ for several points instead to take only one point in each eclipse.

The elements of the system obtained from this analysis,

Table 1

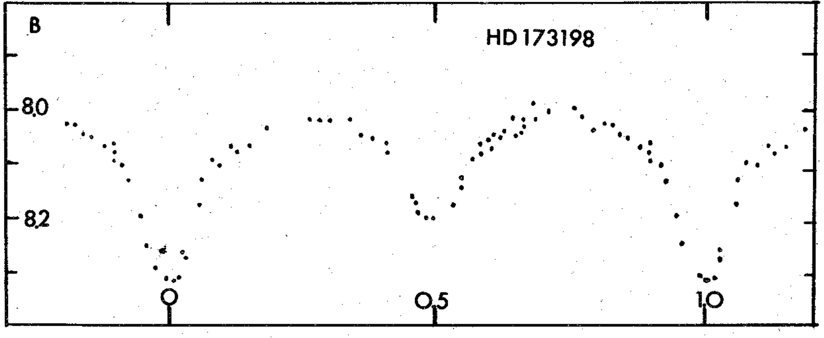
Color	L_1	L_2	r_1	r_2	i
V	0.679	0.321	0.432	0.326	81°
B	0.672	0.328	0.433	0.325	81°

Table 2

Star	Color	r_a	r_b	r_c	$T_e(K^o)$	L	m_1/m_2
1	V	0.516	0.450	0.411	22,000	0.658	1.25
2	V	0.344	0.331	0.321	20,210	0.341	
1	B	0.516	0.450	0.411	22,000	0.666	1.25
2	B	0.344	0.331	0.321	20,154	0.333	

Table 3

Star	Type	$m/m_\odot$	$R/R_\odot$	$(B-V)_o$
1	B1	14.1	6.9	-0.23
2	B2	11.2	5.0	-0.21



namely, the normalized luminosity, relative radius and orbital inclination are given in Table 1.

We have also analysed the light curves through the Wood's model (1971 and modifications 1973-1976). The computations, following the numerical code developed by Wood, were started using as initial parameters those obtained previously through the Russel-Merril method.

The astrophysical parameters obtained directly from our computations are given in Table 2. Main sequence calibration allows us to estimate the individual masses and absolute dimensions, using Kepler's third law. These data are shown in Table 3.

The total visual extinction was estimated to be $A_V=1\overset{m}{.}5$ and the distance is about 1.0 kpc.

A more detailed analysis of this system will be presented elsewhere.

J.A. de FREITAS PACHECO*
CHARLES RITTÉ**
A. DAMINELI NETO**
Instituto Astronomico
e Geofisico, Depto.Astronomia
Universidade de Sao Paulo
Caixa Postal 30627-Sao Paulo
Brasil

References:

Kopal,Z. 1959 in Close Binary Systems

Leewen, von F. 1975, IBVS No.1041

Russel, H.N. and Merril, J.E. 1952, Contributions from the Princeton University Observatory No.26

Wood, D.B. 1972, A Computer Program for Modeling Non-Spherical Eclipsing Binary Star Systems-Goddard Space Flight Center Modifications included are those which have appeared in "Wink Status Report" from No.1 to No.7

---

* Present Address - Observatoire de Nice - Le Mont Gros - Nice, France

**Partially supported by Fundacao de Amparo a Pesquisa do Estado de Sao Paulo

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1307

Konkoly Observatory
Budapest
1977 July 21

PHOTOELECTRIC OBSERVATIONS OF NOVA SAGITTARII 1977

Photoelectric observations of Nova Sagittarii 1977 ($\alpha_{1950}=18^h35^m17^s$; $\delta_{1950}=-23^\circ25'21''$) were secured on the 104-cm and 56-cm reflectors of the Uttar Pradesh State Observatory on several nights during April and May 1977, using UBV filters of the Johnson and Morgan system and photomultipliers cooled to -20°C. Standard dc techniques were employed for recording.

The standard deviations of the comparison star (HD 171810≡ SAO 187068) on any single night are $\pm 0\overset{m}{.}017$; $\pm 0\overset{m}{.}023$; $\pm 0\overset{m}{.}022$ in the V, B and U filters respectively, for both the reflectors. The magnitudes and the colours of the nova and the comparison star are given in Table 1. The light and colour curves of the nova are plotted in Fig.1 and the colour-colour curve in Fig.2.

The comparison star happens to be the same as the one used by Austin who has also observed the nova photoelectrically on three nights earlier to our observations (IAU Circular No.3067). Small systematic differences between the standard magnitudes and colours of the comparison star obtained by Austin and by us are to be noted.

From the V light curve, the average rate of decline of the nova during the period of our observations comes out to be $0\overset{m}{.}04$ per day. The colour curves and the colour-colour diagram of the nova indicate that, in an over all way, the nova relatively brightened up in the B such that, apart from small fluctuations, the B-V index got bluer at an average rate of 0.02 per 10 days, and the U-B index got redder at an average rate of $0\overset{m}{.}04$ per 10 days.

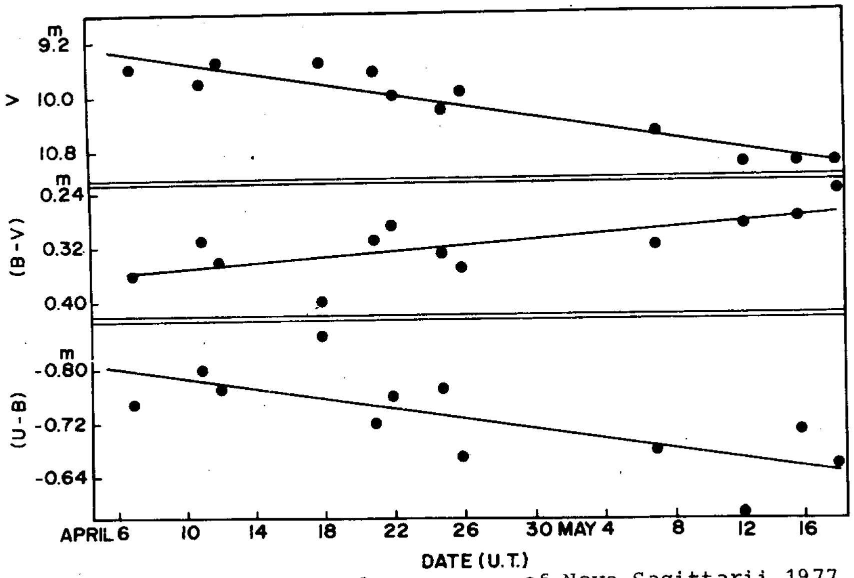


Fig. 1. Light and colour curves of Nova Sagittarii 1977

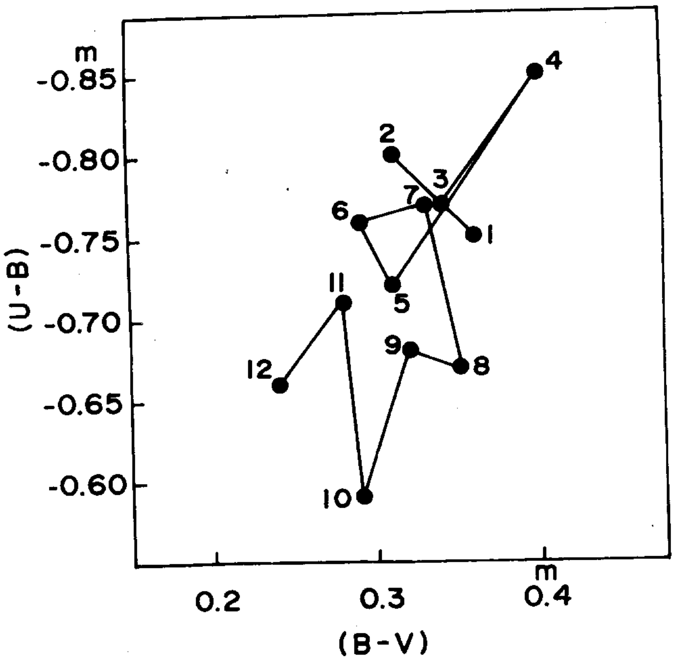


Fig. 2. Colour-colour diagram of Nova Sagittarii 1977. The numbers represent the position of the nova in the colour-colour diagram on successive nights of Table 1.

Table 1

Magnitude and colours of Nova Sagittarii 1977 and the comparison star HD 171810 (≡ SAO 187068).

Sr No.	Date, U.T. 1977	V	(B-V)	(U-B)	Number of observations
1	April $6^{d}.96$	$9^{m}.59$	$0^{m}.36$	$-0^{m}.75$	2
2	10.92	9.82	0.31	-0.80	2
3	11.96	9.50	0.34	-0.77	5
4	17.94	9.56	0.40	-0.85	7
5*	20.90	9.66	0.31	-0.72	6
6*	21.92	10.04	0.29	-0.76	4
7*	24.94	10.22	0.33	-0.77	3
8*	25.89	9.89	0.35	-0.67	8
9	May 6.88	10.58	0.32	-0.68	6
10	11.93	11.02	0.29	-0.59	4
11	15.83	10.99	0.28	-0.71	9
12	17.85	11.02	0.24	-0.66	3
Comparison star .		8.16	0.56	0.00	

*Observed on 56-cm telescope.

Acknowledgement

The authors are thankful to Dr.S.D. Sinvhal for helpful discussions. Thanks are also due to C.D. Kandpal, A.K. Bhatnagar, U.C. Joshi and B.B. Sanwal for participation in the observations.

RAM SAGAR

H.S. MAHRA

S.C. JOSHI

J.B. SRIVASTAVA

Uttar Pradesh State
Observatory, Manora Peak,
Naini Tal-263129
India

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1308

Konkoly Observatory
Budapest
1977 July 26

ON THE POSITION OF Ap-STARS TOWARD THE MAIN SEQUENCE

The problem of the coincidence of Ap-stars with normal stars of the same spectral classes on the main sequence is of great importance for the explanation of the mechanisms responsible for the Ap-star light changes. Simultaneously it also gives information on the relation of Ap-variables with other types of variable stars.

Studies of Ap-stars in the broad-band U,B,V system show that:

1. on the Hertzsprung-Russell diagram they represent a compact group in the limits of the main sequence (Khokhlova, 1970).

2. on the colour-colour (U-B)-(B-V) diagram their position does not differ significantly from the position of normal stars (Osawa, 1965; Eggen, 1967; Stepien, 1968).

With the aid of Strömgren's intermediate-band u,v,b,y photometric system Cameron (1966) establishes certain finer differences in the energy distribution of Ap-stars.

On the realization of the observational program for Ap-stars in a ten-colour photometric system of the Zentralinstitut für Astrophysik der AdW der DDR (Nikolov, 1974, 1977) the differences in the energy distribution of the discontinued spectra of Ap-stars toward main sequence stars were once more established.

Since the problem of Ap-star peculiarity is closely related to the peculiar energy distribution in their discontinued spectrum, we have undertaken an analysis of the behaviour of these stars on the colour-colour diagram and the Q-Q diagram of the ten-colour photometric system toward the normal stars of the main sequence.

The so formed colour indices in this system according to Bartkevicius and Straizys (1970) may be divided into two types - those depending on the chemical composition and influenced by blanketing, and others which are slightly influenced by it and which may serve as indicators of temperature. Thus on the colour-colour U-P/P-Y diagram in Fig.1 the P-Y colour index depends strongly on blanketing, and U-P is the indicator of temperature. The main sequence is described in Fig. 1 by a dash-line, and the reddening line - by a solid line. For the construction of the main sequence observations made by Straizys, Drazdys et al. (1970) are used, as well as observations of standard stars in the ten-colour photometric system by Nikolov (1974). Besides the Ap-stars from Nikolov's (1974) work in the diagram additional 18 Ap-stars are indicated according to the data by Zdanavicius et al. (1969), Sudzius et al. (1970) and Bartkevicius et al. (1973). Ap-stars in Fig. 1 are denoted with crosses.

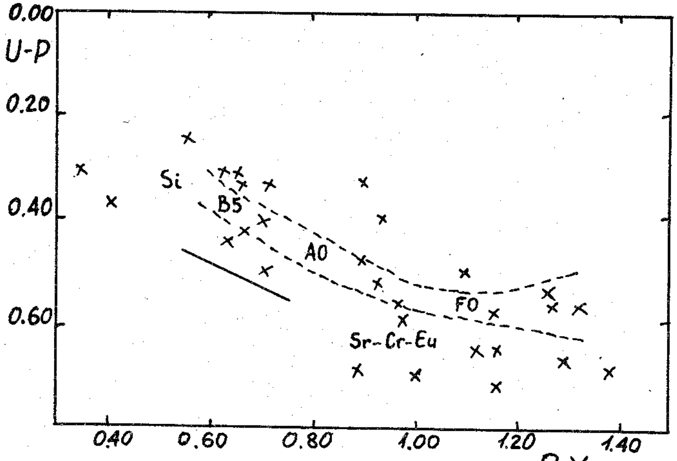


Fig. 1

The separation of the Si type stars from the Sr-Cr-Eu stars denoted by Cameron (1966) is well seen also in Fig.1. The Sr type stars and stars related to them are grouped under the main sequence or on it about at spectral class F0.

Independently from the fact that the reddening line on the discussed colour-colour diagram is almost parallel to the main sequence and the position of Ap-stars on it is relatively slightly influenced by interstellar absorption, we do not know to what extent it has exerted influence. In order to exlude interstellar absorption influence we have built diagrams after the Q-parameters of Ap-stars observed by Nikolov (1974) according to the method by Bartkevicius and Zdanavicius (1975). The use of an iterative procedure on defining the individual Q-parameters of Ap-stars smoothens to a great extent their peculiarity in relation to normal stars - peculiar energy distribution in the discontinued spectrum.

The Q_{upy}/Q_{xyv} diagram (Fig.2) consists of Q-parameters obtained from colours depending comparatively strongly on blanketing. The denoting is as in Fig.1. The main sequence divides the region occupied by Ap-stars into two parts. In the upper part of the diagram are the Si Ap-stars, and in the lower part - the Sr-Cr ones. Here, as well as in the colour-colour (U-P)-(P-Y) diagram, the Ap-star region is partly covered by the main sequence.

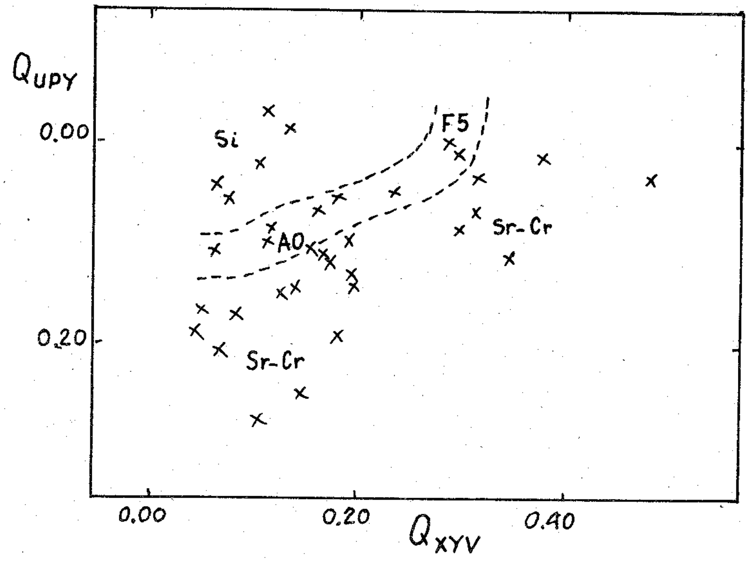


Fig. 2

Thus the problem for the belonging to the group of the Ap-stars is solved with different certainty. The defining of the peculiarity type may be made more accurately.

The separation of Ap-stars from the normal ones in the Q-Q diagrams is important as a fact which demonstrates once more the large dynamic diapason of the Vilnius photometric system. It shows that the separation observed in the colour-colour diagrams, in spite that it is influenced by interstellar absorption, is a result of real differences between Ap-stars and normal stars.

A.S. NIKOLOV
I. ILIEV
University of Sofia
Department of Astronomy

References:
Bartkevicius A. et al., 1970, Vilnius Astr.Obs.Bull.,No.29,3
Bartkevicius A.,Straizys V., 1970,Vilnius Astr.Obs.Bull.,No.28,33
Bartkevicius A.,Zdanavicius K.,1975,Vilnius Astr.Obs.Bull.No.41
Cameron R.C.,1966, Georgetown Observatory Monograph., No.22
Eggen O.J.,1967, in "The Magnetic and Related Stars", ed. by R.Cameron, Mono Book Corp., Baltimore
Khokhlova V.L., 1970, in "Eruptive stars", Publ.House "Nauka", Moscow
Nikolov A.S., 1974, Thesis, AdW der DDR, Berlin
Nikolov A.S., 1977, Variable Stars, in print
Osawa K., 1965, in "The Magnetic and Related Stars",ed. by R. Cameron, Mono Book Corp., Baltimore
Stepien K., 1968, Ap.J., 154, 945
Straizys V., Drazdys R., Gurklite A., 1970, Vilnius Astr.Obs. Bull., No.29, 10
Sudzius J. et al., 1970, Vilnius Astr.Obs.Bull., No.29, 3
Zdanavicius K. et al., 1969, Vilnius Astr,Obs.Bull., No.26, 3

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1309

Konkoly Observatory
Budapest
1977 July 27

PHOTOELECTRIC MOMENTS OF MAXIMA OF SZ Lyn

According to the programme of investigations of dwarf cepheids photoelectric observations of the variable SZ Lyn were carried out in the years 1974-76.Within 12 nights over 500 photoelectric observations have been obtained in the system close to BV which made it possible to determine 10 maxima of light variations in SZ Lyn in each colour.

The epochs E and deviations (O-C) are estimated relative to the ephemeris D3, GCVS, 1968:

Max. J.D. = 2438124.3977 + 0.12053487·E.

The moments of maxima and the deviations (O-C) observed relative to the above elements are tabulated below:

Table

Max. J.D.		E	(O-C)
2442129.5391	B	33228	$+0^{d}.0087$
.5394	V	33228	+0.0090
136.2887	B	33284	+0.0084
.2893	V	33284	+0.0090
.4091	B	33285	+0.0083
.4112	V	33285	+0.0104
.5294	B	33286	+0.080
.5298	V	33286	+0.0084
162.4450	B	33501	+0.0086
.4440	V	33501	+0.0076
871.4218	B	39383	-0.0007
.4232	V	39383	+0.0007
872.3861	B	39391	-0.0007
.3854	V	39391	-0.0014
874.3152	B	39407	-0.0001
.3161	V	39407	+0.0008
.4352	B	39408	-0.0006
.4367	V	39408	+0.0009

Deviations (O-C) confirm the conclusions made on the variability of the period of light variations in SZ Lyn with a cycle of the order of 1146 days.

V.G. KARETNIKOV
Yu.A.MEDVEDEV
Astronomical Observatory
of the Odessa University,
USSR

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1310

Konkoly Observatory
Budapest
1977 July 27

BV OBSERVATIONS OF THE DWARF CEPHEID EH Lib

According to the programme of investigation of dwarf cepheids two-colour photoelectric observations of EH Lib were carried out in the years 1974-1976. Within 13 nights over 500 observations of the variable in the photometric system close to BV have been obtained. From these observations 11 moments of maximum light of EH Lib have been derived for each colour.

The epochs and the deviations (O-C) are computed from the elements D3 GCVS, 1968:

Max. J.D. = 2433438.6073 + 0.088413276·E.

The moments of maxima, epochs and deviations observed are as follows:

Max. J.D.	E	(O-C)	
2442162.5182	98672	-0.^{d}0040	B
.5180	98672	-0.0041	V
182.4132	98897	-0.0018	B
.4135	98897	-0.0015	V
541.4591	102958	-0.0023	B
.4585	102958	-0.0029	V
544.3756	102991	-0.0034	B
.3760	102991	-0.0030	V
.4655	102992	-0.0019	B
.4651	102992	-0.0023	V
577.4435	103365	-0.0021	B
.4440	103365	-0.0016	V
871.5064	106691	-0.0017	B
.5075	106691	-0.0006	V
.5936:	106692	-0.0029:	B
.5929:	106692	-0.0036:	V
872.4775	106702	-0.0032	B
.4770	106702	-0.0037	V
.5654	106703	-0.0037	B
.5661	106703	-0.0030	V
874.5107	106725	-0.0035	B
.5107	106725	-0.0035	V

The observations support the conclusion made on the variability of the period of light variations of EH Lib.

V.G. KARETNIKOV
Yu.A. MEDVEDEV
Astronomical Observatory
of the Odessa University
USSR

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1311

Konkoly Observatory
Budapest
1977 July 28

A DISTORTION WAVE IN THE LIGHT CURVE OF MM HERCULIS

The purpose of this note is to announce the existence of a wave-like distortion in the out-of-eclipse light curve of MM Her. To our knowledge a wave in MM Her has not been detected before this (Hall 1976). The most recent photometry is that of Oliver (1974). The most recent spectroscopic study is that of Imbert (1971).

Using the No. 3 16-inch (40-cm) Cassegrain reflector at Kitt Peak National Observatory, Burke and Mullins obtained 45 differential UBV observations with respect to the comparison star BD $+21^{\circ}3274$ between J.D. 2,442,944.5 and 2,442,962.5. Using the same comparison star, Henry obtained 69 UBV observations between J.D. 2,442,972.5 and 2,443,070.5 with the 32-inch (80-cm) Cassegrain reflector of the Ohio State University at Perkins Observatory. These observations were corrected for differential atmospheric extinction and transformed differentially to the UBV system. Nightly means of the V observations are plotted in the figure where phase is computed with the ephemeris

$$\text{JD (hel.)} = 2{,}431{,}302.451 + 7\overset{d}{.}96037 \cdot E.$$

There is a faint visual companion for which we estimate $\rho = 18$ arcseconds, and $\theta = 120^{\circ}$. A correction of $+0\overset{m}{.}025$ has been added to the Kitt Peak data to allow for the fact that Burke and Mullins included the companion in the diaphragm during photometry while Henry excluded it. One relatively uncertain measurement of the companion relative to the comparison star yielded $\Delta V = 4\overset{m}{.}92$:. Combined with the brightness of the comparison star, $V=8\overset{m}{.}46 \pm 0\overset{m}{.}03$ according to Oliver (1974), this yields $V=13\overset{m}{.}4$ for the companion. Inclusion of a $V = 13\overset{m}{.}4$ companion would increase the deflections of MM Her outside eclipse by $0\overset{m}{.}03$, in fair agreement with the

$0\overset{m}{.}025$ shift we actually applied. No observations were obtained during the relatively short (D = 10 hours) eclipses.

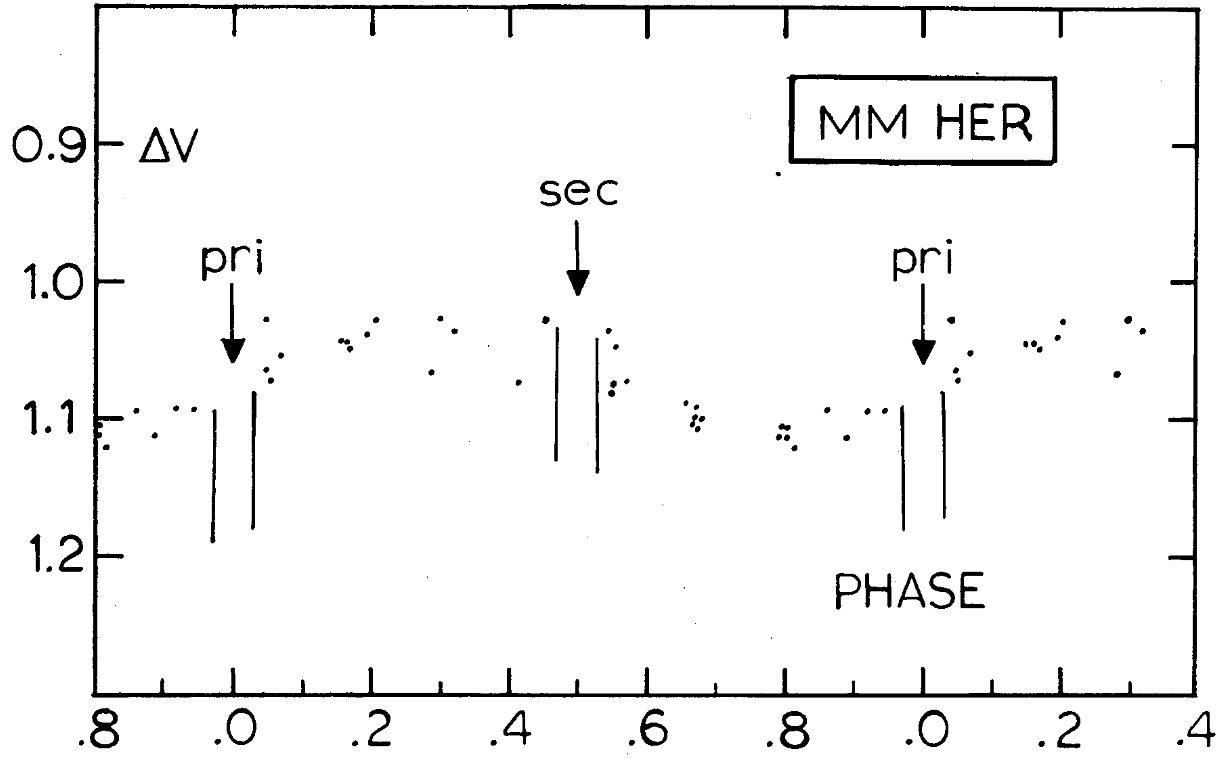
A nearly sinusoidal wave approximately $0\overset{m}{.}08$ in amplitude (from max. to min.) is apparent in V. The observations in B and U indicate amplitudes of approximately $0\overset{m}{.}07$ and $0\overset{m}{.}06$, respectively. Wave minimum occurs at phase $0\overset{p}{.}8$. The authors are continuing to observe MM Her in 1977 to see if the wave exhibits any migration in phase or variation in amplitude.

DOUGLAS S. HALL
GREGORY W. HENRY
Dyer Observatory
Vanderbilt University
Nashville, Tennessee

EDWARD W. BURKE, Jr.*
JEFFREY L. MULLINS*
King College
Bristol, Tennessee

References:
Hall, D.S. 1976, I.A.U. Colloquium No. 29, 287
Imbert, M. 1971, Astr. and Astrophysics, 12, 155
Oliver, J.P. 1974, Ph.D. Thesis, U.C.L.A.

*Visiting Astronomer, Kitt Peak National Observatory, which is operated by the Association of Universities for Research in Astronomy, Inc., under contract with the National Science Foundation.


MM HER
ΔV
0.9
1.0
1.1
1.2
pri
sec
pri
PHASE
.8
.0
.2
.4
.6
.8
.0
.2
.4

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1312

Konkoly Observatory
Budapest
1977 July 28

EVIDENCE OF MASS EJECTION FROM β PERSEI (ALGOL)

Observational evidence of mass ejection has been detected in the ultraviolet spectrum of β Per obtained from the Balloon-borne Ultraviolet Stellar Spectrometer (BUSS). The observations were obtained at JD 2442330.674 in the 24 Å spectral range centered at 2800 Å, which includes the Mg II resonance doublet at 2795.523 and 2802.698 Å and their respective subordinate lines at 2797.989 and 2790.768 Å. The spectrometer entrance slit had a width corresponding to 1/4 Å. The wavelength scale was determined to an accuracy of 1/4 Å.

The resonance lines are narrow and deep and the subordinate lines are markedly pronounced. Both features are analogous to those seen in shell stars. The deep subordinate lines are also characteristic of high luminosity objects (class I or II) in late B spectral types.

To be noted are the shortward-shifting (by 3/4 Å) of the entire set of Mg II lines, as also seen in the shell star ζ Tau (Morgan, Kondo and Modisette, Ap.J., 1977 September 1). The orbital phase of β Per at the time of observation was 0.314; as K_1 = km s^{-1}, the orbital velocity of the primary at that time (-17.6 km s^{-1}) cannot account for the shifting of the Mg II lines. One possible explanation is that all Mg II lines originate from an optically thick expanding shell. (The "photospheric" Mg II lines are theoretically thought to originate in the outermost layers.) The outflowing matter might have been undergoing an acceleration in the fashion of solar wind. If so, the observed expansion velocity of the shell, which is about 80 km s^{-1}, does not preclude the possibility that the mass was being lost from the binary system.

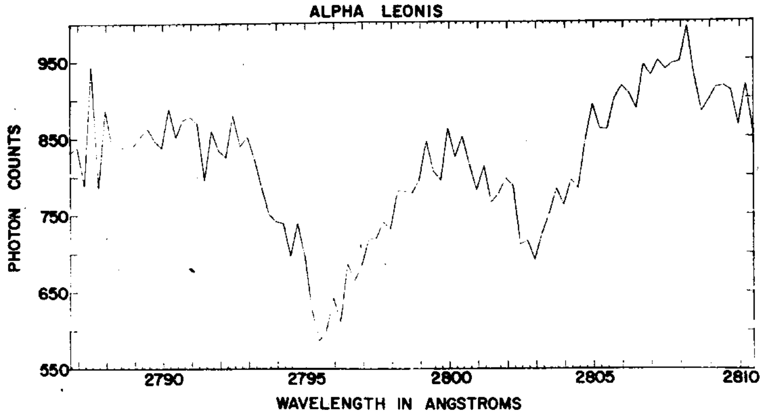
The Copernicus observations of the Mg II lines, obtained by

Chen and Wood (1976, MNRAS, 176, 5P) in January 1974 at phases between 0.845 and 0.093, did not show any measurable shifting of these lines beyond what can be accounted for as the radial velocity of the primary. A tentative explanation of the apparent difference is that the 1974 October 10 BUSS observations were obtained when a significant amount of mass was flowing out of the primary. Had appropriate observations been made at about the same time, Algol might have appeared as an active radio source and a weak X-ray source. Algol has been identified as an incipient radio source by Hjellming, Wade and Webster (1972, Nature Phys.Sci., 238, 52) and as an occasional weak X-ray source by Schnopper et al. (1976, Ap.J. 210, L75). Alternatively, it is possible that a steady-state, non-uniform flow produces different Doppler-shifts at different phases.

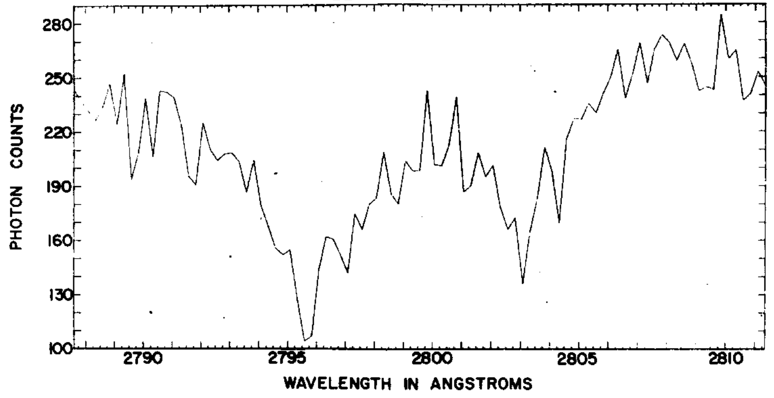
The BUSS spectrum of β Per (B8 V + K IV) is shown together with those of two comparison stars β Lib (B8 V) and α Leo (B7 V). Background has been subtracted in these plots. The spectral classification for β Per is by Hill et al. (1971, Ap.J., 168, 443).

YOJI KONDO
SC23
Johnson Space Center
Houston, TX 77058, U.S.A.

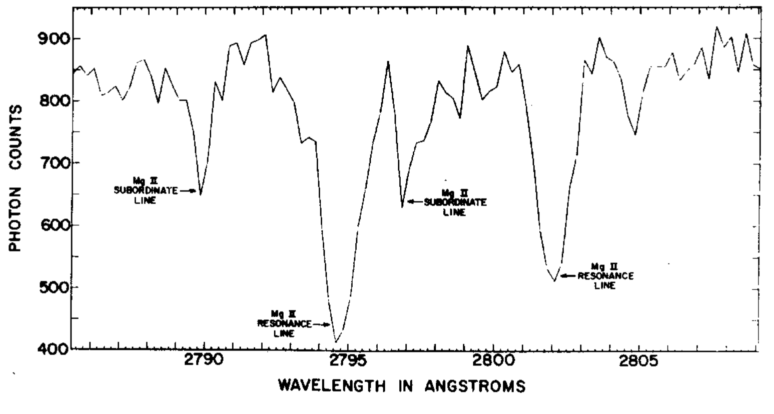
J.L. MODISETTE
T.H. MORGAN
Houston Baptist University
Houston, TX 77036, U.S.A.



ALPHA LEONIS



BETA LIBRAE



BETA PERSEI

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1313

Konkoly Observatory
Budapest
1977 July 29

CD $-30^{\circ}5135$

Photographic magnitudes for this star have been measured on two sets of UBV plates taken by Mr. A. Kinnander on Feb. 20, 1977, with the Schmidt telescope at Uppsala Southern Station at Mount Stromlo Observatory, Australia. The photometric calibration was made by means of a sequence established by Lodén (Ark. Astr. 5, 149, 1968; sequence 5-), about 30' south of the star. The following values were obtained, with an estimated error of about ±0.1 mag.

V = 9.3   B = 10.2   U = 10.6

Thus the star was then 0.3 – 0.4 mag. brighter than when it was observed by Humphreys in 1974 (PASP 87, 933, 1975).

A low-dispersion spectrogram covering the region 3600 – 5500 Å was kindly taken for me by Dr. A. Lauberts on Jan. 17, 1977, with the Boller and Chivens spectrograph at the 1.5 m telescope at ESO, Chile. No significant changes from the spectra reported by Humphreys (op. cit.) and myself (IBVS No 1139, 1976) were found, i.e., the spectral type is early F. Hβ is present in emission, whereas Hγ and Hδ are invisible.

In my previous paper on this star the radial velocity correction to the sun was inadvertently applied with the wrong sign. Hence all velocities should be increased by about 30 km/s, the metal line velocity on Dec. 2, 1973, being 159 km/s. However, this only strengthens the conclusion drawn in that paper, viz., that the observed radial velocity changes were not caused by the orbital motion of a spectroscopic binary.

GUNNAR WELIN
Astronomiska Observatoriet
Box 515
S-751 20 Uppsala, Sweden

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1314

Konkoly Observatory
Budapest
1977 July 29

SPECTRAL CHANGES IN V1331 CYGNI (LkHα 120)*

This unusual T Tauri star was included in a study of mass loss from T Tauri stars by Kuhi (Ap.J.140, 1409,1964). He used 16 Å/mm Lick spectra, in the case of V1331 Cygni unwidened because of the faintness of the star. The spectrum of V1331 Cygni was described as essentially continuous, with superposed emission lines. The early Balmer lines of hydrogen and the K line of ionized calcium showed P Cygni structure. Emission at the CaII H line was quenched by the shortward-shifted absorption component of Hε. Among other emission lines were found the 4063 Å and 4132 Å lines of neutral iron typical of T Tauri stars. No stellar absorption features were observed.

From the strength and displacement of the Hγ, Hδ and K absorption components Kuhi estimated the mass loss from V1331 Cygni to be of the order of $6x10^{-7}M_{\odot}$ per year. This is a considerably higher value than found for any other T Tauri star. In addition, Kuhi derived a mass of the star of about $4M_{\odot}$,also this higher than the masses of ordinary T Tauri stars. Although it should be remarked that the precise values are dependent on certain assumptions made by Kuhi for want of adequate data,they clearly put V1331 Cygni in a class of its own among the more thoroughly studied T Tauri stars.

In August, 1976, two spectrograms of V1331 Cygni were obtained with the 1.52 m telescope of l'Observatoire de Haute-Provence equipped with the PEDISCOU (PEtite DISpersion COUdé)spectrograph and an RCA two-stage image tube. The reciprocal dispersion of these spectrograms is about 100 Å/mm over the wavelength region 3700-5400 Å.

*Based on observations made at l'Observatoire de Haute-Provence (CNRS).

It was noted by Kuhi that the spectrum of V1331 Cygni had shown no appreciable changes over a period of about four years. In contrast to this the 1976 spectrograms show a marked weakening of the emission lines, and a strengthening of the absorption components of the hydrogen lines, when compared to the spectrogram reproduced by Kuhi. Thus, no emission is seen at Hγ and Hδ. The FeI 4063 Å line is also absent, and may even be weakly in absorption, whereas its companion line at 4132 Å is present in emission, although apparently weaker than in Kuhi's spectrum. The other lines of this FeI multiplet (43) seem all to be in absorption, as are a number of other lines, notably CaI 4227 Å and several TiII lines.

The similarities between the earlier spectrograms of V1331 Cygni and the only existing spectrogram of V1057 Cygni before its FU Orionis-like brightening in 1969-70 have been noted previously (Welin, Astron. Astroph. 49, 145, 1976). There is an interesting possibility that the spectral changes now observed in V1331 Cygni may be signs of an imminent flare-up of this star. However, occasional checks of the brightness of V1331 Cygni during the last year have so far not revealed any variations in excess of those already known.

GUNNAR WELIN

Astronomiska Observatoriet
Box 515
S-751 20 Uppsala, Sweden

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1315

Konkoly Observatory
Budapest
1977 August 3

PRELIMINARY ELEMENTS FOR BV 1621 CMa = HD 56429

Markworth (IBVS No.921) found this variable and published two minima. Popper and Andersen (IBVS No. 1298) obtained spectrograms which shows that the star is a spectroscopic binary with a period of approximately $4\overset{d}{.}80$. From their uvby photometry they found the period close to $4\overset{d}{.}801$, a deep secondary minimum and a duration of the minima of $0\overset{d}{.}35$.

A new investigation of all available Bamberg-Sky-Survey plates shows the following minima:

E	Min. (J.D.)$_{\odot}$	O - C	m_{pg}
0	$2438814\overset{d}{.}276$	$+0\overset{d}{.}003$	8.6
70	39150.384	+0.038	8.6
75	39174.291	-0.060	8.6
131.5	39445.539	-0.072	8.6
132.5	39450.516	+0.104	8.6
597.5	41683.038	+0.137	8.6
671.5	42038.048	-0.131	8.7

With this minima preliminary elements are established:

$$\text{Min.} = 2438814\overset{d}{.}273 + 4\overset{d}{.}801052 \cdot E.$$

In maximum-light, the star is constant at magnitude $8\overset{m}{.}1$ pg, it belongs to the Algol-class.

U. HOPP and M. KIEHL
Dr.Remeis Observatory,Bamberg

ELEMENTS FOR BV 840 Cen, BV 1172 Cen, BV 1444 Ara, V 449 Cen AND V 603 Cen

On plates of the Bamberg-Sky-Survey these five long-period variables were investigated using the Argelander-step method. The magnitudes of the comparison stars were determined with SA 153 and SA 177 (1). Using all maxima of Table 2, together with values of some ascending and descending branches, the elements of Table 1 were determined.

Table 1

	Type	E_o	P	Amplitude	N
BV 840 Cen	M	2438554^d	228^d	$9\overset{m}{.}8 - 12\overset{m}{.}6$ pg	126
BV 1172 Cen	M	38511	261	10.9 -(13.8	70
BV 1444 Ara	M	39298	266	11.8 -(13.9	109
V 449 Cen	SRb	39614	123	10.3 - 11.0	131
V 603 Cen	M	38898	253	11.1 -(13.4	60

(N=Number of plates with positive observations)

Table 2

	E	O	Date (J.D.)		m_{pg}	O-C
BV 840 Cen	O	M	2438547^d	:	10.3	$+ 7^d$
		m	38892		11.9	
	3	M	39238		10.2	± 0
		m	40731		12.6	
	11	M	41062		10.7	± 0
BV 1172 Cen	0	M	38521		11.5:	+10
	3	M	39295		11.5	+ 1
	7	M	40344		11.5:	+ 5
BV 1444 Ara		m	38945		13.6	
	0	M	39299		11.8	+ 1
		m	40028	:	13.7	
	4	M	40360		12.2	- 2
	11	M	42225	:	12.1	+ 1
V 449 Cen	0	M	39614		10.5	± 0
	3	M	39976		10.4	- 7
	9	M	40732		10.5	+11
	12	M	41090	:	10.7:	± 0
V 603 Cen	0	M	38898		11.2	± 0
	3	M	39657	:	11.1	± 0

U. HOPP and M. KIEHL
Dr. Remeis Observatory,Bamberg

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1316

Konkoly Observatory
Budapest
1977 August 4

PHOTOELECTRIC MINIMA OF W UMa

V photoelectric observations were carried out with a 21 cm reflector at Skibotn on three nights in January and February 1977. A chopping photometer (Myrabø, 1977) was used to eliminate the variation of the sky brightness caused by the aurora (Skibotn: latitude 69°22'). The photometer was furnished with an EMI 9601 A photomultiplier tube and Schott filter GG 14. BD +56°1399 was used as comparison star. The times of the minima are determined by the least squares method described by Kwee and van Woerden:

Minimum	J.D. Hel.	Phase interval
II	2443 155.5246±0.0004	0.12
II	157.1926±0.0004	0.12
I	183.3858±0.0003	0.10

The measurements were part of an investigation of photometric observations of stars in the auroral zone. During 1977 a new 50.8 cm telescope with a high-speed photometer will be installed. The long nights in winter at this high latitude where most of the sky is cirkumpolar favour variable star observations.

J. BØNES
Institute of Mathematical and Physical Sciences,
University of Tromsø,
Norway

H.K. MYRABØ
Norwegian Defence Research Establishment, Division for Physics, Kjeller,
Norway

Reference:

Myrabø, H.K. 1977, On stellar photometry in the auroral zone, The Auroral Observatory, Tromsø, Report No.44-77

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1317

Konkoly Observatory
Budapest
1977 August 4

HD 20301: AN ECLIPSING, DOUBLE-LINED EARLY G GIANT

Recently, Andersen and Nordström (1977) found HD 20301 to be a double-lined spectroscopic binary with sharp lines, equal components and small velocity amplitudes. Subsequently the system was found to show eclipses (Olsen 1977). The star is an early G giant, judging from both the photometry and the spectra, and it is a prime candidate for determination of fundamental masses and radii of evolved stars.

The system is not an RS CVn binary and does not show any convincing CaII H and K emission on the five 20Å/mm coudé spectra available so far (Andersen, private communication). In the group of 24 giant binaries discussed by Lloyd Evans (1977), HD 20301 fits in as a somewhat atypical early member without, or with extremely faint H and K emission.

Additional photometry in 1976 and 1977 by Drs.J.Andersen, B.Reipurth and the author has now made it possible to give three tentative ephemerides for the eclipses. The photometry has been obtained with the simultaneous four-channel spectrograph-photometer on the Danish 50 cm reflector on Cerro La Silla, ESO,Chile. The Table gives the individual observations reduced to the standard four-colour and V systems. This table is a continuation of Table 2 in Olsen (1977). The deepest minimum found as yet is $0\overset{m}{.}28$, $0\overset{m}{.}25$, $0\overset{m}{.}21$ and $0\overset{m}{.}19$ in u, v, b and y, respectively.

We strongly urge observers to observe more eclipses of this extremely interesting system in order to fix the period and improve the epehemeris. The most probable ephemeris is

$$\mathrm{HJD\ (MinI)} = 2443216\overset{d}{.}14+37\overset{d}{.}805\mathrm{xE} \qquad (1)$$

with the next eclipses expected at U.T. 1977 Aug. 11.9, Sep.18.7, Oct. 26.5, Dec. 3.3, 1978 Jan. 10.1, Feb. 16.9 and Mar. 26.7.

Primary eclipse may last about 24 hours. An observation within 9 hours of phase 0.5 has not revealed any eclipse. The double period $75\overset{d}{.}61$ cannot be excluded, but the available velocities favour the shorter period.

Another possible, but slightly less likely ephemeris is

$$\mathrm{HJD\ (MinI)} = 2443216\overset{d}{.}67+50\overset{d}{.}46\mathrm{xE} \qquad (2)$$

with nearly equal primary and secondary eclipses expected at U.T. 1977 Aug. 12.6, Sep. 6.8, Oct. 2.0, Oct. 27.2, Nov. 21.5, Dec. 16.7, 1978 Jan. 10.9, Feb. 5.2, Mar. 2.4 and 27.6.

A third possibility, with an excentric orbit and the secondary minimum displaced to phase 0.44 is

$$\mathrm{HJD\ (MinI)} = 2443216\overset{d}{.}71+44\overset{d}{.}18\mathrm{xE} \qquad (3)$$

with eclipses expected at U.T. 1977 Aug. 13.3, Sep. 6.9, Sep. 26.5, Oct. 21.1, Nov. 9.7, Dec. 4.3, Dec. 23.9, 1978 Jan. 17.5, Feb. 6.0, Mar. 2.7 and 22.2.

The 1980.0 coordinates of HD 20301 are $3^{h}13^{m}53^{s}$ and $-35^{\circ}37\overset{\prime}{.}8$.

ERIK HEYN OLSEN
Copenhagen University Observatory
Brorfelde, Denmark

References:

Andersen, J. and Nordström, B. 1977, Astron.Astrophys.Suppl., in press

Lloyd Evans, T. 1977, MNASSA 36, 41

Olsen, E.H. 1977, Astron.Astrophys.Suppl., in press

Table

HJD 2440000+	V	b-y	M1	C1	Observer
3029.80535	6.875	0.466	0.258	0.437	BR
3029.88713	6.878	0.467	0.257	0.434	BR
3030.77558	6.883	0.466	0.253	0.456	BR
3030.88539	6.878	0.474	0.245	0.442	BR
3031.83323	6.879	0.468	0.254	0.443	BR
3031.89801	6.879	0.469	0.258	0.438	BR
3032.75178	6.876	0.466	0.263	0.446	BR
3034.82254	6.880	0.464	0.257	0.441	BR
3034.89308	6.865	0.478	0.260	0.417	BR
3036.78249	6.877	0.469	0.256	0.437	BR
3049.78634	6.883	0.465	0.256	0.452	BR
3050.89130	6.875	0.462	0.265	0.438	BR
3051.75804	6.879	0.469	0.255	0.447	BR
3051.85721	6.880	0.469	0.260	0.438	BR
3052.76996	6.886	0.459	0.276	0.422	BR
3123.75091	6.879	0.461	0.265	0.443	BR
3124.56473	6.874	0.470	0.262	0.437	BR
3125.67673	6.875	0.465	0.268	0.425	BR
3126.77094	6.876	0.465	0.262	0.437	BR
3132.72024	6.889	0.453	0.274	0.452	BR
3133.71853	6.885	0.458	0.272	0.443	BR
3135.70173	6.875	0.458	0.275	0.422	BR
3136.72083	6.879	0.469	0.244	0.464	BR
3142.65766	6.882	0.470	0.245	0.452	BR
3147.69260	6.886	0.474	0.241	0.437	BR
3212.51030	6.874	0.463	0.262	0.422	EHO
3212.52919	6.875	0.467	0.251	0.434	EHO
3212.55007	6.873	0.469	0.249	0.440	EHO
3213.50629	6.868	0.468	0.253	0.432	EHO
3213.52677	6.864	0.465	0.256	0.441	EHO
3213.54912	6.869	0.468	0.248	0.450	EHO
3214.51173	6.876	0.468	0.249	0.446	EHO
3214.53842	6.879	0.462	0.255	0.448	EHO
3215.50912	6.865	0.472	0.248	0.433	EHO
3215.53921	6.883	0.471	0.241	0.458	EHO
3216.50982	7.045	0.489	0.286	0.416	EHO
3216.53556	7.050	0.486	0.287	0.416	EHO
3216.55798	7.055	0.491	0.284	0.418	EHO
3217.51024	6.876	0.471	0.249	0.443	EHO
3217.53876	6.880	0.466	0.257	0.444	EHO
3218.50864	6.881	0.462	0.264	0.431	EHO
3218.53981	6.888	0.464	0.256	0.444	EHO
3219.51239	6.879	0.468	0.252	0.440	EHO
3220.50919	6.877	0.465	0.262	0.432	EHO
3221.51055	6.870	0.468	0.253	0.439	EHO
3222.50940	6.877	0.466	0.257	0.431	EHO
3223.52	6.87:				EHO
3224.50	6.87:				EHO
3225.50	6.87:				EHO
3226.50307	6.879	0.469	0.251	0.422	EHO
3227.49834	6.859	0.461	0.253	0.426	EHO
3228.49854	6.881	0.464	0.258	0.441	EHO
3229.49308	6.881	0.470	0.254	0.439	EHO
3230.49486	6.902	0.467	0.266	0.448	EHO

Table (cont.)

HJD 2440000+	V	b-y	M1	C1	Observer
3231.49516	6.874	0.455	0.276	0.413	EHO
3232.49367	6.866	0.461	0.268	0.423	EHO
3234.49432	6.886	0.465	0.261	0.437	EHO
3235.49148	6.869	0.470	0.250	0.436	EHO
3235.51365	6.882	0.471	0.247	0.467	EHO
3236.49170	6.904	0.479	0.256	0.425	EHO
3237.49130	6.874	0.470	0.256	0.414	EHO
3238.48817	6.874	0.464	0.259	0.445	EHO
3240.488	6.87:				EHO
3242.48031	6.895	0.471	0.246	0.452	JA
3245.47404	6.887	0.458	0.264	0.438	JA
3251.47251	6.877	0.461	0.259	0.434	JA
3252.47774	6.917	0.464	0.262	0.417	JA
3254.47612	6.934	0.469	0.247	0.439	JA
3255.47528	6.882	0.463	0.257	0.438	JA
3256.47515	6.856	0.449	0.262	0.400	JA
3256.48065	6.843	0.458	0.258	0.381	JA
3259.47363	6.887	0.449	0.261	0.410	JA
3260.47625	6.907	0.462	0.278	0.395	JA

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1318

Konkoly Observatory
Budapest
1977 August 8

A RECONSIDERATION OF THE ORBITAL PERIOD OF AZ Cas

Ashbrook (1956) found that the cool supergiant AZ Cas was an eclipsing variable with a period of about 9.3 years. From magnitudes estimated on Harvard patrol plates covering the eclipses between 1901 and 1947 he derived the ephemeris :
Min = JD 2432484 + 3406 E.

Larsson-Leander (1959) noted that his photoelectric coverage of the 3rd and 4th contacts during the 1957 eclipse occurred about 6 days earlier than predicted from Ashbrook's ephemeris. In a discussion of the eclipse times Bonnell and Herczeg (1976) have concluded that the period should be revised to 3402^d. However, their ephemeris predicted the 3rd and 4th contact of the 1975 eclipse to occur on 1975 Nov. 17 and 27 $\pm 1^d$, respectively. Florkowski's (1975) photoelectric coverage of the eclipse shows the 4th contact occurred on 1975 Dec. 8, suggesting that P = 3402^d is too short. On the other hand, 1st and 2nd contacts as given by Florkowski (1975 Aug.2-3) and Tempesti (1975) (1975 Aug. 11) occurred 10 days too early to satisfy Ashbrook's ephemeris. Using all of these data we have derived periods based on comparing times of 1st, 2nd, 3rd and 4th contacts to be 3403±1.2, 3402±1.8, 3406±0.7 and 3405±1.4, respectively. Each figure is derived from between three and five eclipses between 1901 and 1975, but because of incomplete coverage not all the periods are determined from the same eclipses. From all of these data we derive an ephemeris:

$$\text{Min} = \text{JD } 2432481 + 3404\ (\pm 1^d)\ E.$$

We note that there is good evidence that in the last two eclipses for which we have observations (1957 and 1975) the duration of the eclipse was longer by ~9 and ~20 days than the mean duration

(~86^d) of the eclipses observed by Ashbrook. This change in eclipse duration does not extrapolate back through Ashbrook's observations, however. The effect is to make the periods derived from 1st and 2nd contacts shorter than the mean, and similarly those periods determined from 3rd and 4th contacts somewhat longer. The mean value should be unaffected. The increased duration of the minimum may have caused Bonnell and Herczeg to suggest an abrupt period change after the 1947 eclipse.

The same value of the period (3404^d) was also derived by a slightly different method, using the deviations of times of mid-eclipse from the values predicted by Ashbrook's ephemeris. This method is not quite as sensitive since the whole of totality was not usually observed and one must assume something about the eclipse duration, which appears to be variable. Presumably the variation in eclipse duration may be due to a change in radius of the primary star. Spectroscopic data on AZ Cas are discussed in full elsewhere (Cowley, Hutchings, and Popper 1977).

We thank Dr. Ashbrook (1975) for the use of his eclipse data in advance of publication.

A.P. COWLEY and J.B. HUTCHINGS

Dominion Astrophysical Observatory
Victoria, Canada

References:

Ashbrook, J. 1956 Harvard Obs. Announcement Card No. 1340

Ashbrook, J. 1975 Private communication

Bonnell, J.T., and Herczeg, T.J. 1976 IBVS No. 1146

Cowley, A.P., Hutchings, J.B., and Popper, D.M. 1977, in press

Florkowski, D.R. 1975 Private communication

Larsson-Leander, G. 1959 Arkiv Astron. 2, 347

Tempesti, P. 1975 IAU Circ, No. 2825

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1319

Konkoly Observatory
Budapest
1977 August 9

DATA ON THE VARIABLE STAR STUDIES IN THE USSR DURING 1972-1975

Only a small part of the "Data on the Variable Star Studies in the USSR during 1972-1975" is contained in the Reports on Astronomy, volume XVI A, part 2, 1976.

Here we present the missing part of the "Data" according to kind permission of President of the IAU Commission 27, Dr.J. Smak.

1. General Data

The 60th name list of variable stars (498 objects) was published. The "Third Supplement" is being prepared, the 61st name list of variable stars containing 200 objects is in press. The work on the storage of the Catalogue data on a magnetic tape is under way.

The last, 5th volume of the series of monographs on variable stars "The Phenomena of Non-Stability and Stellar Evolution" was published (ed. A.A.Boyarchuk and Yu.N.Efremov). The monographs "RW Aurigae Type Stars" by V.P.Tsesevich and B.A.Dragomiretskaya, "Nova-like Stars and Novae" by V.G.Gorbatsky and "Novae and Supernovae" by Yu.P.Pskovsky were published. The edition of the bulletin "Variable Stars" was continued. 11 issues of bulletin and 6 Supplements were published during the period.

The Odessa depositarium of the photoelectric observations of the variable stars received 34 lists of observations of 65 stars in 1973-1975 (see Astron.Circ. 765 and 844). The photographic sky patrol was continued in Odessa (Mayaki station) and in Dushanbe; at the Sternberg Institute and its Crimean station the regions of clusters and associations were photographed.

2. The Orion and flare stars

In 1973 co-operative observations of four T Tau stars (RY Tau, T Tau, AB Aur, NU Ori) were carried out at six observatories. The results of photometric, polarimetric and IR spectroscopic investigations are given by Shanin et al. (Var.Stars, 1975, in press). Shanin, Shevchenko and Shcherbakov (Proceed. IAU Symp.67) obtained IR spectra of four T Tau stars; they found P Cyg profiles for He I 10380 line in the spectra of T Tau and V 1057 Cyg. On the basis of the analysis of television observations of 12 T Tau stars in seven spectral regions Petrov (Crimean Publ. 54, 1975) concluded that for more massive stars the non-stability is caused by processes in the dust envelope mainly whereas for low mass stars the non-stability resembling the chromospheric activity dominates. Zaitseva et al. (Astrofisika 10, No.3, 1974) investigated the changes of emission lines in the spectrum of RY Tau.

Zakirov (Tashkent) found that 71 per cent of T Tau stars in four T-associations are members of binary systems or Trapezium Ori systems. Satyvoldiev and Filin (Dushanbe) confirmed the reality of the association Sco T-1; among 57 variables in this association 47 were discovered by them. Dragomiretskaya (Astron. Circ. 824) found that for the stars of T-associations in Taurus the nearer the star to the initial main sequence, the higher the intensity of the H-alpha emission.

Karetnikov and Pugach (IBVS 783, Var.Stars, 1975) came to the conclusion that the explanation of the variability of stars showing Algol-like fadings in terms of the hypothesis of the circumstellar dust envelope meets difficulties.

Gershberg and Chugainov (Ap. and Sp. Sci. 19,75,1972, Crimean Publ. 50,93,1974) carried out the analysis of many-years co-operative observations of flare stars and estimated the statistical parameters of their activity. Krasnobabtsev and Gershberg (Crimean Publ. 53, 154, 1975) carried out the statistical analysis of the observations of flare stars in the Pleiades and Orion and found some statistical parameters common for both samples of flare stars in clusters and solar neighbourhood. There are similar features in the energy distribution of flares in wide ranges of luminosity and ages. Kulapova and

Shakhovskaya(Crimean Publ.49,65,1974) found out that in the system EQ Peg both the faint and the bright component show flare activity.

Gershberg and Shakhovskaya(Crimean Publ. 49, 73, 1974) found a correlation between the spottedness of BY Dra and the intensity of its emission spectrum and concluded that electromagnetic activity similar to that of solar chromosphere causes isolated flares of UV Ceti type as well as slow light variations of BY Dra type.

Shakhovskaya(Crimean Publ. 50,84,1974) found a correlation between the rate of the fading after the flare and the luminosity at maximum light which is common for 11 stars in the luminosity range from $+8^m$ to $+16^m$. She also carried out quantitative analyses of more than 100 spectrograms of 43 dK2e-dM8e stars and, particularly, found another correlation between the luminosity of quiet chromosphere of the star and the energy emitted during flares (Crimean Publ. 51, 92, 1974).

Gershberg (Russian AJ 51, 552, 1974; Crimean Publ. 51,117, 1974) evaluated the electron density of the flare stars chromospheres and concluded that at this density the agent exciting the flares acts during the time nearly equal to that of the optical flare.

3. Other eruptive variables

Gorbatsky (Russian AJ 50,19,1973; ibid. 51, 753,1974) investigated the causes for the coronal lines appearance in the Novae spectra and the mechanism of matter outflow after the separation of the main envelope. He found that outbursts of U Gem stars occur when the outflow of matter from the companion is increasing due to the non-stability of convection (Russian AJ Lett., 1, 23, 1975). He also investigated the genetic connection between U Gem and W UMa stars (Ap. and Sp.Sci.,1975).

Mustel (IAU Symp. 67) argumented for existence of strong magnetic fields at the Novae. Sharov and Alksnis continued the search for Novae in the Andromeda nebula and its surroundings.

The thorough investigations of R CrB stars were carried out at Abastumani and Kiev; Proceeding of Colloquium on this topic held in Kiev in October 1973 are published (Var.Stars 19, No.6, 1975). Orlov and Rodriges (Astr.and Ap.31,203,1974; Astron.Circ.

813, 1974) investigated the spectra of RY Sgr and XX Cam; they found that the spectrum of DZ And is like that of a normal K-giant. The theory of envelopes of the stars and energy transport in them was elaborated by Zhilyaev, Redkoborody, Shulman (Astrometry and Ap. 22, 21, 1974; ibid. 22, 30, 1974). Totochava discovered light variations with amplitude $0^{m}.15$ and the cycles 30-40 days for R CrB and XX Cam. Pugach confirmed the existence of permanent re-emitting envelope of RY Sgr and found that deep minima do not change the phases of 38-day pulsations.

Sharov (Var.Stars 19, 3, 1973) obtained light curves of luminous irregular blue variables in M 31 and M33. Shulov and Kopatskaya (Astrofisika 10, 117, 1974) discovered the light variations of the white dwarf G 29-38.

4. Pulsating variables

The Odessa Observatory headed by Prof.V.P. Tsesevich continued the compilations of ephemeris for bright RR Lyrae stars which are published in Cracow (SAC 45,46,47). More than 2000 maxima for more than 100 stars were determined in 1973-1975. Romanov et al. (Astron. Circ. 787), Firmanuk (Astr.Circ. 828, 843), Frolov (Astron. Circ. 745) studied the Blazhko effect; RZ Lyr, RR Lyr, XZ Cyg, KX Lyr, TV Boo, ST Boo and SX Phe were investigated.

Kukarkin (IAU Symp. 67) gave the review on RR Lyrae and W Virginis stars; he stressed the non-homogenity of these stars entering halo as well as disk population. Frolov (Astron. Circ. 759, 1973) found the luminosity of RR Lyrae field stars to be possibly no more than $+1^{m}$. He concluded also that Delta Scuti and AI Velorum stars may be separated according to their light amplitudes only if their periods are smaller than $0^{d}.1$.

It was found (Frolov, Var. Stars 19, 327, 1975) the factor "p" for the conversion from radial to pulsation velocity to be equal to 1.28 instead 1.41 for stars with tenuous atmospheres.

Efremov and Kholopov (IBVS 1073, 1975 ; Var.Stars 20, No.2, 1976) confirmed their conclusions of 1967 that V 367 Sct is double mode Cepheid with the fundamental period $6^{d}.2930$ and obtained the secondary period $4^{d}.3849$. This is the only double mode cepheid in an open cluster (NGC 6449). Efremov (Astron. Circ., 1975 in press; 3rd European Meeting 1975) obtained the periodage relation based on 70 Cepheids connected with more than 30 clusters and associations of the Galaxy and Magellanic Clouds. This relation is close to theoretical one of Kippenhahn and Smith.

Erleksova divided the RV Tauri stars into groups according the physical and kinematical criteria. The existence of RV Tau stars with periods similar to those of W Vir stars was established. Kiseleva found two sequences of Mirae in the color-magnitude diagram and concluded that B-V and U-B for these stars correlate with the carbon and oxygen abundance. Vasilyanovska concluded that the difference between Cepheid light curves may be explained by variation in the phase lag between maxima of fundamental and overtone pulsations. These works were carried out at the Dushanbe Observatory.

Shanin and Shcherbakov (Crimean Publ. 53, 1975) investigated the spectrum of ζ Gem in the range 10580-11020 A^{o}.Klimishin (Ap. and Sp.Sci. 22, 1973) elaborated the theory of shock and thermal waves in atmospheres of Novae and pulsating stars.

5. X-ray sources

Kurochkin (Astron.Circ. 717; Circ.IAU 2436, 1972) proved the identity of Her X-1 with HZ Her having found for the latter the period equal to that of the X-ray variation. Cherepashchuk, Efremov, Kurochkin, Shakura and Sunyaev (IBVS 720, 1972)explained the optical variations of HZ Her as the consequence of optical re-emission of the X-ray radiation of compact component at the surface of colder star ("reflecting" effect). The theory of this re-emission was elaborated by Basko and Sunyaev (Ap. and Sp. Sci. 23, 117, 1973). Efremov, Sunyaev and Cherepashchuk (Var. Stars 19, 407, 1974) examined the photometric effect in close binary systems with X-ray sources; they suggested that Cyg X-2 may be a system of HZ Her type and noted the division of X-ray sources into two groups belonging to the extreme Population I and to the Population II. Karimova and Pavloskaya (Astron. Circ. 868, 883, 1975) showed that the galactic orbit of Cyg X-1 = V 1357 Cyg is typical for Population I objects whereas the orbit of Her X-1 = HZ Her is similar to those of Population II stars.

Cherepashchuk et al.(Var.Stars 19,no.4, 1975) carried out photoelectric photometry of HZ Her and V 1357 Cyg.

PROFESSOR B.V. KUKARKIN
President of Moscow Bureau
on Variable Stars

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1320

Konkoly Observatory
Budapest
1977 August 10

ON THE VARIABLE STAR UU SAGITTAE

This eclipsing star has been studied by Bezdenezhny and Tsessevich (1) and the following elements have been obtained

$$\text{Min.hel.JD} = 2432797.283 + 0.4650697 \cdot E. \qquad \text{(A)}$$

Recently Bond (2) has discovered that this star is the nucleus of a planetary nebula which makes it distinguished among all the other objects. Müller, Krzeminski and Priedhorsky (3) confirmed the eclipsing character of light variation independently of us and determined nearly the same value of the period. They also reported the moment of the minimum observed which I have taken into account when I have improved the period evaluated by me.

Since the time my book (1) was published, more and more sky photographs of Moscow collections have been gained. From these new observations a mean light curve (Fig. 1) and a moment of minimum have been obtained by me. All the known moments are given in the table; the O-C residuals are calculated with the new improved formula:

Moments of minima of UU Sagittae

Min.hel.JD	E	O-C	Source of Information
2432797.283	0	+0.003	Simeis
3033.534	508	- .002	"
3447.439	1398	- .009	"
3448.379	1400	+ .001	"
7163.358	9388	+ .006	Moscow
7176.381	9416	+ .007	"
40512.310	16589	- .007	"
0819.266	17249	+ .003	"
1475.468	18660	- .008	"
1564.312	18851	+ .007	"
2626.520!	21135	- .003	"
3013.928	21968	+ .002	IAU Circ.2974

$$\text{Min.hel.JD} = 2432797.2805+0.46506944 \cdot E; \; P^{-1}=2.1502165. \qquad \text{(B)}$$

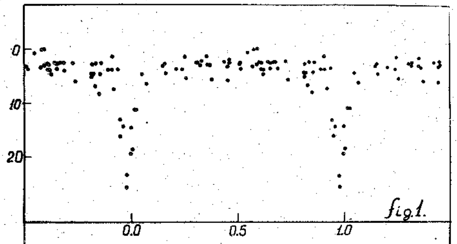


fig.1.

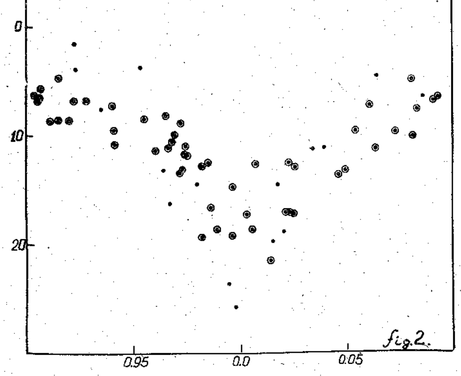


fig.2.

In Figure 2 observations ranging from phases $-0\overset{P}{.}1$ to $+0\overset{P}{.}1$ reduced to one period with the formula (B) are shown. As is seen from Figure 2 the light curve undergoes essential fluctuations which are not unexpected.

V.P. TSESSEVICH
Odessa Astronomical
Observatory
U.S.S.R.

References:

1 Tsessevich, V.P., "Studies of Variable Stars in Selected Regions of the Galactic Field", Kiev
2 Bond, H.E., PASP, No.522, 192
3 Miller, J.S., Krzeminski, W., Priedhorsky, IAU Circular 2974

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1321

Konkoly Observatory
Budapest
1977 August 10

ECLIPSE TIMINGS OF CATACLYSMIC VARIABLES

The following heliocentric times of eclipse of the cataclysmic variable U Gem have been obtained from photoelectric observations made in blue light with the No. 2, 91-cm telescope at Kitt Peak National Observatory.

HJD	(O-C)	(O-C)	Eclipse Depth (mag)	Eclipse Width (day)
2443192.7960	+0.0079	-0.0007	0.70	0.0143
2443193.6806	+0.0080	-0.0006	0.65	0.0137
2443195.8038	+0.0083	-0.0003	0.71	0.0134

Residuals in the second column are based on light elements given by Krzeminski (Ap. J. 142, 1051, 1965), while those in the third are based on the quadratic solution given by Arnold, Berg, and Duthie (Ap. J. 206, 790, 1976).

G. S. MUMFORD
Tufts University
Medford, Mass USA

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1322

Konkoly Observatory
Budapest
1977 August 10

SPECTROSCOPIC OBSERVATIONS OF V389 CYGNI

Hoffleit (1977) has recently called for intensive new spectroscopic and photometric observations on V389 Cygni. This star was on the spectroscopic program of the David Dunlap Observatory from 1971-1974. During that time about 100 12Å mm^{-1} spectrograms were obtained. The analysis of this material is still underway, but it is possible to make a few preliminary comments.

Periods shorter than the $3^{d}.3$ period found by Young are not present. The $3^{d}.3$ period is present in our data set, but the scatter about the velocity curve is enormous considering the quality of the spectra - $\underline{v}\sin\underline{i} < 15$ km s^{-1}. However, multiple plates taken on a single night do not show this scatter. They are found to fit the mean velocity curve well provided a different V_o is adopted for each night. I have therefore concluded that the system is triple. The long period may be $\sim 150^d$, but periods of $\sim 110^d$ and $\sim 270^d$ are also possible.

C.T. BOLTON

David Dunlap Observatory
P.O. Box 360
Richmond Hill, Ontario
Canada L4C 4Y6

References:
Hoffleit, D. 1977, I.B.V.S. No. 1283
Young, R.K. 1921, Pub. D.A.O. 1, 319

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1323

Konkoly Observatory
Budapest
1977 August 11

DUPLICITY AND SPECTRAL TYPES OF HV 10814

HV 10814 = CSV 2851 was discovered by Swope (Harv. Ann. 109, no. 9, 1943), who remarked: "there is variation in median magnitude during a season, with rapid variations superposed". Sanduleak and Stephenson (IBVS no. 770, 1973) found that the spectral type was dM3e, with H and Ca II emission. Busko, Quast and Torres (IBVS no. 1275, 1977) discovered that the star varied sinusoidally in light over a range of $\Delta B = 0.15$ mag. with, tentatively, a period of 2.69 days.

The star was observed on 1977 July 7 at the coude focus of the Lick 120-inch reflector, and was found to be in fact a visual double. The separation was estimated as about 3" in p.a. 200°, with $\Delta m = 1-2$ mag. Slit spectrograms (dispersion 34 A mm^{-1}, covering the yellow-red region) of the individual stars show that the brighter component is type M3e V, in agreement with Sanduleak and Stephenson; Hα is a strong, narrow emission line and the He I lines $\lambda\lambda$5875, 6678 are weakly in emission. The fainter component is M4e V, with narrow bright Hα but without He I emission. The radial velocity determined from the single spectrogram of star A is -18 km sec^{-1}, while B was measured as -28 km sec^{-1}. Experience with velocities measured on such plates indicates that the standard deviation of one of these velocities is about 4 km sec^{-1}, so that a common velocity for the pair is not ruled out. It is not apparent which star is the variable.

G. H. HERBIG
Lick Observatory
University of California
Santa Cruz, California 95064,U.S.A.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1324

Konkoly Observatory
Budapest
1977 August 11

A NEW VARIABLE Be STAR : HD 218 393

HD 218 393 (MWC 397, BD+49°4045) is a well-known Be star exhibiting very pronounced spectral variations. Struve (1944), Halliday (1950) and Doazan and Peton (1970) observed cyclic appearance and disappearance of the metallic shell lines, repeating every 35 - 40 days. Because these variations were not strictly periodic, they interpreted them invariably as a consequence of some sort of atmospheric oscillations. Kriz and Harmanec (1975) analyzed all available velocities of the star and suggested that the object may be a strongly interacting spectroscopic binary, with a possible orbital period of 38.873 days. Polidan (1976) proved the binary nature of the star by the discovery of some lines of the secondary component in the infrared part of the spectrum. According to him, the system consists of a B3e primary and a gK1 secondary.

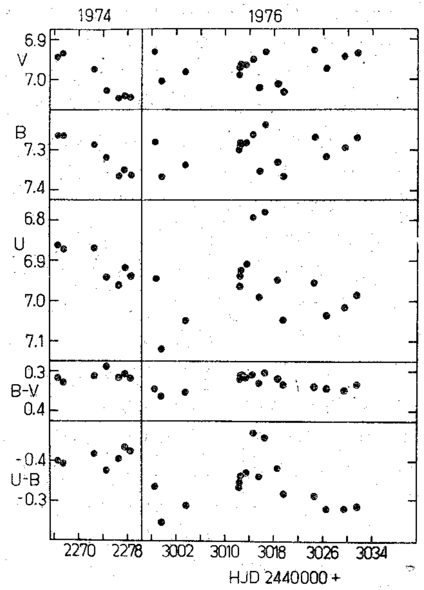
We observed the star photoelectrically, in the UBV system, at the Hvar Observatory (Jugoslavia) during two summer periods: in 1974 and in 1976. All the measurements were carried out differentially, using 5 And as the primary comparison star, and transformed to the international UBV system (for the description of measuring technique and reduction see Harmanec et al. (1977)). From absolute photometry, using a set of standard stars, we derived the following values for 5 And: $V=5\overset{m}{.}682$, $B-V=0\overset{m}{.}434$ $U-B=0\overset{m}{.}011$. These values give an estimate of the spectral type of 5 And to be F4V which well agrees with the spectroscopic classification F5V.

All the UBV measurements of HD 218 393, which we present in Table 1, were derived differentially, using the above (fixed)

Table 1

HJD	V	B	U	B-V	U-B	N
42266.551	6.945	7.265	6.864	0.319	-0.401	5
42267.512	6.935	7.265	6.873	0.330	-0.392	2
42272.489	6.974	7.288	6.872	0.314	-0.416	6
42274.506	7.028	7.318	6.943	0.290	-0.375	3
42276.476	7.047	7.366	6.963	0.318	-0.403	6
42277.487	7.041	7.351	6.919	0.310	-0.432	4
42278.494	7.044	7.363	6.941	0.320	-0.423	4
42998.520	6.933	7.280	6.947	0.347	-0.334	4
42999.486	7.004	7.368	7.122	0.364	-0.246	2
43003.527	6.983	7.338	7.049	0.355	-0.289	7
43012.401	6.989	7.300	6.965	0.312	-0.336	4
43012.437	6.972	7.284	6.938	0.312	-0.346	4
43012.517	6.966	7.287	6.925	0.322	-0.362	3
43013.388	6.965	7.282	6.911	0.316	-0.371	3
43014.469	6.952	7.263	6.794	0.311	-0.469	4
43015.484	7.022	7.355	6.993	0.332	-0.361	3
43016.559	6.934	7.238	6.781	0.304	-0.457	4
43018.490	7.012	7.331	6.950	0.319	-0.381	2
43019.374	7.032	7.367	7.048	0.335	-0.318	5
43024.497	6.928	7.269	6.955	0.341	-0.313	4
43027.477	6.973	7.317	7.037	0.343	-0.280	4
43029.442	6.946	7.296	7.017	0.349	-0.279	6
43031.405	6.937	7.271	6.986	0.334	-0.286	2

Fig. 1



values for 5 And. Extinction was measured every observing night.

Measurements in all three colours are plotted in Fig. 1. It is apparent that the brightness of the star varies for at least $0\overset{m}{.}1$ in V and B, and $0\overset{m}{.}3$ in U colour. In 1974, we observed a gradual decline taking place during about ten days. The minimum corresponds roughly to the phase of maximum velocity (if the 38.9 day period is assumed). In contrast to is, more rapid variations prevail in 1976. Clearly, our data are insufficient for some more detailed analysis. We continue with the observations and appeal also to other observers interested in the field to secure more data about this extremely interesting Be star.

P. HARMANEC, J. HORN, P. KOUBSKY, S. KRIZ
Astronomical Institute, 251 65 Ondrejov,
Czechoslovakia
Z. IVANOVIC, K. PAVLOVSKI
Hvar Observatory, 58450 Hvar, Jugoslavia

References:

Doazan, V., Peton, A. (1970) Astron. Astrophys. 9, 245
Halliday, I. (1950) J. Roy.Astron.Soc. Canada 44, 149
Harmanec, P., Grygar, J., Horn, J., Koubsky, P., Kriz, S., Zdarsky, F., Mayer, P., Ivanovic, Z., Pavlovski, K., (1977) Bull. astr. Inst. Czech. 28, 133
Kriz, S., Harmanec, P. (1975) Bull. astr. Inst. Czech. 26, 65
Polidan, R.S., (1976) in "Be and Shell Stars" (ed.by A.Slettebak), D. Reidel Dordrecht-Holland, pp. 405-407
Struve, O. (1944) Astrophys.J. 99, 75

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1325

Konkoly Observatory
Budapest
1977 August 12

XX CEPHEI: NEW TIMES OF MINIMUM AND A STUDY OF THE PERIOD

The A8 single-spectrum (Struve, 1946) eclipsing system XX Cephei, was observed photoelectrically with the 60 cm telescope at Loiano (Bologna). Nine new times of minimum, derived by the Kwee-Van Woerden's method are reported in Table I, along with the standard errors, the number of single observations used in the determination of the minima and the colour of the observations (columns 1, 2, 3 and 4, respectively).

Table I

	J.D. hel (-2400000)	sigma	n	colour
I	40506.4019	.0002	86	blue
I	40866.3467	.0004	8	blue
I	40866.3485	.0006	8	yellow
I	40887.3841	.0007	18	blue
I	40887.3841	.0007	19	yellow
I	41539.4973	.0003	36	blue
I	41539.4972	.0002	39	yellow
II	41608.443	.003	30	yellow
II	41622.476	.001	44	yellow

Several authors pointed out a variability of the orbital period (Fresa, 1953; Lavrov, 1957; Koch and Koch, 1962; Kopal, 1965). The presence of an apsidal motion was suspected by Fresa (1953). In his classical paper Kopal (1965) indicated the possibility of an apsidal motion and , on the basis of Iljasova (1946), Struve (1946), and Fresa's (1953) data he was able to calculate a value U/P=10000 ± 1200. With the present data we can rule out this possibility. Table II collects these data, with no claim of completeness. We underline the fact that any argument founded on the analysis of the secondary minimum must be considered with caution. This minimum is in fact very shallow, about $0\overset{m}{.}03$ in blue and yellow colours, according to our well observed light-curve.

The period, however, appears not to be constant: in fact the primary minima cannot be represented by a unique linear relation. For the first sixteen minima (Table II) a least squares solution gives:

$$\begin{array}{l} \mathrm{Min.} = \mathrm{JD}\ 2425096.449 + 2\overset{d}{.}337340\cdot E \\ \qquad\qquad\qquad\quad \pm .\ \ 8\ \pm .\qquad 4 \end{array} \qquad (1)$$

For the remaining ones the least squares linear ephemeris turns out to be:

$$\begin{array}{l} \mathrm{Min.} = \mathrm{JD}\ 2441539.4917 + 2\overset{d}{.}3373059\cdot E \\ \qquad\qquad\qquad\quad \pm .\ \ \ 5\ \ \pm .\qquad\ 5 \end{array} \quad (-4801 \leq E \leq 643) \qquad (2)$$

The best fit with our own observations (1969-1973) is obtained with the ephemeris:

$$\begin{array}{l} \mathrm{Min.} = \mathrm{JD}\ 2441539.4971 + 2\overset{d}{.}337321\cdot E \\ \qquad\qquad\qquad\quad \pm .\ \ \ 6\ \ \pm\qquad\ 2 \end{array} \qquad (3)$$

In these solutions the minima are weighted with the criterion of inverse proportionality to the squares of mean errors, when published; in the other cases the weights were attributed on the basis of subjective considerations (photoelectric, photographic or visual observations; number of points, etc.). The O-C values (Fig.1) correspond to (2).

A parabolic-like fit does not improve the run of the residuals and in this case one must assume the old visual or photographic data to be affected by large errors; this, however, is not reasonable because the primary minimum is deep (about 1^m) and, following our observations, symmetric. Some unreasonably great residuals can be found even by using the linear ephemerides of (1) and (2) but in this cases there is not a serious systematic trend. This can perhaps be accounted for with some variation of the light-curve. Our photoelectric light-curves (unpublished) do no agree with those of Iljasova (1946) and Fresa (1953, 1956) but are consistent with those of Schneller (1930) and Lavrov (1957). In all cases these variations, if real, are neither drastic nor rapid.

Table II

XX Cephei (Min.=JD 2441539.4917+$2^{\mathrm{d}}.3373059 \cdot E$)

JD HEL	SIGMA	E	O-C	REFERENCE
2414931.400		-11384	-.201	LAVROV,1959
15291.350		-11230	-.196	,,
17196.190		-10415	-.261	,,
19255.410		-9534	-.207	,,
25124.470		-7023	-.122	,,
25131.500		-7020	-.104	,,
25442.365		-6887	-.101	,,
25484.436		-6869	-.101	TSESEVITCH,1954
25851.405		-6712	-.089	KOCH AND KOCH,1962
25858.417		-6709	-.089	,,
28574.398		-5547	-.058	LAVROV,1959
28595.433		-5538	-.059	,,
28607.148		-5533	-.030	,,
28810.469		-5446	-.055	,,
28920.332		-5399	-.045	,,
29775.889		-5033	.058	,,
30318.100		-4801	.014	,,
30589.228		-4685	.014	,,
30603.229		-4679	-.008	,,
30610.250		-4676	.001	,,
30617.284		-4673	.023	,,
32059.37		-4056	-.009	KOCH AND KOCH,1962
32204.285		-3994	-.007	,,
32232.33		-3982	-.010	,,
32612.09		-3819.5	-.062	,,
32954.561		-3673	-.006	,,
33099.464		-3611	-.016	,,
33134.51		-3596	-.030	,,
33155.555		-3587	-.020	,,
33445.426		-3463	.025	LAVROV,1959
33587.97		-3402	-.007	,,
33889.494		-3273	.005	,,
34039.078		-3209	.001	,,
34041.415		-3208	.001	,,
34060.114		-3200	.001	,,
34061.302		-3199.5	.021	KOCH AND KOCH,1962
34062.451		-3199	.001	LAVROV,1959
34088.162		-3188	.002	,,
34387.337		-3060	.001	,,
34394.349		-3057	.001	,,
34457.455		-3030	.000	,,
34543.921		-2993	-.014	KOCH AND KOCH,1962
34623.395		-2959	-.009	,,
34630.415		-2956	-.000	,,
34768.319		-2897	.002	LAVROV,1959
34903.883		-2839	.003	KOCH AND KOCH,1962
34949.468		-2819.5	.010	,,
34983.350		-2805	.001	LAVROV,1959
35240.452		-2695	-.000	KREINER,1971

Table II (cont.)

JD HEL	SIGMA	E	O-C	REFERENCE
2435247.468		-2692	.004	KOCH AND KOCH,1962
35275.510		-2680	-.002	"
36285.234		-2248	.006	LAVROV AND LAVROVA,1973
37255.205		-1833	-.005	"
37790.450		-1604	-.003	DUEBALL AND LEHMANN,1965
37790.451		-1604	-.002	"
37921.349		-1548	.007	"
38087.315	.001	-1477	.024	OBURKA,1964
38295.3105		-1388	-.0006	"
38302.3209		-1385	-.0021	KORDYLEWSKY,1964
38727.708		-1203	-.005	ROBINSON,1965A
38739.392		-1198	-.007	LAVROV AND LAVROVA,1973
38786.138		-1178	-.007	"
39057.265		-1062	-.008	AHNERT,1967
39057.274		-1062	.001	POHL AND KIZILIRMAK,1966
39057.280		-1062	.007	"
39080.649		-1052	.003	ROBINSON,1965B
39087.650		-1049	-.008	ROBINSON,1966A
39094.664		-1046	-.006	"
39183.520		-1008	.033	ROBINSON,1966B
39384.502	.005	-922	.006	CZERLUNCZAKIEWICZ & FLIN,1968
39384.508	.005	-922	.012	"
39433.569		-901	-.010	ROBINSON,1967
39702.379		-786	.010	LOCHER,1967
39737.446		-771	.017	KIZILIRMAK AND POHL,1968
39821.582		-735	.010	BALDWIN,1973
40090.360		-620	-.002	LAVROV AND LAVROVA,1973
40097.373		-617	-.001	KIZILIRMAK AND POHL,1970
40139.442		-599	-.003	"
40237.617		-557	.005	BALDWIN,1973
40473.660		-456	-.020	"
40506.4019	.0002	-442	-.0006	THIS PAPER
40513.419		-439	.005	KIZILIRMAK AND POHL,1970
40520.426		-436	-.000	KIZILIRMAK AND POHL,1971
40737.789		-343	-.007	BALDWIN,1975
40742.471		-341	.001	"
40859.339		-291	.003	"
40866.3473	.0003	-288	-.0003	THIS PAPER (*)
40887.3841	.0005	-279	.0007	THIS PAPER (*)
41060.344		-205	.000	LAVROV AND LAVROVA,1973
41060.351		-205	.007	LOCHER AND DIETHELM,1971
41214.61	.01	-139	.004	MEYER,1972
41303.429		-101	.005	LAVROV AND LAVROVA,1973
41359.525		-77	.006	"
41380.560		-68	.005	"
41420.294		-51	.005	"
41448.340		-39	.003	"
41490.414		-21	.006	PETER,1972
41539.4972	.0002	0	.0055	THIS PAPER (*)

Table II (cont.)

JD HEL	SIGMA	E	O-C	REFERENCE
2441608.443	.003	29.5	.001	THIS PAPER
41622.476	.001	35.5	.010	THIS PAPER
41628.309		38	-.000	DIETHELM,1972
41628.317		38	.008	LAVROV AND LAVROVA,1973
41649.359		47	.014	PETER,1975A
42439.340		385	-.014	LOCHER,1975
42439.383		385	.029	DIETHELM,1975
42453.383		391	.005	PETER,1975B
43042.399		643	.020	PETER,1976

REFERENCES:

AHNERT,P., MITT.VERANDERL.STERNE,SONNEBERG,4,137,1967.
BALDWIN,M.E., I.B.V.S.,795,1973.
BALDWIN,M.E., A.A.V.S.O.,4(2),86,1975.
CZERLUNCZAKIEWICZ,B.,FLIN,P. ACTA ASTRON.,18,331,1968.
DIETHELM,R., B.B.S.A.G.,6,1972.
DIETHELM,R., B.B.S.A.G.,21,1975.
DUEBALL,J.,LEHMANN,P.B., ASTRON.NACHR.,288,167,1965.
KIZILIRMAK,A.,POHL,E., ASTRON.NACHR.,291,111,1968.
KIZILIRMAK,A.,POHL,E., I.B.V.S.,456,1970.
KIZILIRMAK,A.,POHL,E., I.B.V.S.,530,1971.
KOCH,J.C.,KOCH,R.H., ASTRON.J.,67,462,1962.
KORDYLEWSKY,K., I.B.V.S.,46,1964.
KREINER,J.M., ACTA ASTRON.,21,365,1971.
LAVROV,I.M., PEREM.ZVEZDY,12,21,1959-60.
LAVROV,M.I.,LAVROVA,N.V., ASTRON.CIRC.,756,1973.
LOCHER,K., ORION,12,135,1967.
LOCHER,K., B.B.S.A.G.,20,1975.
LOCHER,K.,DIETHELM,R., ORION,29,111,1971.
MEYER,A., I.B.V.S.,668,1972.
OBURKA,O., BULL.ASTRON.INST.CZECH.,15,250,1964.
PETER,H., B.B.S.A.G.,3,1972.
PETER,H., B.B.S.A.G.,20,1975A.
PETER,H., B.B.S.A.G.,21,1975B.
PETER,H., B.B.S.A,G.,30,1976.
POHL,F.,KIZILIRMAK,A., ASTRON.NACHR.,289,191,1966.
ROBINSON,L.J., I.B.V.S.,111,1965A.
ROBINSON,L.J., I.B.V.S.,119,1965B.
ROBINSON,L.J., I.B.V.S.,129,1966A.
ROBINSON,L.J., I.B.V.S.,154,1966B.
ROBINSON,L.J., I.B.V.S.,180,1967.
TSESEVITCH,V.P., ODESSA IZV.,IV,193,1954.

REMARK:

(*) THIS TIME OF MINIMUM IS THE WEIGHTED MEAN OF TWO-COLOURS MINIMA

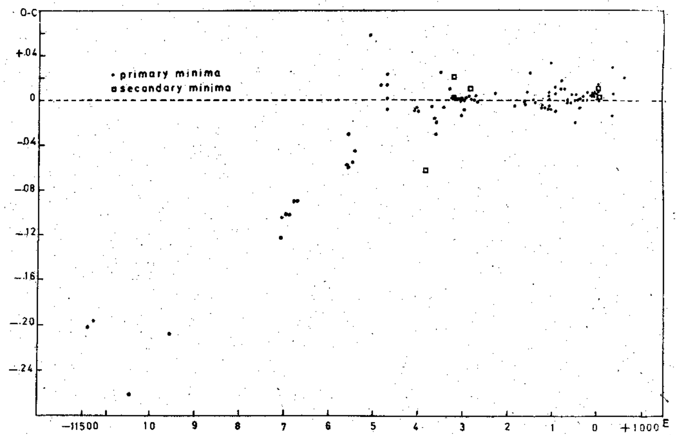


Figure 1 Residuals of XX Cep

In conclusion, we believe that changes of period in XX Cep are real and presently these are better interpreted by two jumps approximately at epochs -4800 and -450. Nevertheless accurate photoelectric observations of primary minimum (easily observable) will possibly evidence a smooth variation of the period which, if this is the case, is now masked by the large residuals.

We should like to thank Mrs. A. Tura who collected the data in Table II.

P. BATTISTINI
A. BONIFAZI
A. GUARNIERI

Istituto di Astronomia
Università di Bologna,Italy

References:

Fresa, A.: Mem.Soc.Astron.Ital. 24, 341, 1953
Fresa, A.: Mem.Soc.Astron.Ital. 27, 299, 1956
Iljasova, I.: Engel.Astr.Obs.Bull.No. 24, 1946
Koch, J.C. and Koch, R.H.: Astron.J. 67, 462, 1962
Kopal, Z.: Adv. in Astron. and Astrophys. 3, 89, 1965
Lavrov, M.I.: Perem.Zvezdy 12, 21, 1957
Schneller, H.: Veröff. Berlin-Babelsberg 8 (6), 42,1930
Struve, O.: Astrophys.J. 103, 76, 1946

Erratum

nton Paschke reports a probable typing error in IBVS 1325. The time of the mini-
um of XX Cep observed by R. Diethelm in 1975 (as printed in IBVS 1325: 42439.383
iethelm 1975) should be 42439.370 according to the BBSAG Bulletin No. 20.

12 September 2002

The Editors

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1326

Konkoly Observatory
Budapest
1977 August 15

THE LINEAR POLARIZATION OF u HERCULIS

The eclipsing variable, u Her (68 Her, HR 6431, HD 1566383, BD +33°2864), was observed with the polarimeter described by Koch and Pfeiffer (1976) mounted on the Pennsylvania 72-cm reflector. The instrumental polarization, which was small for all bandpasses, was evaluated from the observations of 16 zero-polarization standard stars. The notation of Koch and Pfeiffer is used in the present paper. Table I lists the instrumental responses and the integration and housekeeping intervals. It may be noted that T = 2800 sec. corresponds to 0.016 P. The journal of the observations appears in Table II for which phases have been computed from the ephemeris:

Pr. Min. (hel.) = 2405830.033 + 2.051027 E.

The first purpose for obtaining the present observations was to compare and contrast the present blue polarization state of u Her against the similar data of Rudy and Kemp (1977), which are much more numerous and of greater observational weight and were obtained in the previous season. The following remarks may be made. (1) For both series most of the signal is contained in the Q-parameter. (2) The phases and magnitudes of minimum polarization are essentially the same for the two seasons. The minimum polarization of about 0.02% is consistent with the interstellar component (Mathewson and Ford 1970) to be expected at a distance of about 200 pc for the galactic coordinates of u Her. (3) For both seasons one polarization maximum of 0.06% occurs near phase 0.75 P. (4) In both sets of data a second polarization maximum occurs at phase 0.3 P. The peak-to-peak scatter of both the Oregon and Pennsylvania observations is about 0.04%. The mean of the Pennsylvania measures from 0.24 P to 0.41 P is greater than the Oregon mean by 0.02% ± 0.006%. The scatter in both data sets and the imprecision of the small systematic difference permit only a weak conclusion: the systematic difference, if

Table I. Instrumental responses and observing intervals for u Her.

Filter	$\lambda_{eff.}$ (Å)	FWHM (Å)	t (sec.)	T (sec.)
Narrow red	7450	200	1920	2800
Red	6520	850	320	840
Green	5350	800	320	840
Blue	4300	760	320	840
Ultraviolet	3710	310	1920	2800

Table II. Polarization observations of u Her.

Filter	J.D.(hel.)- 2443200	Phase	Q(%)	U(%)	p(%)
Blue	49.822	0.414	-.02 (.02)	-.06 (.02)	0.06 (.02)
Green	49.840	.423	-.08 (.02)	.00 (.02)	.08 (.02)
Blue	51.778	.368	-.04 (.01)	-.02 (.01)	.05 (.01)
Red	51.799	.378	+.01 (.01)	-.04 (.01)	.04 (.01)
Red	51.814	.385	-.03 (.02)	-.07 (.02)	.07 (.02)
Blue	51.833	.394	-.05 (.02)	-.05 (.02)	.07 (.02)
Blue	64.736	.686	-.06 (.01)	+.04 (.01)	.08 (.01)
Ultraviolet	64.780	.707	+.01 (.03)	-.02 (.03)	.02 (.03)
Ultraviolet	64.820	.727	-.06 (.03)	-.06 (.03)	.09 (.03)
Blue	64.858	.745	-.056 (.009)	-.001 (.009)	.056 (.009)
Blue	75.733	.047	-.01 (.01)	+.01 (.01)	.02 (.01)
Blue	75.827	.093	-.03 (.01)	+.03 (.01)	.04 (.01)
Blue	78.637	.463	+.02 (.01)	-.02 (.01)	.02 (.01)
Narrow red	78.690	.489	+.04 (.04)	-.05 (.04)	.06 (.04)
Green	78.739	.513	-.06 (.01)	+.02 (.01)	.06 (.01)
Green	78.758	.523	-.02 (.01)	.00 (.01)	.02 (.01)
Blue	78.780	.533	-.01 (.02)	.00 (.02)	.01 (.02)
Blue	79.635	.950	-.05 (.01)	.00 (.01)	.05 (.01)
Blue	85.625	.871	-.05 (.02)	.00 (.02)	.05 (.02)

Table II. (cont.)

Filter	J.D.(hel.)- 2443200	Phase	Q(%)	U(%)	p(%)
Red	85.649	.882	-.04 (.02)	-.01 (.02)	.04 (.02)
Red	85.665	.890	-.01 (.03)	-.01 (.03)	.02 (.03)
Blue	85.684	.899	-.06 (.02)	-.02 (.02)	.06 (.02)
Ultraviolet	85.736	.925	+.01 (.02)	-.01 (.02)	.02 (.02)
Blue	85.789	.951	+.04 (.01)	-.04 (.01)	.06 (.01)
Blue	90.622	.307	-.10 (.01)	-.01 (.01)	.10 (.01)
Green	90.642	.317	-.09 (.01)	+.01 (.01)	.09 (.01)
Green	90.664	.327	-.02 (.02)	.00 (.02)	.02 (.02)
Blue	90.682	.336	-.08 (.02)	-.04 (.02)	.09 (.02)
Narrow red	90.735	.362	+.04 (.06)	-.04 (.06)	.06 (.06)
Blue	90.780	.384	-.08 (.02)	+.02 (.02)	.08 (.02)
Blue	91.619	.795	-.05 (.02)	+.02 (.02)	.05 (.02)
Ultraviolet	91.731	.850	-.08 (.03)	+.03 (.03)	.08 (.03)
Blue	91.768	.868	-.04 (.02)	+.01 (.02)	.04 (.02)
Red	91.792	.879	+.02 (.01)	+.04 (.01)	.04 (.01)
Red	91.816	.891	-.04 (.02)	-.01 (.02)	.04 (.02)
Blue	91.837	.902	-.04 (.01)	.00 (.01)	.04 (.01)
Blue	98.687	.240	-.08 (.01)	.00 (.01)	.08 (.01)
Blue	98.807	.299	-.05 (.03)	-.04 (.03)	.07 (.03)
Green	98.835	0.312	-.11 (.02)	-.03 (.02)	0.12 (.02)

real, cannot be due to the familiar close binary reflection effect. (5) It is similarly true that the small systematic difference between the Pennsylvania polarizations at the two maxima cannot be due to the reflection effect. (6) Over the phase interval, 0.89 P to 0.95 P, the Pennsylvania results are 0.02% ± 0.006% greater than the Oregon mean. (7) The limiting measure by Hall and Mikesell (1950) sheds no light on possible intrinsic variability.

The second reason for obtaining the new observations was to determine a polarization spectrum. This accounts for the sequence of the data of Table II which typically permitted interpolating the blue measures to the times of those for other filters. Two procedures were used to calculate the spectrum: (1) normalize by division a non-blue measure by the interpolated blue value, and (2) establish a fictitiously constant blue polarization, correct all real blue measures to that constant value, and apply the same additive correction to the non-blue values. The two procedures yielded the identical result that, within a precision of 0.02%, the polarization spectrum of u Her is flat from λ3700 to λ7450. The wavelength dependence of the interstellar component cannot be recognized for a value as small as 0.02%. Additionally, there is no reason to suppose that a thick shell is associated with the u Her system so hydrogen self absorption should be absent. The best interpretation appears to be that electron scattering is truly the cause of the systemic polarization as Rudy and Kemp have postulated. These authors also note that the polarization should decrease with increasing wavelength if the scattering mechanism is the reflection effect seated in the cool (B5) binary component. From λ3700 to λ7450, a 35% polarization decrease is suggested by the models given in Gingerich (1969) if the reflection effect is really the cause of the scattering. The present ultraviolet and narrow red observations have not been made at the same phases. When they are corrected for the mean phase dependence of Rudy and Kemp's blue data, no polarization gradient emerges. A realistic test would have to distinguish between, say, 0.05% at λ3700 and 0.03% at λ7450. This is impossible for the present data since the error of the mean at λ7450 is ± 0.03%.

The possible intrinsic polarization variability of u Her would be qualitatively consistent with the evidence of streaming gas developed by Kovachev and Reinhardt (1975). Since the binary is no longer a ZAMS one, variability is also compatible with the statistical summary by Pfeiffer and Koch (1977). There remains only the question of what fraction of the variability is due to scattering in the circumstellar volume, and it is reasonable to suppose that a lower limit to this value is displayed by the intrinsic seasonal variability which remains poorly known at present.

We are indebted to J. C. Kemp and R. J. Rudy for communicating their results in advance of publication. NSF Grant MPS 74-01656 A01 supported this work.

ROBERT H. KOCH
Department of Astronomy
University of Pennsylvania
Philadelphia, PA 19104, U.S.A.

RAYMOND J. PFEIFFER
Department of Physics
Trenton State College
Trenton, NJ 08560, U.S.A.

References:

Gingerich, O. (1969). Theory and Observation of Normal Stellar Atmospheres: Proceedings of the Third Harvard-Smithsonian Conference on Stellar Atmospheres (M.I.T. Press, Cambridge, Mass.).
Hall, J. S. and Mikesell, A. (1950). Publ. U. S. N. O. 17, 1.
Koch, R. H. and Pfeiffer, R. J. (1976). Astrophys. J. 204, L47.
Kovachev, B. J. and Reinhardt, M. (1975). Acta Astron. 25, 133.
Mathewson, D. S. and Ford, V. L. (1970). Mem. Roy. Astr. Soc. 74 (5), 139.
Pfeiffer, R. J. and Koch, R. H. (1977). Publ. Astron. Soc. Pac. 89, 147.
Rudy, R. J. and Kemp, J. C. (1977). Astrophys. J. (in press).

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1327

Konkoly Observatory
Budapest
1977 August 16

SPECTROSCOPY OF HM SAGITTAE, A POSSIBLE EMBRYONIC PLANETARY NEBULA

The sudden six magnitude outburst of the emission-line object now known as HM Sagittae was reported by Dokuchaeva (1976). Subsequent spectroscopic observations by Stover and Sivertsen (1977) showed HM Sge to have strong emission lines of H, He I, He II, [OI], [OIII], and [AIII]; in general the spectrum resembled that of a planetary nebula. Feldman (1977) has reported a radio detection of this object at 10.5 GHz. In the infrared, the color temperature is 950 K, and moderate silicate emission is seen (Merrill 1977).

On 22 June 1977 UT we obtained three image-tube spectrograms of HM Sge at Ritter Observatory. The 1-m reflector and Cassegrain spectrograph were used with a Varo 8605 image-tube, yielding a dispersion 40 Å mm^{-1} over the wavelength interval λλ5800-7500. The spectra were recorded on hydrogen-treated 127-04 emulsion, and the resolution was ~1 Å. At the time of exposure the estimated brightness of HM Sge was V~11.

The table below lists the observed emission features and a visual estimate of their intesities.

λ_{Obs}	Identification		Intensity
5876.7	He I	5875.8	20
6300.7	[OI]	6300.2	5
6312.5	[SIII]	6312.1	7
6548.4	[NII]	6548.1	7
6563.3	Hα	6562.8	300
6583.6	[NII]	6583.6	15
6678.1	He I	6678.1	10
7065.2	He I	7065.2	25

Table (cont.)

λ_{Obs}	Identification	Intensity
7134.0	[AIII] 7135.8	20
7279.0	He I 7281.3	2
7316.9	[OII] 7319.0	25
7327.1	[OII] 7330.3	20

The measured radial velocity from half a dozen lines is $+25\pm3$ km s^{-1}. Because of distortions in the image-tube, the wavelengths longward of λ7100 have low accuracy and were not included in the velocity determination. To record the faint emission lines, two of the spectrograms have Hα heavily exposed. The third exposure was widened with optimal exposure of the Hα emission. On this latter spectrogram, no evidence for structure or profile asymmetry in Hα is seen. The continuum is surprisingly strong on our plates; an apparent weakening of the continuum near λ6200 may be due to TiO, but further spectrograms will be required to confirm this.

This research was partially supported by a grant from Research Corporation.

BERNARD W. BOPP

Ritter Observatory
The Univ. of Toledo
Toledo, OH 43606
U.S.A.

References:

Dokuchaeva, O.D. 1976, I.B.V.S. No. 1189

Feldman, P.A. 1977, I.A.U. Circular No. 3081

Merrill, K.M. 1977, I.A.U. Circular No. 3088

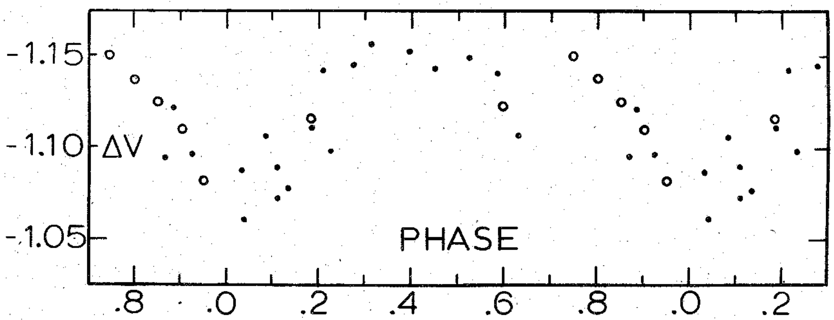
Stover, R.J., and Sivertsen, S. 1977, Ap.J.(Letters) <u>214</u>, L33

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1328

Konkoly Observatory
Budapest
1977 August 17

σ 75 Gem: A BRIGHT VARIABLE SIMILAR TO HK Lac

Recent photoelectric photometry of the bright ($V=4^{m}.2$) one-lined spectroscopic binary σ Gem has shown it to be a variable star. Landis obtained 41 differential measures on 20 nights between 2,443,181.5 and 2,443,261.5. At Dyer Observatory Henry obtained 18 differential measures on 7 nights between 2,443,261.5 and 2,443,276.5. Both used filters selected to match V of the UBV system and both used HR 2896 = ADS 6185AB as the comparison star. Nightly means of these observations, corrected for differential atmospheric extinction with mean extinction coefficients and transformed differentially to the UBV system with a mean value of $\Delta(B-V) = 0^{m}.11$, are plotted in the Figure. Points are from Landis Observatory and open circles are from Dyer; Δ is in the sense variable minus comparison.



Phase has been computed with the ephemeris

$$\text{JD (hel.)} = 2{,}418{,}967.33 + 19^{d}.603 \cdot E,$$

where the period is the spectroscopically determined orbital period as redetermined by Harper (1935) and the epoch is the time of conjunction with the K component in front, derived by adding P/4 to the instant when the K star passes through the ascending node according to Luyten (1936).

From the Figure we can see that the amplitude of the variation, from maximum to minimum, is around $0^{m}.07$. Up until now σ Gem has been a suspected variable, SVS 100890. There are three photometric measures of σ Gem listed in the UBV catalogue of Blanco, Demers, Douglass and FitzGerald (1968). These show a range of $0^{m}.06$, consistent with the range we see.

Although we have too few observations at present actually to determine the photometric period reliably, the light does appear to vary in phase with the orbital period. Assuming the orbital period is uncertain by about $\pm 0^{d}.001$, the time elapsed between the initial epoch and our observations produces an uncertainty of only $\pm 0^{p}.06$ in our phases. Therefore it seems that light minimum occurs around conjunction. The minimum is too broad to let us explain the light variation as a result of eclipses. It would be more reasonable to attribute the light variation to the same mechanism operating in HK Lac. If this mechanism is operating then it is fortuitous that light minimum occurs so near conjunction. The following table, with data for HK Lac taken from Hall (1976), illustrates the similarities.

	HK Lac	σ Gem
spectrum	FIV + K0III	? + K1III
CaII H&K emm.	yes	yes
orb. period	$24^{d}.428$	$19^{d}.603$
phtm. period	$25^{d}.2$	$\sim 20^{d}$
wave ampl. in V	$0^{m}.10$	$0^{m}.07$

Although the orbital period of σ Gem is too long for it to be an RS CVn binary as defined by Hall (1976), it would be a member of his "long-period group".

We are planning to resume observing σ Gem as soon as it is available again in the sky. One goal will be to refine our determination of the photometric period. Since several RS CVn binaries and at least one in the long-period group (λ And) are radio sources, the radio astronomers also will want to observe σ Gem.

DOUGLAS S. HALL
GREGORY W. HENRY
Dyer Observatory
Vanderbilt University
Nashville, Tennessee
U.S.A. 37235

HOWARD J. LANDIS
Landis Observatory
2395 Wood Hill Lane
East Point, Georgia
U.S.A. 30344

References:

Blanco, V.M., Demers, S., Douglass, G.G., FitzGerald, M.P.1968 Pub. U.S. Naval. Obs., Ser. 2, 21, 269

Hall, D.S. 1976, I.A.U. Colloquium No. 29,Vol. I. 287

Harper, W.E. 1935, P.D.A.O., 6, 224

Luyten, W.J. 1936, Ap.J. 84, 90

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1329

Konkoly Observatory
Budapest
1977 August 18

PHOTOGRAPHIC OBSERVATIONS OF DELTA CEPHEI VARIABLES

An investigation of 17 cepheids was carried out on blue plates of the Bamberg Sky Survey by the Argelander step method. From time intervals of about 1000^d to 4000^d all observations were taken into a mean curve. From these curves the values of Table 1 were determined. The magnitudes of the comparison stars were determined with nearby Selected Areas (1) or - in the case of the Cassiopeiae-variables - taken from the AGK 3 - Catalogue (2). For the calculation of the mean curves, the period values of the GCVS 1969 (3) were used.

Table 1 : Results

	Maximum (J.D.)	O-C	Δm_{pg}	$\frac{M-m}{P}$	N	Remarks
RX Aur	$2426219\overset{d}{.}80 \pm 0\overset{d}{.}05$	$+0\overset{d}{.}16$	0.8	$0\overset{P}{.}45$	104	
	26997.79	-0.67	1.1	0.46	115	
	36542.00	+0.14	0.9	0.48	53	
SY Aur	26221.88	-0.43	1.1	0.44	102	
	27368.30	-0.32	1.0	0.49	103	
UY Car	38444.16	-0.02	0.8:	0.37	95	1
	39231.32	-0.07	1.2	0.35	104	
UZ Car	38444.23	+0.05	1.0	0.36	92	
	39235.00	-0.29	1.0	0.31	111	
AQ Car	38445.36	+0.35	0.7	0.58	93	
	39236.58	+0.29	0.8	0.52	113	
GX Car	38445.41	+0.32	1.1	0.27	96	2
RW Cas	25557.29	-2.06	1.2	0.29	98	
	26223.87	-1.43	1.1	0.32	92	
RY Cas	26165.68	-0.19	1.5	0.37	92	
SW Cas	25747.31	+0.06	1.1	0.38	95	
	26269.45	-0.19	1.1	0.33	94	
	26873.58	+0.06	1.1	0.38	96	
SY Cas	26932.82	-0.04	-	0.36:	49	
XY Cas	25854.91	+0.11	0.9	0.40:	95	
DL Cas	26163.82	+0.52	-	0.38	94	
FM Cas	26933.83:	-1.29	0.9	0.32	46	

	Maximum (J.D.)	O-C	m_{pg}	$\frac{M-m}{P}$	N	Remarks
V Lac	$2425746^{d}.61 \pm 0^{d}.05$	$+0^{d}.02$	1.7	$0^{P}.29$	97	
	26872.97	+0.12	1.5	0.36	96	
X Lac	25744.43	+0.24	1.1	0.36	98	3
	26931.54	+0.32	0.9	0.38	97	
Z Lac	25747.37	±0.00	1.5	0.37	96	
	26879.52	+0.02	1.4	0.42	96	
RR Lac	26870.80	-0.15	1.4	0.23	94	
	25747.99	-0.13	1.5	0.27	97	

Remarks: N = Number of plates; 1) small number of maximum-observations; 2) may be a classical cepheid from the light-curve; 3) used period P=5.44506 days, periods given in the GCVS-remarks for this time interval do not represent the observations.

All O-C values are calculated with the elements of the GCVS 1969 (3).

M. KIEHL and U. HOPP
Dr. Remeis Observatory
Bamberg

References:

(1) Brun, Vehrenberg - Atlas of Harvard-Groningen Selected Areas, Treugesell-Verlag, Düsseldorf (1965)

(2) Dieckvoss - AGK 3, Hamburg-Bergedorf (1975)

(3) Kukarkin et al. - General Catalogue of Variable Stars, 3rd Edition, Moscow (1970)

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1330

Konkoly Observatory
Budapest
1977 August 18

NOTE ON V 644 Cen = HD 306989(B3)

This variable star, investigated by O'Connell (1) and Gaposchkin (2), was suspected to be an eclipsing variable. They found a descending branch to a deep minimum in 1950 with an amplitude from $9^m.55$ - $10^m.25$ pg. No later observations have been published.

An examination - with Argelander-step-method - of 271 Bamberg Sky Survey plates leads to the 100^d - mean magnitudes of the table. The star returned to a new maximum light of $8^m.86$ pg. Used comparison stars are

CPD - 59°3803 (B8) $8^m.42$ pg
CPD - 59°3734 (B8) $9^m.19$ pg

Table of observations

Date (J.D.)	Mag.	(pg.)	N
2438472^d	$8^m.90$	± $0^m.12$	26
527	8.85	0.06	46
791	8.88	0.09	6
859	8.82	0.12	37
907	8.86	0.08	11
39180	8.74	0.11	8
237	8.87	0.09	32
569	8.91	0.11	7
629	8.93	0.09	3
948	8.82	0.08	13
40285	8.83	0.07	4
350	8.86	0.12	11
670	8.86	0.11	32
726	8.90	0.13	7
41064	8.83	0.11	18
174	8.78	0.06	4
42718	8.97	0.06	3

N = number of plates

U. HOPP and M. KIEHL
Dr. Remeis Sternwarte
Bamberg

References:
(1) O'Connell - MN RAS Vol. 111, 111 (1951)
(2) Gaposchkin - HA Vol. 113, 2 (1953)

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1331

Konkoly Observatory
Budapest
1977 August 22

A BRIGHT NOVA IN THE SURROUNDINGS OF THE ANDROMEDA NEBULA

In AJ <u>78</u>, 375-376, 1973, van den Bergh, Herbst and Pritchet published a list of variable objects near M 31. Among them is variable "m" ($\alpha=0^h29^m28^s$; $\delta=+41^o41'$; 1950) which the authors saw only on two plates taken on August 26, 1971. Romano (AJ <u>82</u>, 319-321, 1977) examined this object on plates of the Asiago Observatory. On this series of plates the star was always below the plate limit ($>19\overset{m}{.}5$), except in the same period of time when van den Bergh et al. observed the variable near the maximum at about $12\overset{m}{.}8$. I examined 295 plates of the Sonneberg field ν And between J.D. 244 0802.....1988 (plate limit ≈ $18\overset{m}{.}0$). Object "m" is visible only on 15 plates between J.D. 244 1192.....1217; on all the other plates it is beyond the plate limit. In Figure 1 the light curve is shown. The value $14\overset{m}{.}9$ at J.D. 1209, given by Romano, seems to be too bright. I observed $15\overset{m}{.}85$ at J.D. 1208 (3 plates) and $16\overset{m}{.}25$ at J.D. 1210 (2 plates).

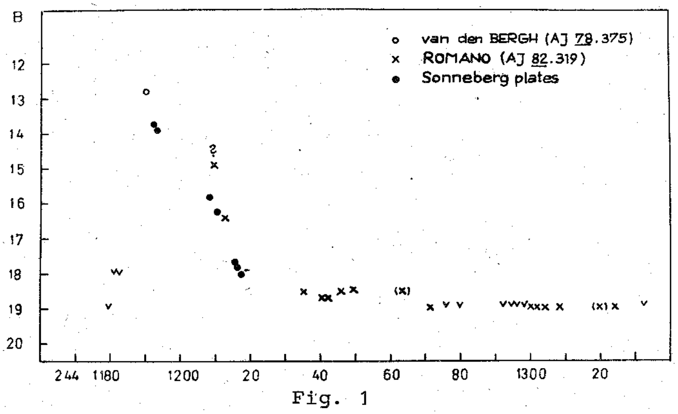


Fig. 1

This star is clearly a fast nova. It cannot be a supernova because no galaxy is seen near the star. It is also not a long-period U Geminorum star of the UV Persei type as suggested by Romano because

1. the amplitude of variation is higher than 8 mag. (it is very doubtful that the star is faintly visible on the Palomar Sky Survey as Romano believes. I rather think this impression belongs to another object)
2. the decline of brightness after maximum is too fast
3. no further outbursts are observed.

This object is probably a very bright nova in the halo of M 31. Similar objects - but not as bright - I observed on Tautenburg plates (see AN 294, 255, 1973 and Mitt. veränderl.Sterne 5, 177-195, 1971).

In order to get a better light curve observers are requested to look at their plates and to place their observations at my disposal. On Sonneberg Schmidt plates taken by Götz I measured a sequence of comparison stars (see Figure 2). The magnitudes are in the system of Arp (AJ 61. 15, 1956).

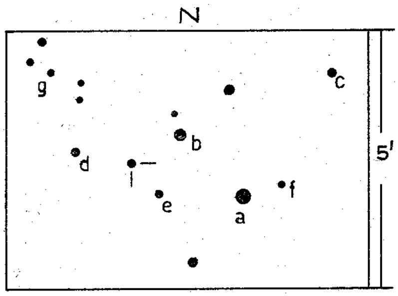


Fig. 2

	B	V
a	12^{m}.5	12^{m}.2
b	13.0	13.2
c	14.1	14.6
d	15.7	15.5
e	15.9	15.6
f	16.7	16.4:
g	17.7:	-

L. MEINUNGER
Central Institute for Astrophysics of Academy of Sciences of GDR, Observatory
Sonneberg, GDR

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1332

Konkoly Observatory
Budapest
1977 September 1

ON THE PROBABLE VARIABILITY OF HR 1861

In a recent investigation of σ Orionis E, Hesser et al. (1977) have used the <u>uvbyβ</u> standard star HR 1861 (B1 IV) as comparison star. The purpose of their extended series of measures has been to impose constraints on the several models proposed for σ Ori E, a unique helium rich B star. In their discussion, Hesser et al. note a secular variation in σ Ori E relative to HR 1861, and they cannot unequivocally rule out a variation in HR 1861 as the cause. Since HR 1861 is very conveniently located 1^{o} from σ Ori E several observers (e.g. Pedersen and Thomsen 1977) have used it as comparison star and it is of some importance to investigate its possible variability.

The purpose of this note is to present a short analysis of about 250 uvby and β measures made by the author and the late Dr.B. Grønbech in the years 1971-76. All the observations have been obtained with the Danish 50 cm reflector located on Cerro La Silla, ESO, Chile. The four-channel uvby photometer has been described by Grønbech et al. (1976, paper I) and the two-channel β photometer by Grønbech and Olsen (1977, paper II). Observation and reduction procedures are fully discussed in paper I and II.

In order to minimize the uncertainties all quantities discussed below are kept in the instrumental systems. In Table 1 and 2 mean values (relative to the instrumental systems) of y, (b-y), m_1, c_1 and β are given in units of $0^{m}.001$. The columns w and nn give the number of observations and the number of nights, respectively. The errors given are the rms errors of the means, i.e. $(\Sigma d^2/w(w-1))^{\frac{1}{2}}$ where d is the deviation of an individual measure from the mean. The mean instrumental values may be found in paper I, table 11 and paper II, table 2, except y which is $5^{m}.348$ (V=$5^{m}.343$).

Table 1

(unit $0\overset{m}{.}001$)

Epoch	$\overline{y}$	$\overline{(b-y)}$	$\overline{m_1}$	$\overline{c_1}$	w	nn
1971 Nov	0±1.1	1±0.6	-2±1.0	1±0.8	39	13
Dec	-1±0.7	0±0.5	0±0.6	0±0.6	60	14
1972 Jan	-1±1.2	-1±0.6	2±0.9	-3±1.0	19	9
Feb	3±1.8	-5±1.5	5±1.5	-1±1.4	15	8
Nov	-1±1.7	0±1.1	0±1.3	-2±1.4	9	7
1974 Dec	0±2.0	1±1.2	-1±2.4	-2±2.9	6	4
1975 Oct	-5±1.2	7±1.4	-7±1.4	-3±0.8	24	12
1976 Feb	-5±1.6	-1±0.5	1±0.7	-3±0.9	18	10

Table 2

(unit $0\overset{m}{.}001$)

Epoch	$\overline{\beta}$	w	nn
1974 Oct 25-Nov 2	-4±1.2	13	6
Nov 2- 21	+3±1.0	31	16
Nov 21-Dec 3	-2±1.2	22	11

The stability of the instrumental uvby system over the five years 1971-76 has been discussed thoroughly on the basis of 9000 standard star observations (Olsen 1977) and it was concluded that the system has remained constant within $0\overset{m}{.}001$-$0\overset{m}{.}002$. In this discussion HR 1861 was frequently the most troublesome star with the largest residuals. The β measures cover only 5 weeks and it is safe to conclude that the instrumental β system has remained constant in this period, especially since no closing errors were found in the discussion of 3476 standard star observations covering all right ascensions (cf. paper II).

An inspection of Table 1 is very suggestive of variability in HR 1861. To test the significance of the variations in the means a "Student's" t-test has been made on the $\overline{y}$ values from February 1972 and October 1975. The probability that the means should differ by $0\overset{m}{.}008$ is less than 0.001, if the two samples of y values have been chosen from the same population as they would have been if HR 1861 is constant. The conclusion is that HR 1861 is probably variable within a total range of about $0\overset{m}{.}010$. The secular variation over two years in σ Ori E found by Hesser et al. (1977) is of the same size, and may therefore be, at least partly, explained by variations in HR 1861.

To test the above conclusion a t-test has been made on the $\overline{y}$ values of HR 1552 and 2880 (B2 III and F0 III) for exactly the same nights as for HR 1861. The probability changes from 0.001 to 0.34 and 0.39, respectively, thus confirming the variability of HR 1861.

Table 2 shows that HR 1861 probably also has a small variation in the strength of the Hβ line, probably due to very small amounts of emission. A t-test on the two first lines in Table 2 gives a probability of constant β less than 0.001.

ERIK HEYN OLSEN
Copenhagen University
Observatory
Brorfelde, Denmark

References:

Grønbech, B. and Olsen, E.H. 1977, Astron.Astrophys.Suppl. 27, 443

Grønbech, B., Olsen, E.H. and Strömgren, B. 1976, Astron. Astrophys, Suppl. 26, 155

Hesser, J.E., Moreno, H. and Ugarte P.,P. 1977, Ap.J.Letters 216, L31

Olsen, E.H. 1977, Astron.Astrophys. 58, 217

Pedersen, H. and Thomsen, B. 1977, Astron.Astrophys. in press

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1333

Konkoly Observatory
Budapest
1977 September 1

REVISED PERIODS FOR TWO RR LYRAE STARS: VARIABLE 24 IN NGC 6171 AND VARIABLE 23 IN NGC 6656

The globular clusters NGC 6171 (Messier 107, R.A. $16^{h}29^{m}.7$, Dec.$-12^{o}57'$,1950) and NGC 6656 (Messier 22, R.A. $18^{h}33^{m}.3$, Dec. $-23^{o}58'$, 1950) have been studied as part of the program at the David Dunlap Observatory for more than 30 years. Now they have been observed with two telescopes at the Las Campanas Observatory of the Carnegie Institution of Washington.Both of the stars investigated here are in such crowded areas that it is not possible to determine magnitudes very accurately. This makes period determination difficult. The northern hemisphere observations could be made over only a short interval in one night, and from these the variables were thought to be of type c. However, the present study, with nine hour runs on some nights, shows that both are of type a. On Las Campanas, they have been photographed with the University of Toronto 24-inch telescope since 1972 and NGC 6656 has also been photographed with the Carnegie 40 inch on five consecutive nights in 1976.

Variable 24 in NGC 6171 was discovered by Oosterhoff (1938) who published magnitudes from 15 photographs but did not have sufficient data for period determination. A period of 0.3462153 days was determined by Coutts and Sawyer Hogg (1971) who commented that an alternate value 0.529586 days was possible. Our Las Campanas plates have been measured with a Cuffey iris astrophotometer and reduced with the aid of sequence by Sandage and Katem (1964). This study indicates that the period is approximately 0.523 days and is changing. We therefore include only 1977 observations in the light curve. A more detailed study of

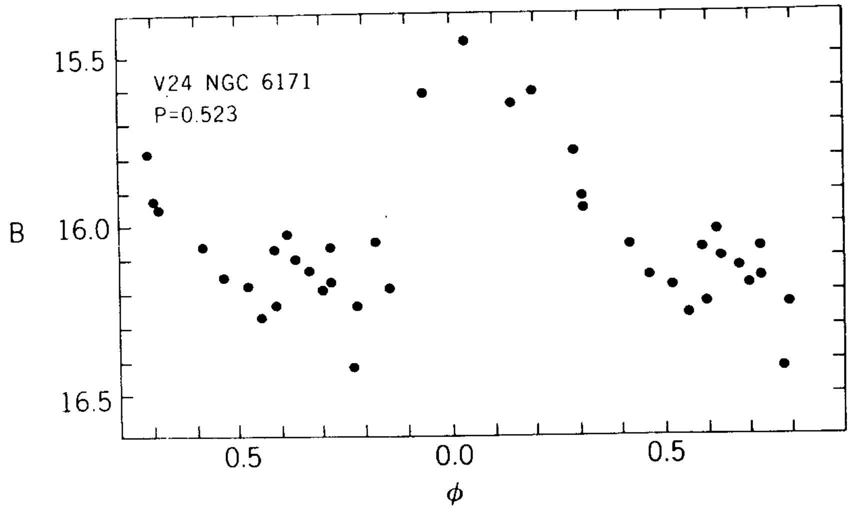

V24 NGC 6171
P=0.523
B
15.5
16.0
16.5
0.5
0.0
0.5
ϕ

Fig. 1

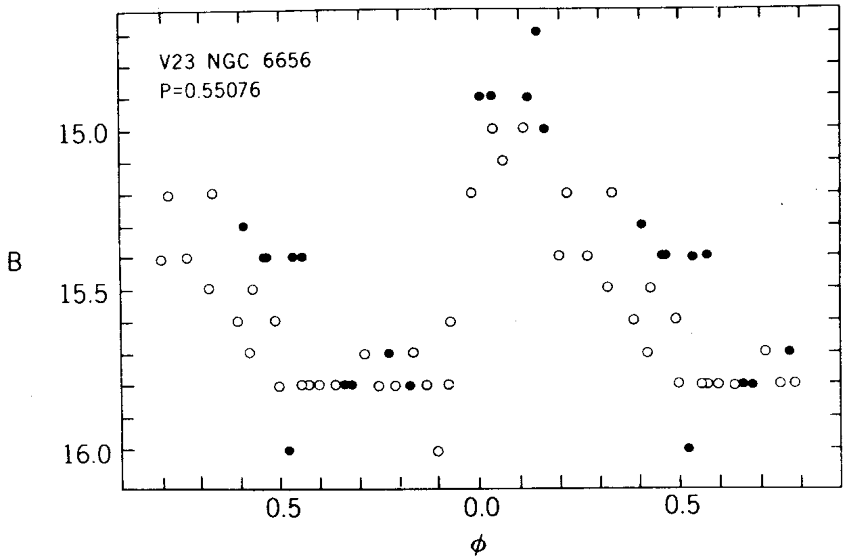

V23 NGC 6656
P=0.55076
B
15.0
15.5
16.0
0.5
0.0
0.5
ϕ

Fig. 2

the period changes of this and other RR Lyrae variables in NGC 6171 will be presented in a future paper.

Variable 23 in NGC 6656 was discovered by Sawyer (1944) who also determined a period, 0.3557 days. She commented that this variable was one of the most difficult in the cluster to estimate owing to its position near the centre. In the present study, we have estimated the magnitudes by eye, using a sequence by Arp and Melbourne (1959). A period of 0.55076 days fits all the observations presented here. This period is accurate to two figures, but further observations will be necessary to determine reliably the last three figures. On the light curve, open circles represent the 40-inch observations and closed circles the 24-inch observations.

This research has been supported by a grant through the National Research Council of Canada. We are grateful to Dr. Amelia Wehlau for suggesting we investigate variable 23 in NGC 6656.

CHRISTINE COUTTS CLEMENT*
Department of Astronomy
University of Toronto
Toronto, Ontario, Canada
M5S 1A7

HELEN SAWYER HOGG
David Dunlap Observatory
Richmond Hill, Ontario
Canada
L4C 4Y6

*Guest observer Hale Observatories, 1976

References:

Arp, H.C. and Melbourne, W.G. 1959, A.J. 64, 28

Coutts, C.M. and Sawyer Hogg, H. 1971. Publ.David Dunlap Obs. 3, 61

Oosterhoff, P.Th. 1938. B.A.N. 8, 273

Sandage, A. and Katem, B. 1964. Ap.J. 139, 1088

Sawyer, H.B. 1944. Publ.David Dunlap Obs. 1, 297

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1334

Konkoly Observatory
Budapest
1977 September 7

RS Cha : A DELTA SCUTI VARIABLE

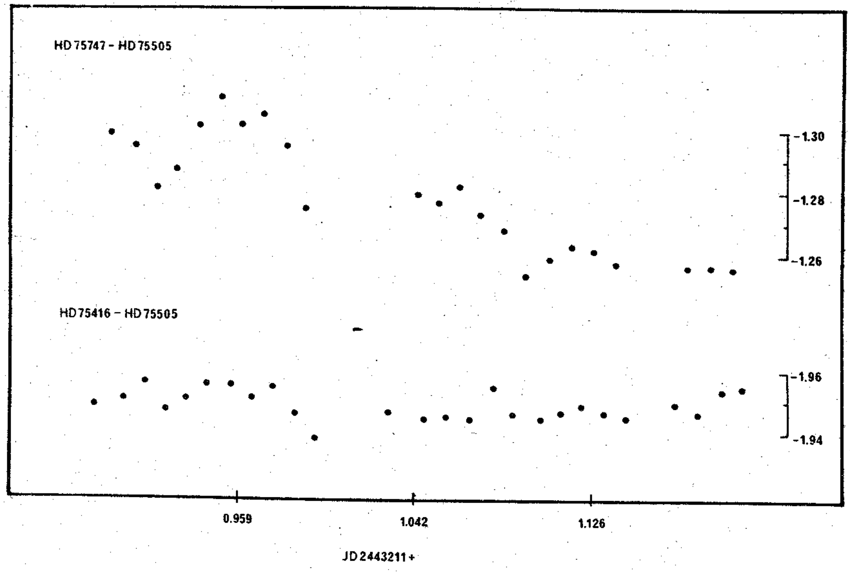
Because of its spectral type, RS Cha (=HR 3524=HD 75747) was observed as part of a programme being carried out at Mount John University Observatory to detect new δ Scuti type variables. It has been found to show light variations of variable amplitude.

The star was observed on 9th March, 1977 in the B and V bands of the UBV system with the 61 cm telescope of the University of Pennsylvania at Mount John University Observatory. A thermoelectrically cooled EMI 6094B photomultiplier tube was used for the observations, each observation consisting of four 10 second integrations. Extinction was determined from the comparison stars and the observations were reduced to the UBV system. The comparison stars used were HD 75416 and HD 75505.

Observations obtained in the B filter on the 9th March are shown in the diagram. The magnitude differences for the comparison stars are also shown for comparison, their mean scatter being 0.004 magnitudes.

RS Chamaeleontis was discovered to be an eclipsing variable by Strohmeier (1964). Andersen (1975) has determined the various elements and physical parameters for this system and believes the secondary to be an Am star.

The lights variations exhibited by RS Cha show that it is also an intrinsic variable, but the limited number of observations obtained on the 9th March have prevented an accurate determination of the period. From variations in the B and V filters we can only conclude that the dominant period lies between 0.074 and 0.097 days. Present observations are insufficient to resolve which component is pulsating or whether both are.



Magnitude differences for RS Cha (HD 75747) and comparison stars in B filter.

If the secondary is in fact a classical Am star then it is unlikely to show pulsational instability, (Breger, 1970). If it is assumed that only the primary is pulsating and it is a δ Scuti star, then by using the physical parameters of Andersen and the P-L-C relationship for δ Scuti stars, (Breger and Bregman, 1975) we find P_o= 0.070 days. On the other hand, using the P-L relationship of Dworak and Zieba (1975) for faint δ Scuti stars we obtain P_o = 0.078 days. Because of the uncertainties involved in the above relationships, these results are in reasonable agreement with the observed period range.

For the period range in question the observed pulsation constant Q agrees with the theoretical value of Q_o = 0.0335 days given for the δ Scuti models above the main-sequence, (Jorgensen and Petersen, 1974). Applying the period-mean density relationship with Q_o= 0.0335 days to the primary, a fundamental period of 0.077 ±0.006 days is obtained. This is in good agreement with the results of the empirical P-L and P-L-C relationships.

The observed light variations of small amplitude and period, together with the good agreement of the physical parameters of the components with mean δ Scuti properties, (Baglin et al., 1973), do indeed suggest that at leats one component in this system is a δ Scuti star.

Further observations are planned in order to obtain a more accurate period, to resolve which component is pulsating or whether both are, and to determine whether non-radial pulsations are evident, (Fitch, 1975).

C.J. McINALLY,
R.D. AUSTIN
Mount John University Observatory, Lake Tekapo,
New Zealand

References:

Andersen, J., 1975, Astron.Astrophys., 44, 445
Baglin, et al., 1973, Astron. Astrophys., 23, 221
Breger, M., 1970, Ap.J., 162, 597
Breger, M., and Bregman, J.N., 1975, Ap.J., 200, 343
Dworak, T.Z., and Zieba, S., 1975, IBVS, No. 1005
Fitch, W.S., 1975, in Multiple Periodic Variable Stars IAU Colloquium No. 29 (Budapest), 167
Jorgensen, H.E., and Petersen, J.O., Astron.Astrophys. 35, 215
Strohmeier, W., 1964, IBVS, No. 55

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1335

Konkoly Observatory
Budapest
1977 September 8

MINIMA OF ECLIPSING VARIABLES

During February of 1977 the author observed the eclipsing binaries RZ Cas and W UMa photoelectrically with the 20-inch reflector at the Urals University Observatory. A yellow filter was used in the photometer. Visual times of minima have been observed with a binocular.

The heliocentric times of the observed minima determined by the chord bisection method are given in the table, along with the epoch number E, the O-C values and the number of estimates n.

Star	Min. hel JD 244...	E	O-C	n	method of obs.
U Cep	$3098\overset{d}{.}1191$	14123	$+0\overset{d}{.}5896$	31	vis
	3113.083	14129	+0.596	9	"
	3128.041	14135	+0.596	11	"
	3138.012	14139	+0.596	9	"
	3142.998	14141	+0.596	8	"
RZ Cas	2770.0220	21263	-0.0425	18	"
	3101.1078	21540	-0.0414	21	"
	3113.0585	21550	-0.0433	10	"
	3130.9860	21565	-0.0444	15	"
	3136.9627	21570	-0.0444	15	"
	3142.9406	21575	-0.0424	11	"
	3150.1115	21581	-0.0438	19	"
	3193.1370	21617	-0.0466	23	pe
	3234.9729	21652	-0.0445	12	vis
W UMa	3189.2229	63938.5	-0.0091	15	pe
	3219.082	64028	-0.011	14	vis
	3220.083	64031	-0.010	15	"
	3222.083	64037	-0.012	17	"

The O-C values were computed using the elements :

U Cep Min. hel JD = $2407890\overset{d}{.}2957 + 2\overset{d}{.}4929005 \cdot E$

RZ Cas Min. hel JD = $2417355\overset{d}{.}4233 + 1\overset{d}{.}1952519 \cdot E$

W UMa Min. hel JD = $2421856\overset{d}{.}9401 + 0\overset{d}{.}333637665 \cdot E$.

L.P. SURKOVA
The Pedagogical Institute
Chita, USSR

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1336

Konkoly Observatory
Budapest
1977 September 9

FO VIRGINIS

FO Vir is catalogued as RR ? in the Third Supplement to the Third Edition of the General Catalogue of Variable Stars (1976) and a period of 0.6 ± days is suggested. From 11 April to 2 July 1977, I have made 325 visual estimates of this variable and I have been able to determine 6 maxima, listed below:

Max. hel.	n	O-C
J.D. 2443 249.428	32	+ .010
250.558	34	- .004
259.418	24	- .006
277.424	23	- .012
285.455	15	+ .014
307.455	18	- .001

These times of maxima exclude the period value of about 0.6 and suggest one close to 0.29 day; this is also confirmed by the daily light-curves. From the 6 maxima, an ephemeris can be calculated:

$$\text{Max} = \text{J.D. hel. } \underset{\pm .013}{2443271.718} + \underset{\pm .00017}{0.28590} \cdot E \qquad (1)$$

and the O-C values of the third column are referred to it. The second column lists the number of estimates to determine each maximum. Notice that the phases predicted by (1) were actually observed during the 20 nights of observation.

Using (1), a mean light-curve is obtained. A M-m value of 0.36 period can be derived and the shape of the curve suggests that FO Vir is a RRc variable.

E. PORETTI
GEOS
12 rue Bezout
F-75014 Paris

Reference:
GEOS Circular NC 165, July 1977

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1337

Konkoly Observatory
Budapest
1977 September 9

NEW PHOTOELECTRIC OBSERVATIONS OF THE DELTA SCUTI STAR HD 73576 (KW 207)

The δ Scuti star HD 73576 (KW 207), belonging to the Praesepe cluster, was observed during one night only by M.Breger (Astrophys.J. 162, 597, 1970). The same author (Astrophys. J. 176, 373, 1972) assigns it a tentative period of $0\overset{d}{.}071$.

We have performed photoelectric observations of this star through B filter during four nights at the beginning of 1977, using the 102-cm reflector of the Merate Observatory. The comparison star, whose constancy we have verified, was HD 73619 (KW 229): it does not vary to an extent of greater than $0\overset{m}{.}003$.

The resulting light curves ($m_C - m_V$) for the first three nights (J.D. 43168, ...173 and ...174) are shown in Fig.1, whereas Fig.2 shows the curve relative to the last night (J.D.43203).

The observed trend of Fig.1 is not significantly different from a simple sinusoid. This fact is confirmed by a spectral analysis with Vanicek's method (Astrophys.Space Sci. 12,10,1971), which also gives, for the period, the value of $0\overset{d}{.}0534$.

It is apparent in the last night the situation is at all different. The analysis gives a non-monochromatic periodogram, with the main peak at $0\overset{d}{.}059$. Another, much less marked peak corresponds to a period of $0\overset{d}{.}068$, and there is perhaps another one at about $0\overset{d}{.}051$. The $0\overset{d}{.}0534$ component seems to be disappeared.

Anyway there is no evidence for the Breger's period. It is our intention to continue with the observations.

M. BOSSI
G.GUERRERO
L. MANTEGAZZA

Osservatorio Astronomico
Via E. Bianchi 46
22035 Merate (Como), Italy

Fig. 1

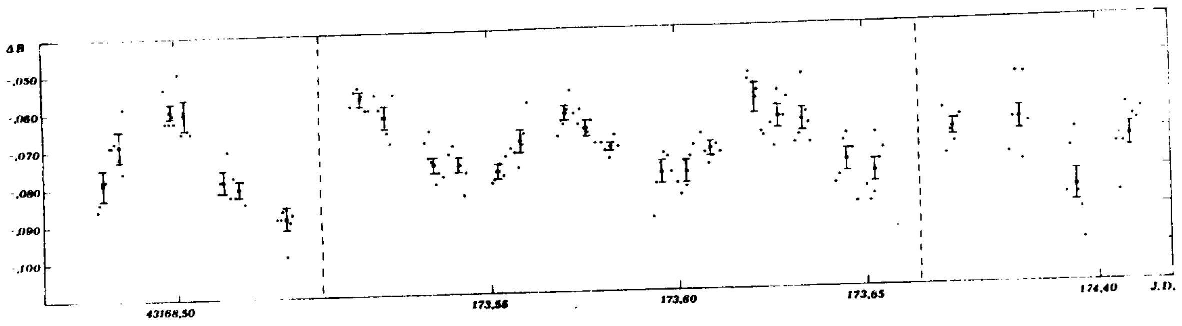
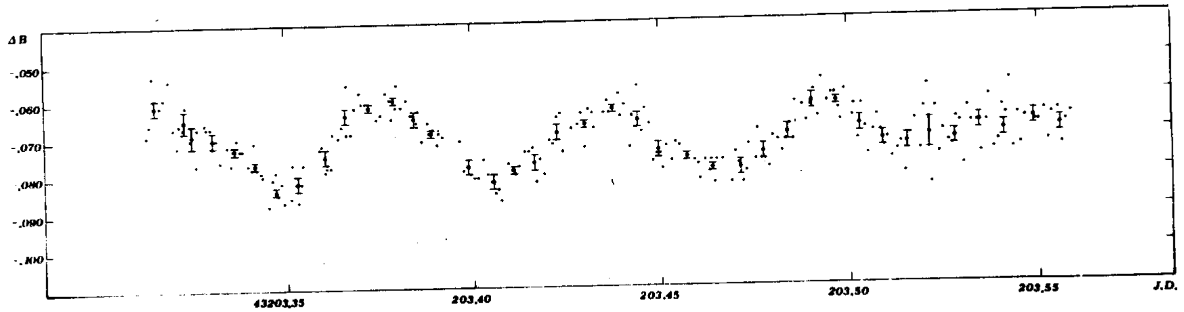


Fig. 2



• *Single measurement.*

Ⱶ *Average of a group of points and standard error.*

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1338

Konkoly Observatory
Budapest
1977 September 15

VZ CANCRI

The short-period variable VZ Cnc was observed at Trieste with a 50-cm Newtonian reflector equipped with a three-channel UBV simultaneous photometer, at Dr. Todoran's suggestion. We report here on the observations made on two nights (Dec.27, 1976 and Jan.17, 1977). The results are given in graphical form in Figs. 2 and 3. We keep the single observations at the disposal of interested persons.

Assuming the elements for the principal period and for the beat period given by Todoran (1976) and the magnitude and colours of the comparison star HD 73938 (BD +11° 1894) given by Fitch (1955), we derive the elements shown in Table 1, according to the corresponding Table 1 of Todoran. The O-Cs fall on the upper border of the strip shown in his Fig.1 (O-C vs. ϕ_b, where ϕ_b is the phase of the beat period) whereas the V_{max} are in perfect agreement with their behaviour, as it is shown in his Fig. 2 (V_{max} vs. ϕ_b).

Our Fig. 1 shows the phase dependent variation of the colours of VZ Cnc in a (U-B)-(B-V) diagram for the night of Dec. 27, 1976. The curve is a free-hand drawing through the observed values. The numbers referring to the phase show that the variation is counter-clockwise, a feature common to many RRc stars. The colours are B-V=+0.23, U-B=+0.11 at maximum light and B-V=+0.37, U-B=+0.05 or 0.06 just after minimum. They correspond to spectral types A7III and F2III (FitzGerald, 1970), in good agreement with the spectroscopic determinations (Abt, 1955).

Table 1

Max.hel. 2443000+	V_{max}	E	O-C	E_b	ϕ_b
140.6090	7.46	53311	$-0^{d}.0021$	13275	0.9612
161.4850	7.50	53428	+0.0053	13304	0.1057

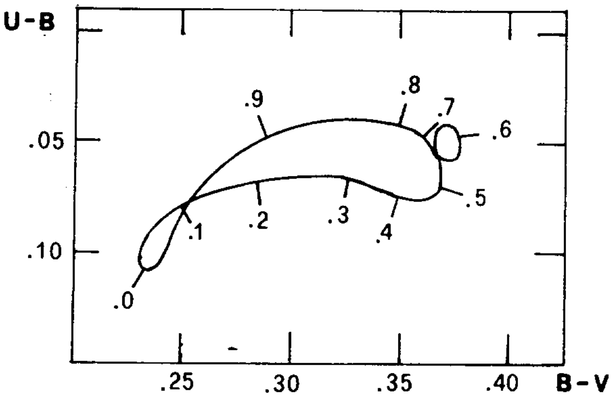

U-B
.05
.10
.25
.30
.35
.40
B-V
.0
.1
.2
.3
.4
.5
.6
.7
.8
.9

Fig. 1

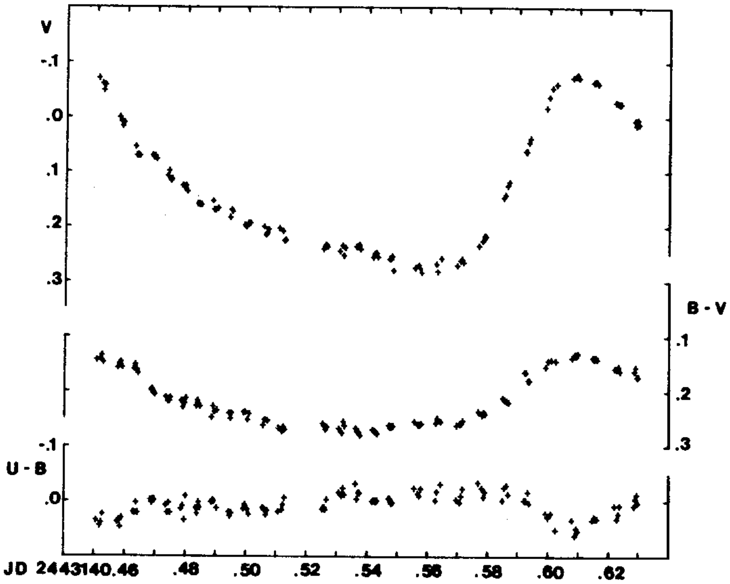

V
-.1
.0
.1
.2
.3
B-V
.1
.2
.3
-.1
U-B
.0
JD 2443140.46
.48
.50
.52
.54
.56
.58
.60
.62

Fig. 2

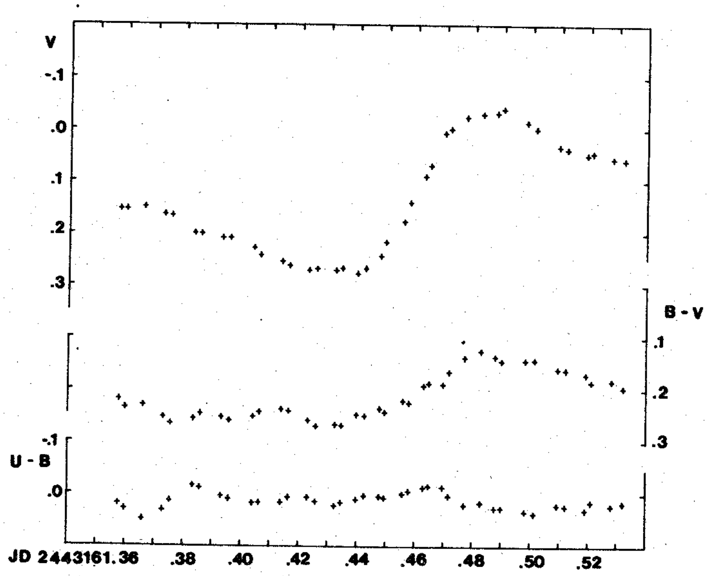


Fig. 3

B. CESTER, G. GIURICIN, F. MARDIROSSIAN
M. MEZZETTI, M. PUCILLO
Osservatorio Astronomico
Trieste, Italy

References:

Abt, H.A. 1955, Astrophys.J. 122, 390
Fitch, W.S., 1955, Astrophys.J. 121, 690
FitzGerald, G.P. 1970, Astron.and Astrophys. 4, 234
Todoran, I., 1976, I.B.V.S. No. 1141

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1339

Konkoly Observatory
Budapest
1977 September 16

POSSIBLE RELATION BETWEEN THE PULSATION CONSTANT AND THE PERIOD IN DELTA SCUTI VARIABLES

Owing to theoretical arguments and observational results of Delta Scuti stars, the pulsation constant has been considered variable with the mode of pulsation but constant for each mode (Cogan 1970, Chevalier 1971, Petersen and Jørgensen 1972, Jørgensen and Petersen 1974).

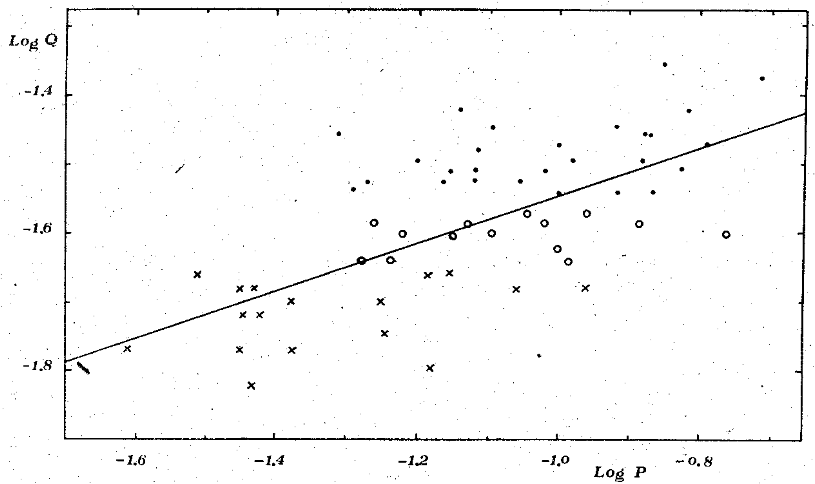
Nevertheless, the observed Q and P reported by Breger and Bregman (1975), plotted in Figure 1, seem to show a continuous relation between Q and P.

Further, if we consider the two zones of the diagram M_v vs T_e reported by Breger and Bregman (1975) as representative for "hot" and "cold" variables, pulsating respectively in the first and fundamental overtone, we can compute the fundamental period of the "hot" variables multiplying their periods by $P_o/P_1 = Q_o/Q_1 = 1.324$. Then, from the data by Breger and Bregman (1975), by least squares, we can obtain

$$\log Q_o = \underset{\pm.11}{0.22} \log P_o - \underset{\pm.09}{1.30}.$$
$$\qquad \pm.08$$

This relation could lessen the discrepancy between the theoretical and the empirical relation $M_{bol}=M_{bol}(P,T_e,M)$, and make more acceptable the values of the masses presently adopted for Delta Scuti stars.

We believe that it should be useful to take in account the above mentioned remarks in the theoretical models of Delta Scuti variables.



Values of Q (Breger and Bregman, 1975) versus periods for Delta Scuti stars: • fundamental mode, Q≥0.29; o first overtone, 0.23≤Q≤0.29; x second overtone, Q<0.23.

E. ANTONELLO, M. FRACASSINI and L.E. PASINETTI
Osservatorio Astronomico di Milano - Merate
Via Brera n.28, 20121 Milano, Italia

References:

Breger, M. and Bregman, J.N. 1975, Astrophys.J. 200, 343
Chevalier, C. 1971 Astron. and Astrophys. 14, 24
Cogan, B.C. 1970, Astrophys.J. 162, 139
Jørgensen, H.E. and Petersen, J.O. Astron. and Astrophys. 35,215
Petersen, J.O. and Jørgensen, H.E. 1972, Astron.and Astrophys. 17, 367

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1340

Konkoly Observatory
Budapest
1977 September 19

THE BELATED DISCOVERY OF NOVA Sgr 1968 AND NOVA Oph 1969

Recent reexamination and intercomparison of several objective-prism plates taken with the Curtis Schmidt telescope at Cerro Tololo, Chile has revealed two previously undetected novae. The plates are Kodak IIa-F behind an RG 1 filter and cover the spectral region λλ6000-6800 at a dispersion of 420 Å/mm at Hα; they are widened to 1/3 mm during the 30-minute exposure and have a limiting red magnitude of about 12.0 for the continuum of a blue star.

Nova Sgr 1968 - position: $17^{h}59^{m}18^{s}.87$, $-28^{\circ}45'23''.8$ (1950). The two prism plates of this object were taken on 1968 May 17 and July 3, and both show broad emission at Hα. The total width of Hα gives a velocity spread of 2900 km/s on the first plate and 2300 km/s on the second. The May 17 plate also shows a faint, reddened continuum, estimated to be of red magnitude 11.0, on which are superposed weak emission bands tentatively assigned to λ6300 and λ6364 of [OI] and to λ6474 of [FeII]; this latter would indicate that it is probably a slow nova. The July 3 plate is somewhat deeper than the first but shows no continuum nor features other than Hα. From the limited spectral information available, it can only be said that the first plate was taken during the Orion or early nebular stage and the second plate was taken during the later nebular stage. There is also available a 5-minute, direct visual plate taken 1971 April 3 which shows no image at the nova position brighter than V = 16.3.

Nova Oph 1969 - position : $17^{h}21^{m}12^{s}.14$, $-24^{\circ}34'08''.0$ (1950). Two prism plates, taken 1969 June 21 and 1974 Aug. 8, are available at this position, but only the first shows evidence of the nova. On this plate very broad Hα emission with a symmetrically-placed core is seen superposed on a continuum of approximate red magnitude 10.8. The spectrum shows no forbidden lines nor absorption features but does have narrow, weak HeI emission at λ6678 indicating that it was in the principal emission stage at this time. The total width of Hα corresponds to a velocity spread of 5000km/s.

Dr. N. Sanduleak, Warner and Swasey Observatory, indicates in a private communication that there is an objective-prism plate on each of these fields at that observatory. The field of the Sagittarius object was taken 1967 July 5 with the Curtis telescope on 103a-F emulsion at a dispersion of about 1000 Å/mm at Hα; he finds no object in the nova position brighter than limiting red magnitude 13.5. The Ophiuchus field was covered on a IIa-O plate (dispersion about 1400 Å/mm at Hγ) taken with the Burrell Schmidt telescope on 1969 July 14, three weeks after the discovery plate. Dr. Sanduleak reports no trace of Nova Oph 1969 down to limiting photographic magnitude 14.

The author expresses gratitude to N. Sanduleak for his communication and to J. Stock for his help in the position determinations.

D. JACK MacCONNELL

CIDA
Apartado 264, Merida
Venezuela

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1341

Konkoly Observatory
Budapest
1977 September 23

o ANDROMEDAE: RADIAL VELOCITIES AND PROBABLE LONG PERIOD VARIATIONS

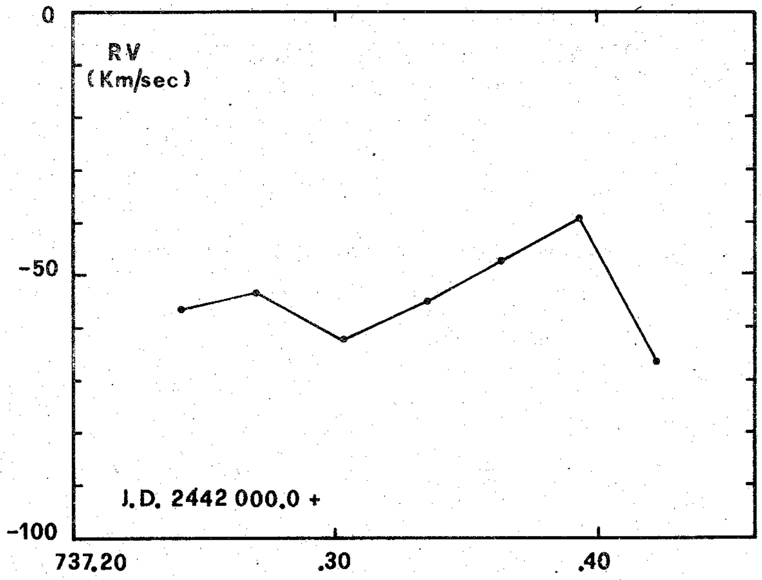
Referring to the I.B.V.S. No. 1296 (1977) by Harmanec et al. and to their conclusions, we point out what follows:

The probable period of 23 years obtained by us (Fracassini et al., 1977) is *not* depending on the radial velocity values of the years 1975, 1976. This fact is an obvious consequence of Lafler and Kinman's (1965) method adopted by us. Indeed the radial velocity values of the years 1900-1976 give P = $23\overset{Y}{.}51$,those of the years 1900-1974 give P = $23\overset{Y}{.}50$.

The comparison of the radial velocities of the period 1975-1976 January with those found in the literature since 1900, is not possible because at our knowledge radial velocities of the phase of the *envelope ejection* were never published. This is shown by the figure and by the table III reported respectively by Fracassini and Pasinetti (1975) and by Fracassini et al.(1977). The only radial velocities of a shell phase are those by Slettebak (1954) obtained from observations made three-five years after the envelope ejection. In particular, the radial velocities of 1949 are relative to a phase without Hα emissions.

The figure 1 reported by Harmanec et al. shows notable variations of radial velocities in the same night: about 20 km/sec for the cores of the hydrogen lines and about 50 km/sec for the Hγ wings relative to the shell core. Analogous variations were found by us on 1975 November 20, during five hours of observation as reported in the Figure.

As to the differences between the absolute values of radial velocities found by us and by Harmanec et al., our checks have not shown any blunder. Therefore we agree with Harmanec et al. that it would be necessary to know the results of other observers.



M. FRACASSINI and L.E. PASINETTI
Osservatorio Astronomico di Milano-Merate
Via Brera n.28. 20121 MILANO, Italia

References:
Fracassini, M., Pasinetti, L.E. 1975 IAU I.B.V.S. No.1044
Fracassini, M., Pasinetti, L.E. Pastori, L., 1977, Astrophys. Spa.Sci., 49, 145
Lafler, J., Kinman, T.D., 1965, Astrophys. J. Suppl., 100, 216
Slettebak, A., 1954, Astrophys. J., 119, 460

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1342

Konkoly Observatory
Budapest
1977 September 26

HD 5303 : A NEW SOUTHERN RS CANUM VENATICORUM BINARY

The southern star HD5303 (BV 625), $\alpha = 00^h51^m21^s$ and $\delta = -74^o56'$ (1950), has been observed spectrographically on the Boller and Chivens 61cm telescope at Mt.John Observatory, Lake Tekapo, N.Z. These observations were part of the joint program of the University of Canterbury and Florida to systematically study RS CVn binaries in the southern hemisphere. Seventeen spectra were obtained with a plate factor of 60Å/mm in the blue and UV spectral region during the period 1976 Sept 01 until 1977 Aug 23. The star is listed as a late-type southern H and K emission line object in the objective prism survey of Bidelman and MacConnell (1973). It is also noted as having H and K emission by Houk and Cowley (1975), who classify the spectrum as G2/5V+F0. HD5303 is given as a Bamberg variable star (BV 625) of unspecified type with amplitude $A_{pg} = 0\overset{m}{.}3$, (Strohmeier et al., 1965).

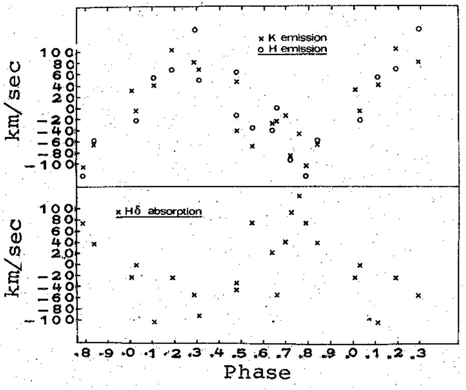
The spectra confirmed the strong H and K emission nature of HD5303. Large velocity shifts of these emission lines relative to the H and K absorption were clearly evident. Tracings of the spectra on the Joyce-Loebl microdensitometer at the University of Canterbury showed no apparent variation in the emission intensity.

The spectra were measured on the Gaertner linear comparator at Canterbury so as to obtain the radial velocity changes of the emission lines and of selected absorption lines relative to the comparison spectrum.

The spectra were analysed using the period analysis program of C.J. McInally based on the Fourier method of Gray and Desikachary (1973). The data were found to be most compatible with a period of P=1.840 days. Preliminary velocity curves for the H and K emission and for the Hδ absorption are shown. The zero points of the velocity axes are arbitrary. The phases were computed relative to phase 0.0 at JD 2443022.716 using the period given above.

From the Michigan spectral classification, the Hδ absorption must come predominantly from the F star, while the K emission is clearly due to the G component alone. The peak-to-peak velocity amplitudes of these two components were both about 130km/s, and hence the mass ratio is approximately unity.

HD5303 complies with the definition of RS CVn stars suggested by Hall (1975). In addition, the mass ratio found is typical of this category of star. Photoelectric photometry is being carried out to determine whether the light variations characteristic of many RS CVn stars are present in this system.



J.B. HEARNSHAW,
Dept. of Physics,
University of Canterbury
Christchurch, N.Z.

J.P. OLIVER,
Dept. of Physics and
Astronomy, University of
Florida, Gainesville,
Florida, U.S.A.

References:

Bidelman, W.P. and MacConnell,D.J. 1973, Astron.J. 78, 687

Gray, D.F. and Desikachary, K., 1973, Astrophys.J. 181, 523

Hall, D.S. 1975, I.A.U. Colloquium 29, Vol.I. 287 (Budapest)

Houk, N. and Cowley, A.P. 1975, Michigan Spectral Catalogue, Vol.I. (University of Michigan)

Strohmeier, W., Knigge, R. and Ott, H. 1965, I.B.V.S. No. 100

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1343

Konkoly Observatory
Budapest
1977 September 26

NOTES ON SIX LONG-PERIOD VARIABLE STARS

On 509 Bamberg Sky Survey plates, the poorly known stars DF, DG, DH, DL Pav, RY and RZ Pic were investigated using the Argelander-step-method. Comparison stars were determined by the Selected Areas no. 169, 196, 197 (1). Table I gives the maxima and minima, found by the Pogson method.

Table I

Star	Ø	Max./Min. (J.D.)	Mag.(pg)	N
RY Pic	M	2438378^{d}	$11\overset{m}{.}4$	19
	M	40565:	10.6	24
RZ Pic	M	38420	10.1	10
	M	38731	10.0	14
DF Pav	m	40386:	15.0:	8
	m	40768:	14.8	7
DG Pav	M	38940	11.9	15
	M	40005:	12.1	5
DH Pav	M	38604	11.7	32
	M	39331	11.7	20
	M	40068:	11.8	6
DL Pav	M	39374:	11.5	20
	M	40082	13.2	12

N= Number of used plates, M=Maximum,m=Minimum.

RY Pic = HV 8090 varies in the limits $10\overset{m}{.}6$ - ($14\overset{m}{.}1$pg. From the whole material, a period of 219^{d} may be possible.

RZ Pic = S 4864. Together with the GCVS epoch (2), we found Max=2425663^{d} + 311^{d}.E. Variable in the limits $10\overset{m}{.}0$ - $14\overset{m}{.}0$ pg.

DF Pav varies from $11\overset{m}{.}9$ to $14\overset{m}{.}8$ pg. The period is in the order of 374^{d}, the lightcurve is strongly variable. The star belongs to the SRa-type.

DG Pav is variable from $11\overset{m}{.}9$ to less than $14\overset{m}{.}1$ pg.

DH Pav. From the table we found Max=2438604^{d} + 244^{d}.E.

Variable in the limits $11\overset{m}{.}7$ - ($14\overset{m}{.}4$ pg.
DL Pav varies from $11\overset{m}{.}0$ to less than $14\overset{m}{.}7$ pg. The period is in the order of 174^{d}.

U. HOPP and M. KIEHL
Dr. Remeis Observatory, Bamberg

References:
(1) Brun, Vehrenberg - Atlas of Havard-Groningen Selected Areas
Düsseldorf 1965
(2) Kukarkin et al. - General Catalogue of Variable Stars,
Moscow 1969

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1344

Konkoly Observatory
Budapest
1977 September 27

LIGHT VARIATION OF THE NUCLEUS OF MARKARJAN GALAXY 358

On the Supernova survey plates taken with the 60/90/180 cm Schmidt telescope of the Konkoly Observatory between December 1965 and September 1977 it was found that the nucleus of the Markarjan Galaxy 358 (B.E. Markarjan, V.A. Lipovetsky, Astrofizika 7, 514, 1971)(i.e. the 5-4-59 of Vorontzov-Veliaminov II. Catalogue) shows a conspicuous brightness variation of the order of two magnitudes. The coordinates of the Galaxy (S.D. Peterson, Astron.Journ.78, 822, 1973):

$$\begin{array}{ll} \text{RA} & 1^h\ 23^m\ 45\overset{s}{.}1 \\ \text{Decl.} & +31^\circ\ 21'\ 13'' \end{array} \quad 1950$$

The spectrum of the nucleus of the galaxy has weak Hα, [NII] λλ 6548/83 and [SII] λλ 6717/31 lines (M.A. Arakelian, E.A. Dibay, V.F. Yesipov, Astrofizika 8, 184, 1972).

In Table 1 the brightnesses of the nucleus of the galaxy with the different data of observations are collected. These values of magnitudes were only estimated. The error of this estimation is not greater than 0.5 magnitude. Plates used were Kodak OaO and 103aO.

M. LOVAS
Konkoly Observatory
1525 Budapest Box 67, Hungary

Table 1

Date			magn.	number of plates
1965	Nov	25/26	16.0	2
1966	Oct	6/7	16.0	2
1967	Jan	7/8	15.5	2
	Febr	7/8	15.0	2
	Aug	8/9	14.5	2
	Sept	7/8	15.0	1
	Oct	2/3	14.5	2
	Nov	1/2	15.0	2
	Dec	2/3	15.5	2
1968	Aug	4/5	14.0	2
	"	23/24	14.5	2
	Oct	14/15	15.0	2
	"	27/28	14.0	2
	Nov	22/23	15.5	2
	Dec	12/13	16.0	1
1969	Jan	8/9	15.0	2
1970	March	8/9	16.0	2
	July	30/31	16.0	2
	Sept	7/8	15.5	2
	Nov	25/26	15.0	2
1971	July	31/1Aug	15.5	2
	Aug	19/20	15.0	2
	Sept	18/19	14.0	2
1972	July	19/20	15.0	2
1972	July	21/22	15.0	2
	Nov	3/4	15.5	2
	Dec	27/28	16.0	1
1973	Jan	4/5	16.0	2
	"	5/6	15.5	2
	"	6/7	15.0	1
	Febr	28/1Mar	14.5	2
	Aug	8/9	16.0	2
	"	26/27	15.5	2
	Nov	21/22	15.0	2
1974	Jan	18/19	15.0	2
	Febr	16/17	16.0	2
	Aug	18/19	14.5	2
	Dec	15/16	15.0	2
1975	March	1/2	15.5	2
	Oct	9/10	15.0	2
	Nov	8/9	16.0	2
	Dec	7/8	16.0	2
	"	9/10	16.0	2
1976	Oct	20/21	14.5	2
1977	Febr	16/17	15.0	1
	July	19/20	14.5	2
	Sept	12/13	14.5	2

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1345

Konkoly Observatory
Budapest
1977 October 3

A NEW FLARE STAR IN CANCER

On the photographic plate taken by the 90/60/180 Schmidt telescope of the Konkoly Observatory on February 29, 1976 appeared a flare type object. Its identification chart is given in Figure 1. The exact coordinates of this object are:

$$\text{R.A.} = 8^h25^m30^s\!,45 \qquad (1950)$$
$$\text{Decl} = +20^\circ21'34''\!,1$$

On this plate the magnitude of the object was $13^m\!.5$. About two hours later this brightness decreased to $18^m\!.0$. Comparing this field with the Palomar Sky Atlas in the blue print there is no trace of this object, while on the red print a faint one is recognizable.

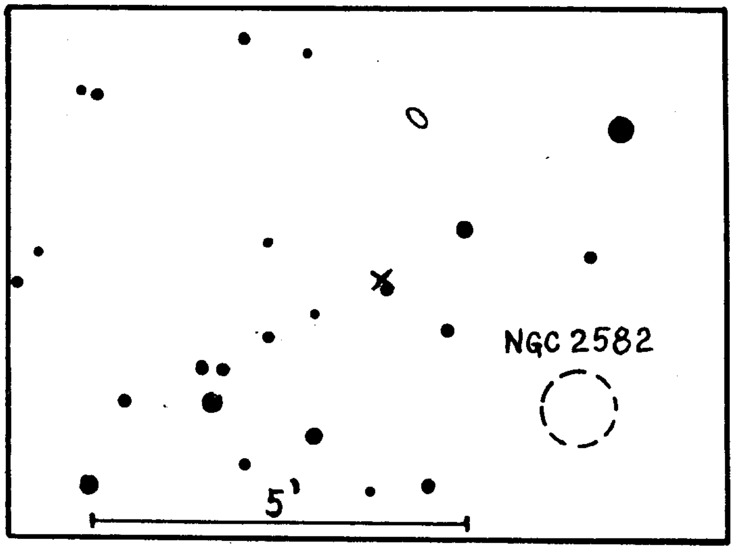
At the Konkoly Observatory 43 plates of this field were collected between 1965 and 1976. The object mentioned above appeared on further 4 of these plates. Results are summarized in the Table 1.

Table 1

Date	J.D. 24...	m_{pg}
1966 March 30	39215.2975	19.0
1968 April 15	39692.3093	19.5
1968 April 15	39692.3225	19.0
1973 Dec. 3	42020.6128	19.5
1976 Feb. 29	42838.3628	13.5
1976 Feb. 29	42838.4168	18.0

M. LOVAS

Konkoly Observatory
1525 Budapest Box 67
Hungary


NGC 2582
5'

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1346

Konkoly Observatory
Budapest
1977 October 6

GL 851.1 - ANOTHER BY Dra-TYPE STAR ?

According to UBV photometry by this author (Krisciunas 1976-1977, JAAVSO 5, 74) the star Gl 851.1 (Gliese 1969, Veröffentl. Astron.-Rechen Inst. Heidelberg No.22) is most likely a dK5e star lying 1 magnitude below the main sequence in the colour-magnitude diagram. It has a (mean) apparent magnitude V=10.12 and a B-V of +1.17. A small variation of 0.03 mag in V was observed, using BD +30°4634 (V=10.15, B-V=+1.36) as a comparison star. Also, the star was monitored visually for flares for a total of 24 hours on 7 nights from September 1975 to September 1976 with a 15 cm reflector. No flares ($\Delta V \gtrsim 0.1$ mag) were noted.

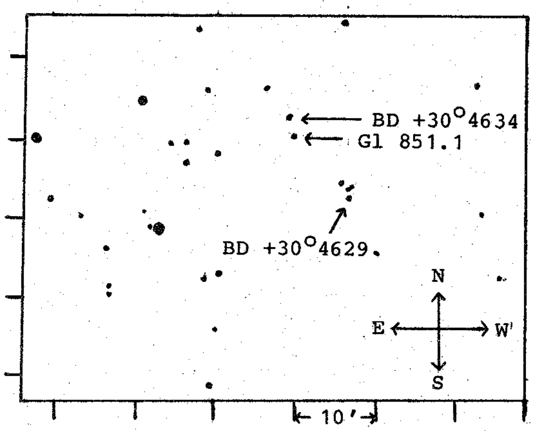
In addition to this, Gl 851.1 has been spot checked visually on 34 other nights. Normally, one can tell that Gl 851.1 is just noticeably brighter than BD +30°4634. However, on one night the reverse was apparently the case. At 0430 UT on 20 September 1977 the red dwarf star was observed to be at least 0.1 magnitude fainter than BD +30°4634. By 0450 UT it was back to "normal".

It is well known to visual variable star observers that red stars grow brighter with prolonged observations. The possible variation of Gl 851.1 on 20 September 1977 could not have been the result of this phenomenon, as the comparison star is 0.2 magnitudes redder.

Red dwarf stars with emission line spectra can be flare stars or BY Dra-type spot stars (Bopp and Espenak 1977, preprint). It appears that Gl 851.1 is not an active flare star, but it could likely be a BY Dra-type star. It would be of value to recheck its spectral type and obtain more UBV photometry. Gl 851.1, in Pegasus, is a fall object.

Finder Chart for Gl 851.1

1950 RA $22^{h}\ 9^{m}\ 53^{s}$
1950 Dec +31°19′ 12"



Star	V	B-V	U-B	Number of observations
BD +30°4629	9.90	+1.62	+1.7	1
Gl 851.1	10.12	+1.17	+1.1	2
BD +30°4634	10.15	+1.36	+1.5	2

Photometry done with Leuschner Observatory 76 cm reflector, 1-3 August, 1975.

K. KRISCIUNAS

NASA/Ames Research Center
Mail Stop 248-1
Moffett Field
California 94035
U.S.A.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1347

Konkoly Observatory
Budapest
1977 October 10

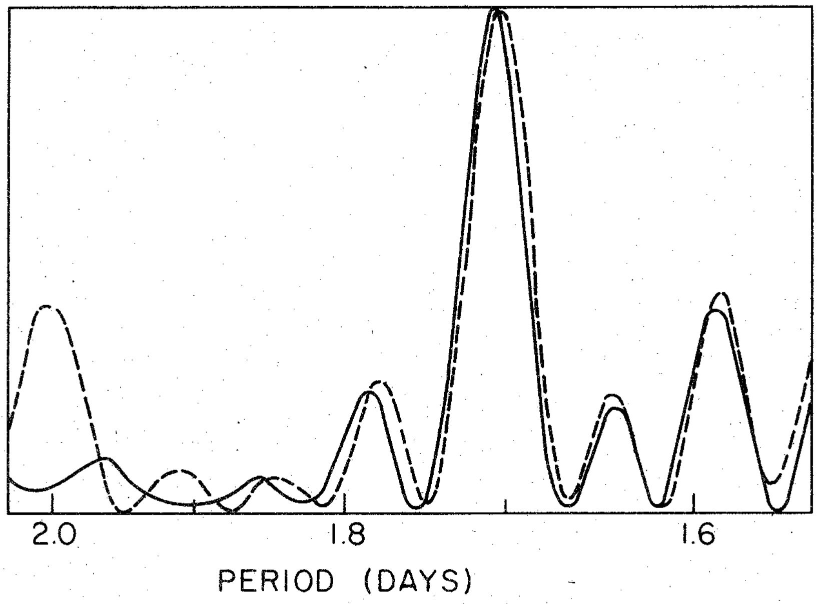
PRACTICAL FORMULAE TO SEARCH PERIODICITIES IN VARIABLE STARS

The distribution of the dates in the series of observations of variable stars are often very irregular. The spacing between consecutive dates may range from hours to weeks or even months. Such unlikeness forbids the use of classical methods to search periodicities, or, at least, makes its use very hazardous. Nevertheless, the use of the fast Fourier transform is almost generalized among astronomers under the pretext that the results obtained are fairly good. In fact we obtained some good results in the study of some BY Dra stars observed at the I.T.A. Astronomical Observatory before 1974. However this has not been always true and practical questions arose when comparing some completely different results obtained for HD 319139 using the fast Fourier transform or the Lafler-Kinman method. The light curve of BY Dra stars are characterized by small amplitude and great noise, and in 1975 we adopted a new technique to deal with series where the dates are arbitrarily spaced. This technique is a natural generalization of the fast Fourier transform and gives more accurate estimates.

In the figure, we show the periodogram obtained for 21 V-magnitudes of the star HD 319139 observed by C.A.O. Torres and I.C. Busko at Cerro Tololo in 1974 (solid line); we also compare it to the periodogram obtained with the classical fast Fourier transform (dashed line).

Recently, in a review paper presented in the Colloquium on Close Binary Stars held in Sao Paulo we have shown the way in which the technique may be generalized to more complex cases like those were the data consist of N pieces of continuous records or where the data have different precisions.

A typical example of problem involving unevenly spaced data of different precisions is the problem of the search of periodicities (and beats) in irregular, semi-regular or long-period variable stars. In this case the measurement I(ω) of the power spectrum at the trial frequency ω is given by the expressions in the next page.



$$x_j = 2\pi\omega t_j$$

$$a_o^{-2} = \Sigma\ w_j$$

$$a_1^{-2} = \Sigma\ w_j \cos^2 x_j - a_o^2(\Sigma\ w_j \cos\ x_j)^2$$

$$\begin{aligned} a_2^{-2} = {} & \Sigma\ w_j \sin^2 x_j - a_o^2(\Sigma\ w_j \sin^2 x_j)^2 - a_1^2(\Sigma\ w_j \cos\ x_j\ \sin\ x_j)^2 \\ & - a_o^4 a_1^2(\Sigma\ w_j \cos\ x_j)^2.(\Sigma\ w_j \sin\ x_j)^2 \\ & + 2a_o^2 a_1^2(\Sigma\ w_j \cos\ x_j).(\Sigma\ w_j \sin\ x_j).(\Sigma\ w_j \cos\ x_j\ \sin\ x_j) \end{aligned}$$

$$c_1 = a_2\ \Sigma\ w_j f(t_j) \cos\ x_j$$

$$\begin{aligned} c_2 = {} & a_2\ \Sigma\ w_j f(t_j) \sin\ x_j\ - \\ & - a_1 a_2 c_1(\Sigma\ w_j \cos\ x_j\ \sin\ x_j - a_o^2\ \Sigma\ w_j \cos\ x_j.\Sigma\ w_j \sin\ x_j) \end{aligned}$$

$$I(\omega) = c_1^2 + c_2^2$$

In these formulae t_j are the observation dates and w_j the weights of the observations. The measures $f(t_j)$ are referred to their mean value, i.e., they are shifted in a way such that $\Sigma\ w_j f(t_j) = 0$. All other symbols are intrinsic quantities.

The light curves under study may be formed by several waves, not necessarily harmonic (as in Blazhko effect). In such cases, before searching for a secondary period, it is necessary to filter the time-series from the main wave. If ω_1 is the main frequency, the filtered time-series is given by

$$g(t_j) = f(t_j) - d(t_j)$$

where

$$d(t_j) = d_o + d_1 \cos x_j + d_2 \sin x_j$$

$$(x_j = 2\pi\omega t_j)$$

and

$$d_o = - a_o^2 (d_1 \Sigma w_j \cos x_j + d_2 \Sigma w_j \sin x_j)$$

$$d_1 = a_1 c_1 + a_2 a_1^2 c_2 (a_o^2 \Sigma w_j \cos x_j . \Sigma w_k \sin x_k - \Sigma w_j \cos x_j \sin x_j)$$

$$d_2 = a_2 c_2$$

The secondary frequencies are searched in the periodogram of the filtered series $g(t_j)$.

The epoch of the minimum in the main wave is one of the two roots of tg $x_o = d_2/d_1$.

S. FERRAZ-MELLO
Universidade de São Paulo
Departamento de Astronomia
(Brazil)

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1348

Konkoly Observatory
Budapest
1977 October 11

A VARIABLE LIGHT-CURVE IN AU MONOCEROTIS

New photoelectric observations in V light of the eclipsing binary AU Monocerotis were carried out during the period September 1976 - April 1977 at the Observatory of Torino with a 45 cm reflector by means of a photoelectric photometer equipped with a photomultiplier 6256 S EMI[1]. These observations, including three minima, show that the cyclic variation of the period suggested in a previous paper (Lorenzi, 1977) and remarked by Todoran (cf. IBVS No. 1217), is not real, but rather the light-curve of this binary is shifted up and down, probably because of long period variations of luminosity of the system as a whole. In order to eliminate any possible fluctuation due to the comparison star, three comparison stars (see Table 1) were used and checked with respect to each other (Fig.1). It turned out that the star No.1, already utilized in the previous work (1977), has shown some instability. Though this instability is very small (see Fig 1a, 1b), star No.3 was preferred as comparison.

Table 1

No.		m_V (SAO)	SP
1	BD -1°1424	9.0	B8
2	BD -1°1447	8.6	K0
3	BD -1°1413	9.0	B9

A mean value of the extinction coefficient K_V was determined each night and the corresponding corrections applied to all observed points; these have been reduced to the international UBV system with the determination of the instrumental scale factors (Hardie, 1962).

[1] The tables of the individual photoelectric observations are available at the Observatory of Torino (Italy).

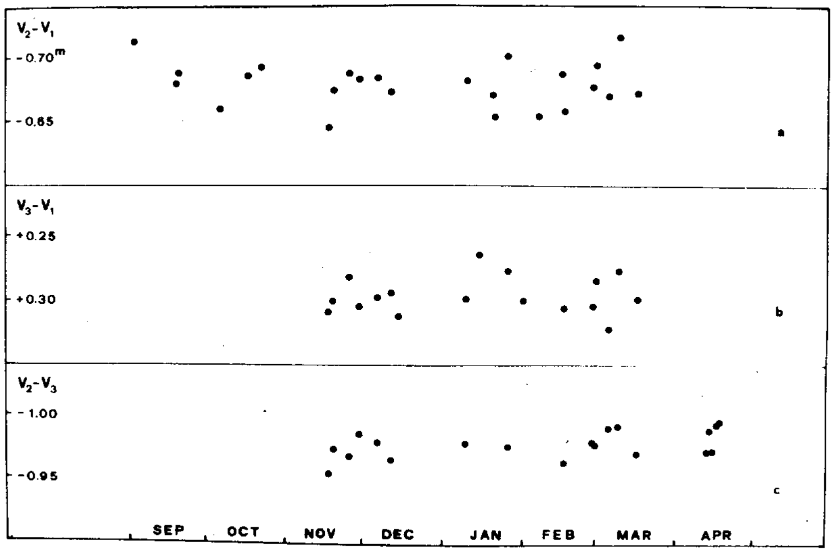


Figure 1: Mean values of the differences in V magnitude, corrected for differential extinction, for each pair of comparison stars obtained during the single nights of observation.

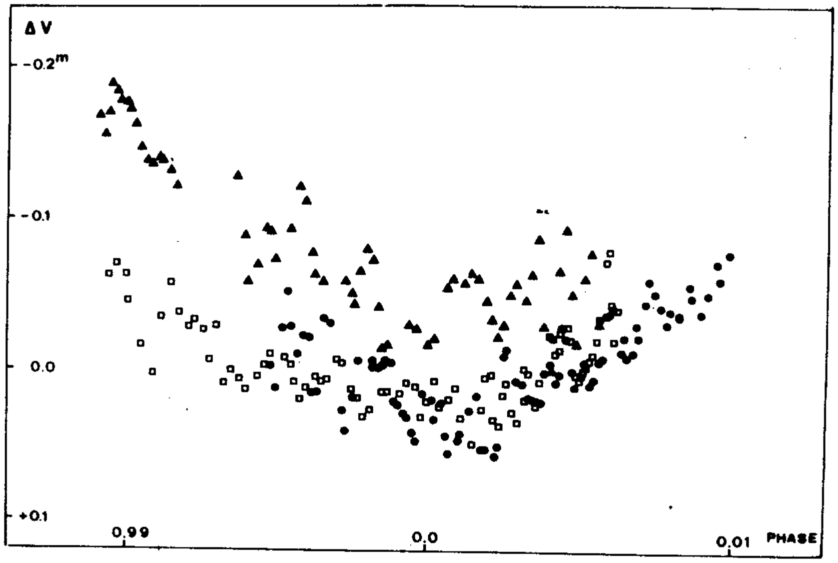


Figure 2: Three observed minima
▲ refer to minimum No.1, • to minimum No. 2,
◘ to minimum No.3.

The results obtained till now suggest that the light-curve might be subject to long period variations.

For three minima (Fig.2) the times of minimum light and their mean error are computed by the KW method (Kwee and van Woerden, 1956). The results are listed in Table 2. These epochs are in quite good agreement with the linear ephemeris (Lorenzi, 1977):

$$M\ (E) = 2442801.3602 + 11\overset{d}{.}11306 \cdot E. \qquad (1)$$

Table 2

	J.D. Hel	σ_{KW}
1	2443123.6530	$\pm 0\overset{d}{.}0006$
2	3190.3323	.0005
3	3201.4495	.0011

Observations carried out in other phases apparently confirm the variability of the light-curve. Consequently, in order to ascertain the reality of this phenomenon, observations in the same ranges of phase were repeated. The results of this research are collected in Table 3.

Table 3

	N	Phase	$\overline{\Delta V}$	$s_{\overline{\Delta V}}$
19/9/1976	46	0.5303	−0.715	+0.001
25/11/1976	21	.5390	− .799	.003
5/12/1976	34	.5315	− .770	.004
4/ 3/1977	21	.5307	− .650	.003
15/ 3/1977	42	.5232	− .627	.003
2/ 9/1976	14	.0019	+ .048	.002
19/11/1976	18	.0019	− .037	.002
11/12/1976	15	.0019	− .046	.004
15/ 2/1977	18	.0019	+ .029	.005
26/ 2/1977	16	.0019	+ .022	.003
11/12/1976	18	.9958	− .079	.006
15/ 2/1977	13	.9958	− .013	.007
26/ 2/1977	16	.9958	+ .004	.002
17/10/1976	26	.0400	− .657	.005
12/ 4/1977	33	.0400	− .508	.005
28/11/1976	26	.9023	− .815	.002
8/ 3/1977	14	.8942	− .643	.012

All data refer to normal points. The columns contain respectively: date, number of single observations used to form a normal point, phase according to ephemeris (1), $\overline{\Delta V}$ according to comparison star No.3, mean error $s_{\overline{\Delta V}}$. Their analysis suggests a long-term displacement of the whole light-curve.

A series of observations carried out at maximum during consecutive nights, compared with those of December 1976, seem to confirm the slow variation of the light-curve. Table 4 summarizes these results, following the same scheme as Table 3.

Table 4

	N	Phase	$\overline{\Delta V}$	$s_{\overline{\Delta V}}$
13/12/1976	14	0.2462	-0.873	±0.004
13/ 4/1977	17	.1312	- .615	.004
15/ 4/1977	15	.3107	- .665	.003
16/ 4/1977	15	.4006	- .651	.005

Now we should like to recall that the conclusions drawn in a previous paper were based on the assumed hypothesis (Lorenzi, 1977; see footnote 2) that the light-curve would be constant with time. This assumption was justified by the sole existing photographic light-curve (Wachmann, 1954); as a matter of fact, it was built up collecting observations spread through a period of about fifteen years and the probable fluctuations were smoothed by plotting the mean values.

This possible shift of the whole light-curve alongside the vertical axis, due to a long period fluctuation in the luminosity of the system, rules out the procedure of deducing the minimum epochs from parts of the ascending or descending branches through an extrapolation alongside the phase axis. Consequently, the epochs Nos. 16-18-19 reported in Table 1 of the previous paper (Lorenzi, 1977) are not real, since they were deduced from the remarkable shifting of the ascending branches with respect to the minimum No.17. Possibly, owing to the great difficulties in the observation of this system, some previous epochs of minimum have also been deduced in the same way or from normal minima, originating the scattering of the (O-C)'s.

M. CERRUTI-SOLA

L. LORENZI

Osservatorio Astronomico
di Torino
10025 Pino Torinese,Italia

References:

Hardie, R.H.: 1962, Stars and Stellar Systems,Chicago Press, Vol. II, 178
Kwee, K.K., Woerden, H. van: 1956, Bull.Astron.Inst.Neth.12,327
Lorenzi, L.: 1977, Astron.Astrophys. 55, 195
Todoran, I.: 1976, I.B.V.S. No.1217
Wachmann, A.A.: 1954, Astron.Abh.d.Hamb.Sternwarte 7, 407

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1349

Konkoly Observatory
Budapest
1977 October 11

CHARTS AND UPDATED RESULTS FOR TWELVE SAGITTARIUS VARIABLES

Finder charts (Figures 1 and 2) and updated results are given (Table I) for twelve long-period variables in Sagittarius. Their elements as given in the GCVS had been determined prior to 1959 from observations on Harvard plates taken mainly between 1924 and 1950. The Nantucket plates taken from 1957 to 1977 were searched for maxima and the periods have been revised accordingly. In all cases the previous periods were either confirmed or only slightly altered. In general, both the old and the new observations are satisfied by the new period. Three of the stars, however, appear to have changing periods: V1658, V1667 and V1691 Sgr. Although the changes for the first two of these are small, better representations of the maxima are found when the early and the late observations are treated separately. Fig. 3 indicates a fair representation by a single constant period for all of the observations of V1658 Sgr, but the scatter is improved if the period is assumed to have changed at about JD 28000. V1667 Sgr is a similar case. Both of these stars should probably be classified as SR. The three day decrease in period of V1691Sgr is unmistakable; the period for neither group of observations will adequately satisfy the other group.

This investigation was carried out under a grant from the U.S. National Science Foundation, AST77-06974.

DORRIT HOFFLEIT
Maria Mitchell Observatory
Nantucket, Mass. 02554,
U.S.A.

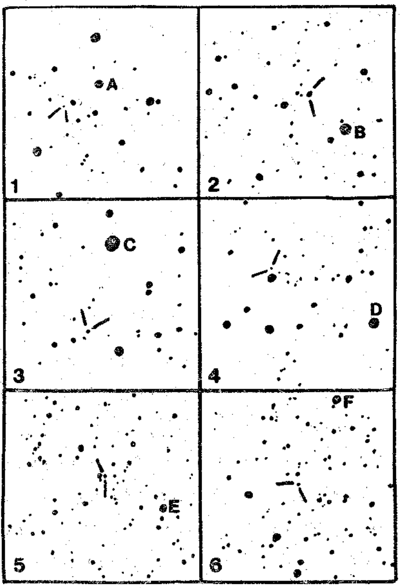


Figure 1. Finder charts for the first six variables in Table I. South at top, area of field approximately 10′ x 10′.

1. V1651 Sgr A is Co.D.-23°14286
2. V1658 Sgr B is Co.D.-23°14319
3. V1663 Sgr C is Co.D.-25°13149
4. V1665 Sgr D is B.D.-21°5017
5. V1667 Sgr E is Co.D.-24°14385
6. V1668 Sgr F is Co.D.-22°13014

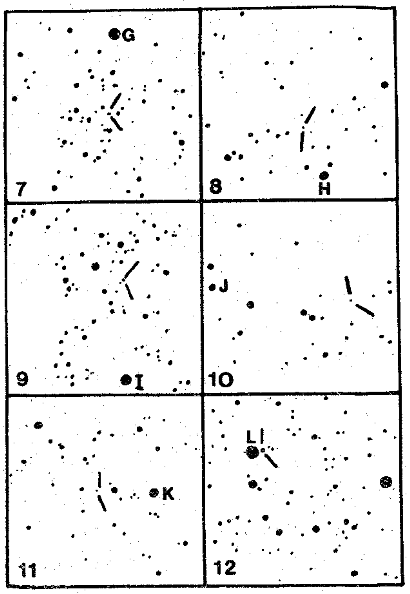


Figure 2. The last six variables in Table I.

7. V1689 Sgr G is Co.D.-22°13095
8. V1691 Sgr H is Co.D.-22°13101
9. V1695 Sgr I is Co.D.-22°13119
10. V1696 Sgr J is Co.D.-25°13271
11. V1697 Sgr K is Co.D.-22°13135
12. V1901 Sgr L is Co.D.-26°13247

Table I

Revised Data for Sagittarius Variables

Name Sgr	GCVS JD$_0$	Per	Revised JD$_0$	Per	Chart	Note
1651	24440	398^d	40400	400^d	1	a
1658	26560	105	36410	106	2	b
1663	26570	148	43000	148:	3	SR
1665	26170	297	42275	298	4	
1667	26560	158	43010	159	5	c
1668	27230	285	41530	286	6	
1689	23590	149.5	42275	149.5	7	SR
1691	26520	235	39300	232	8	d
1695	24380	191	40090	191.5	9	SR
1696	26230	292	42585	292	10	
1697	26120	260	43010	260	11	
1901	26160	142.6	42278	142.6	12	e

a. The new period satisfies both the older Harvard and the recent Nantucket observations.

b. The early period holds through JD 28000; thereafter 106^d is better. See Fig. 3.

c. Period seems to be changing. 158^d holds to JD 36000, 159^d thereafter.

d. Period seems to have changed sometime between JD 28000 and 36000. The Harvard observations were mainly for JD 23900 to 28000; the Nantucket from JD 36000 to 43000.

e. Estimates for this star on Nantucket plates were carried out by a student, Gail Harns.

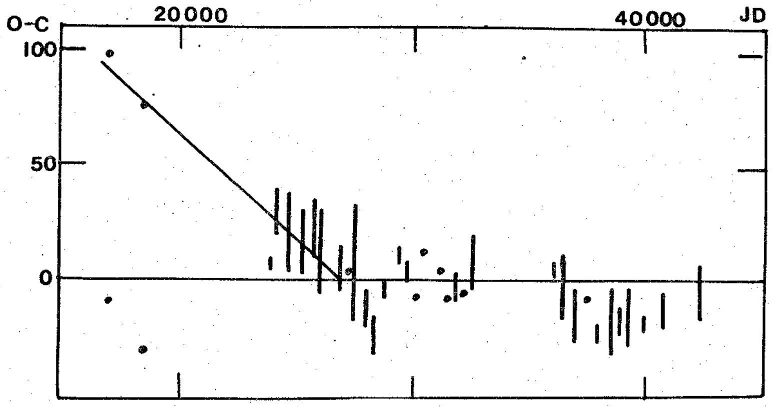


Figure 3. O - C plot of maxima for V1658 Sgr based on period of 106 days. Horizontal markers at intervals of 10,000 days, vertical intervals of 50 days. The observations near JD 18000 are plotted as computed and displaced by one cycle, thus indicating the early period of 105 days. Dots indicate single observations, vertical bars the span or duration of maxima.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1350

Konkoly Observatory
Budapest
1977 October 17

MINIMA OF ECLIPSING BINARY STARS

Presented are 28 minima of eclipsing binary stars. All observations were visual with both the descending and ascending branch of the light curve observed. Times of minima were found by the tracing paper method.

Column one gives the heliocentric time of minima. Column two gives the number of visual brightness estimates used in the light curve. Columns three and four give the epoch and O-C from the linear elements of GCVS 1969. Column five gives the standard deviation, σ, expected for a single visual minimum of that star is given. These standard deviations are calculated from studies by Mallama, A.D. (1974a, JAAVSO, 3, 11 and 1974b, JAAVSO, 3, 49). Column six indicates the observer.

Telescopes used were as following: 20.3 cm refractor, 36.2 cm reflector, and a 15.2 cm reflector.

JD hel. 2,440,000 +	n	Epoch	O-C days	σ	Observer
OO Aquilae					
2906.737	8	17722	-^{d}.035	^{d}.006	Stephan
2957.680	11	17822.5	-.025		Stephan
WW Aurigae					
2786.800	10	3897.5	-.001	.01	Stephan
R Canis Majoris					
2887.502	8	6490	-.010	.01	Stephan
RZ Cassiopeiae					
2412.644	16	4408	+.005	.004	Stephan
2510.652	14	4490	+.003		Stephan
2712.649	10	4659	+.003		Stephan
2786.750	14	4721	-.001		Stephan
2878.781	14	4798	-.004		Stephan
3073.609	10	4961	-.001		Stephan
3080.775	9	4967	-.007		Stephan
EK Cephei					
2447.546	14	778	+.003	.006	Stephan

Table (cont.)

JD hel. 2,440,000 +	n	Epoch	O-C days	σ	Observer
U Coronae Borealis					
2984.695	8	7600	-^{d}.021	^{d}.007	Stephan
W Corvi					
2510.634	8	37748	-.008	.01	Stephan
Y Cygni					
2574.719	10	11027	-.168	.01	Stephan
2712.570	12	11073	-.146		Stephan
RZ Draconis					
2984.641	11	24571.5	-.012	.005	Stephan
AI Draconis					
2574.725	13	2934	-.006	.005	Stephan
YY Eridani					
2760.708	12	28439.5	-.004	.005	Stephan
SZ Herculis					
2878.748	12	9646	+.030	.003	Stephan
FL Lyrae					
2906.758	9	2151	-.004	.01	Stephan
U Ophiuchi					
2574.651	10	20446	-.006	.01	Stephan
ER Orionis					
2446.541	8	14024	-.019	.007	Stephan
2760.703	11	14766	-.020		Stephan
HU Tauri					
3080.750	8	8481	+.010	.01	Stephan
X Trianguli					
3050.668	11	5639	-.035	.003	Stephan
3053.585	9	5642	-.033		Stephan
AZ Virginis					
2503.746	13	47733	-.024	.005	Stephan

JD hel. equals the heliocentric Julian Day for minima.

n equals the number of visual brightness estimates used to plot the light curve.

Epoch and O-C are from the linear elements in the 1969 General Catalogue of Variable Stars.

CHRISTOPHER P. STEPHAN
Mahoning Valley Observatory
Braceville, Ohio, U.S.A.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1351

Konkoly Observatory
Budapest
1977 October 17

NOVA SAGITTARII 1975 NO 2

Nova Sagittarii 1975 No 2 was found on an objective prism plate taken with the Uppsala Southern Schmidt telescope at Mt Stromlo (IAU Circ. 2997). Since the plate belongs to a large survey work, it was unfortunately not searched until more than a year after the exposure. The only observations of the nova in the bright phase besides this spectrogram are, as far as we know, three magnitude measurements made by Huth (IBVS No. 1205) included in the Sonneberg Sky Patrol programme. We have also identified the star on Palomar Observatory Sky Survey and on Uppsala Southern Schmidt plates taken during 1977. The position of the candidate star is

$$\alpha = 17^{h}46^{m}47\overset{s}{.}4 \pm \overset{s}{.}4$$
$$\delta = -17^{\circ}22'30'' \pm 5''$$

for the epoch 1950.0, being equal to $\ell=10.39^{\circ}$, $b=5.15^{\circ}$, i.e. close to the direction of the galactic centre. A finding chart is given in Fig.1, magnitude observations in Table 1.

Table 1

Year, date	Source	m_{pg}
1950	Palomar Observatory Sky Survey	15:
1975 May 12.98	Sonneberg Sky Patrol	>11
1975 June 1.99	Sonneberg Sky Patrol	9.4
1975 June 8.69	Uppsala Southern Schmidt (prism)	8.5:
1975 July 5.92	Sonneberg Sky Patrol	>11
1977 March 15	Uppsala Southern Schmidt (direct)	15:

The objective prism spectrogram was scanned with the PDS machine of Lund Observatory. Unfortunately the spectrum was partly

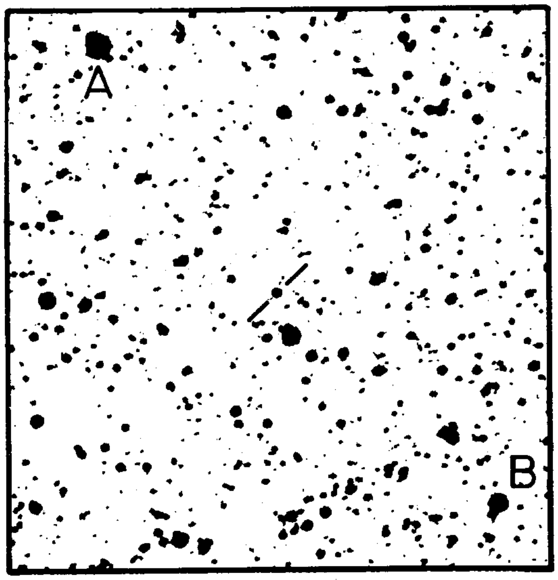


Fig.1. Finding chart for the nova. The side of the field is 10′. Visual plate from Uppsala Southern Schmidt Star A is HD 162080 and star B is BD -17°4926.

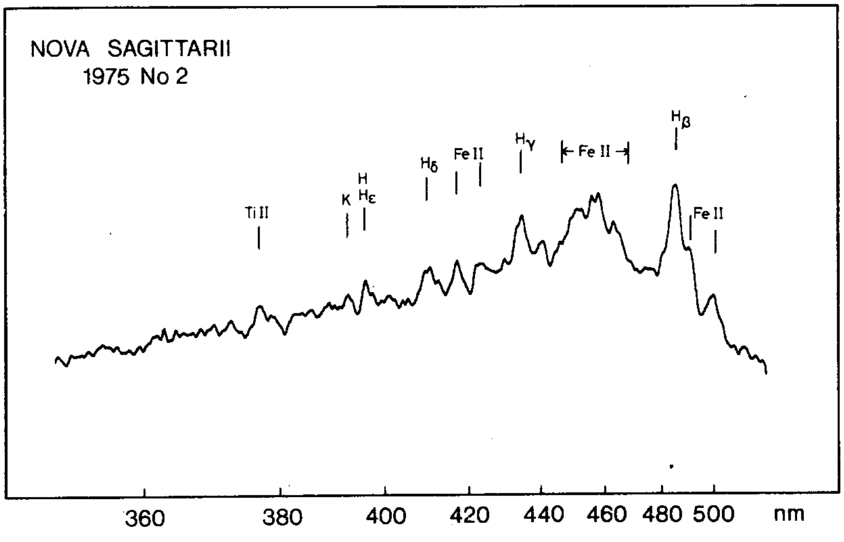


Fig.2. Filtered density tracing of the nova spectrum. Original dispersion is 47 nm/mm.

overlapped with the fainter spectrum of a nearby star, thus preventing us from using the full width of the spectrogram.Fig.2 shows a density tracing filtered with a Gaussian numerical filter in order to reduce the background noise. The relatively low original dispersion, 47 nm/mm at Hγ, does not allow a detailed identification of the spectral features. The strongest emission features, besides the Balmer lines, are due to Fe II and Ti II, and the absorption lines are not very pronounced. This suggests that the spectrum is of the "diffuse enhanced" type, characteristic for a nova about two magnitudes below maximum. Moreover, a comparison with a series of spectrograms of Nova Cygni 1975 (Lindegren and Lindgren, Nature 258, 501), shows that the spectrum very closely resembles the spectrum of Nova Cygni 1.5 magnitudes below maximum. The maximum magnitude would then be around m_{pg} =7, giving a total amplitude of about 8 magnitudes. This also implies that the observation on June 1.99 is a premaximum observation, and that the maximum brightness occurred one or two days later. The (negative) observation on July 5.92 puts an upper limit on the time for the decline to three magnitudes below maximum, t_3. It follows that $t_3 < 33$ days, probably is t_3 considerably smaller (10 - 20 days). This places the nova in the group of fast or possibly very fast novae.

On the basis of the scarce data no reliable values for absolute magnitude and distance can be calculated. We would be very happy to know if there exist any other observations of this nova during its active stage, since such data could provide a basis for more firm and reliable conclusions about its properties.

INGEMAR LUNDSTRÖM
BJÖRN STENHOLM

Lund Observatory
Svanegatan 9
S-222 24 Lund, Sweden

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1352

Konkoly Observatory
Budapest
1977 October 19

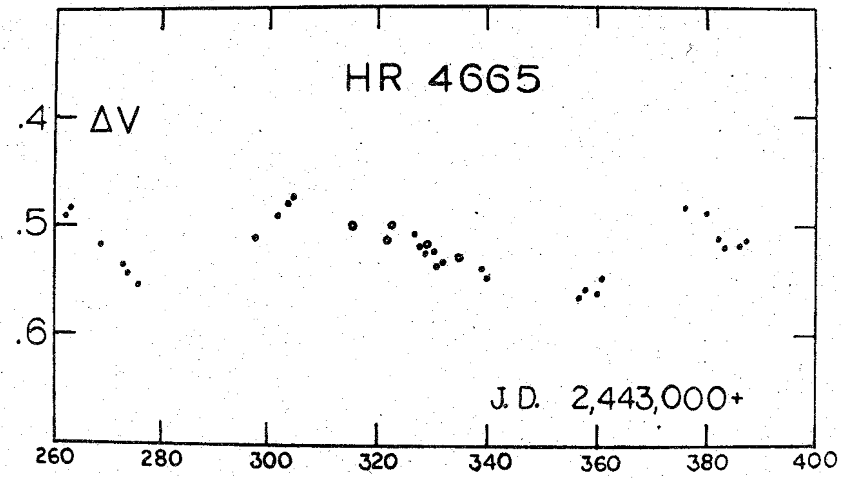
HR 4665: A NEWER, BRIGHTER RS CVn BINARY

The recent discovery of the interesting characteristics of HR 1099 = V711 Tau (Bopp and Fekel, 1976; Bopp, Espenak, Hall, Landis, Lovell and Reucroft, 1977; Owen, 1976) has given observers a bright ($V \approx 5^{m}_{\cdot}8$) readily accessible RS CVn binary that can be studied in many different wavelength regions. To further aid satellite-UV observers, radio astronomers, and high dispersion spectroscopists, we have discovered a brighter RS CVn binary: HR 4665 ($V \approx 5^{m}_{\cdot}4$ according to the 1964 Yale Bright Star Catalogue).

HR 4665 is listed by Bidelman (1954) as a spectroscopic binary with CaII emission. Several spectra obtained by Young (1945) had indicated a velocity variation of ~ 30 km/sec. Spectroscopic observations by Doty (1975) with the 1-meter Ritter Observatory reflector revealed the Ca II H and K reversals to be exceptionally strong. In addition, his spectra (dispersion 30 Å/mm) exhibited variable line widths suggesting a double-line spectroscopic binary. Subsequent coudé spectra (dispersion 8 Å/mm) obtained at McDonald Observatory confirmed the suspected line doubling. On these high dispersion blue spectra the absorption lines of both components are narrow, with approximately equal intensity. Ca II emission is present in both components. The spectral types are near K0. A few observations of the red region obtained at Ritter show Hα as a normal absorption feature. A spectroscopic orbit has not yet been determined, but an orbital period in the range 10^{d} to 20^{d} is suggested by the data.

Recent photoelectric photometry at two observatories has revealed the optical variability of HR 4665. Using the 60-cm Cassegrain reflector at Dyer Observatory, Henry obtained 90 differential V observations on 28 nights between JD 2,443,260 and 2,443,387. With his 20-cm Newtonian reflector Landis obtained 11 observations in the V on 5 nights from JD 2,443,316 to 2,443,335. All observations were made with respect to the comparison star HR 4659 and corrected for differential atmospheric extinction. Nightly extinction coefficients were used whenever possible because of the rather wide angular separation of the variable and the comparison (about 2°) and the large hour angles at which many of observations were made. In addition, the observations were transformed to V of the UBV system, but the corrections involved were very small since Δ(B-V) is only $-0^{m}.04$. As a check on the constancy of the comparison star, HR 4740 was observed differentially with respect to HR 4659 on 5 nights by Henry. The resulting mean difference was $\Delta V=0^{m}.613$, with a standard deviation of $\pm 0^{m}.007$ for a single observation about that mean.

Nightly means of the differential magnitudes of Henry and Landis are plotted in the Figure as closed circles and open circles, respectively; Δ is in the sense variable minus comparison.



The uncertainties of these nightly means probably fall in the range $\pm 0^{\mathrm{m}}.005$ to ± 0.015. Although there are gaps in the light curve, the simplest interpretation yields a photometric period in the range 60^{d} to 70^{d} and an amplitude from maximum to minimum of $0^{\mathrm{m}}.08$.

Since it seems that the photometric period and the spectroscopically determined orbital period are considerable different, HR 4665 resembles λ And (Landis, Lovell, Hall, and Henry, 1977) more so than it does HR 1099. In λ And the orbital period is $20^{\mathrm{d}}.5$ and the photometric period is in the range 48^{d} to 57^{d}. If the orbital period of HR 4665 turns out to be greater than 14 days, it would not strictly be an RS CVn binary but would be a member of the long period group defined by Hall (1976).

We are preparing to obtain additional observations of HR 4665, both spectroscopic and photometric, as soon as it again becomes observable in the sky.

BERNARD W. BOPP
Ritter Observatory
University of Toledo
Toledo, Ohio 43606

FRANCIS FEKEL, Jr.
Department of Astronomy
University of Texas
Austin, Texas 78712

DOUGLAS S. HALL

GREGORY W. HENRY
Dyer Observatory
Vanderbilt University
Nashville, Tennessee 37235

HOWARD J. LANDIS
Landis Observatory
2395 Wood Hill Lane
East Point, Georgia 30344

References:

Bidelman, W.P. 1954, Astrophys.J.Suppl. 1, 175

Bopp, B.W. and Fekel, F. 1976, Astron.J. 80, 771

Bopp, B.W.,Espenak, F.,Hall, D.S.,Landis,H.J.,Lovell,L.P., Reucroft, S. 1977, Astron.J. 82, 47

Doty, E. 1975, Master's Thesis, University of Toledo

Hall, D.S. 1976, I.A.U. Colloq. No.29, part I, 287

Landis, H.J.,Lovell, L.P., Hall, D.S., Henry, G.W. 1977, Bull.Am.Astron. Soc. 9, 351

Owen, F.N. 1976, I.A.U. Circ. No. 2929

Young, R. 1945, Pub. David Dunlap Obs. 1, 1

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1353

Konkoly Observatory
Budapest
1977 October 21

PHOTOELECTRIC OBSERVATIONS OF 44i BOOTIS

Veröffentlichung der Wilhelm Foerster Sternwarte Nr.48

This bright W UMa type variable was investigated for sudden period changes and disturbances in the light curve by Bergeat et al. (1972) and Duerbeck (1977). From their investigations a period jump and lightcurve activity could be expected in 1977.

A total of 375 V observations were carried out in six nights. An unrefrigerated RCA 1P21 multiplier, attached at the 75 cm reflector (2 nights) or at the 31.4 cm refractor (4 nights) of the Wilhelm Foerster Observatory was used. The comparison star was 47 k Boo in all nights. A correction for extinction was made in the usual way.

From this material, the minima of Table 1 were determined by Pogson's method:

Table 1: Minimum times

Epoch	Minimum	O-C	Instrument
12621	$2443232^{d}.5917$ ± 0.0005	$-0^{d}.0031$	75 cm
12695	252.4113 ± 0.0010	-0.0019	31.4 cm
12826	287.4937 ± 0.0005	-0.0033	31.4 cm

The ephemeris is adopted from Duerbeck (1975).

Unfortunately only the primary minima of the star were observed. But in all cases there are evidences for activities in the curves, observed as small minima in the descending branches. Table 2 gives the dates, phases, amplitudes and durations:

Table 2: Lightcurve activities

Date	Phase	Amplitude	Duration
2443232^{d}	$0^{P}.865$	$0^{m}.02$	$0^{d}.008$
252	0.873	0.02 :	0.010
287	0.771	0.03	0.010
295	0.731	0.03	0.03

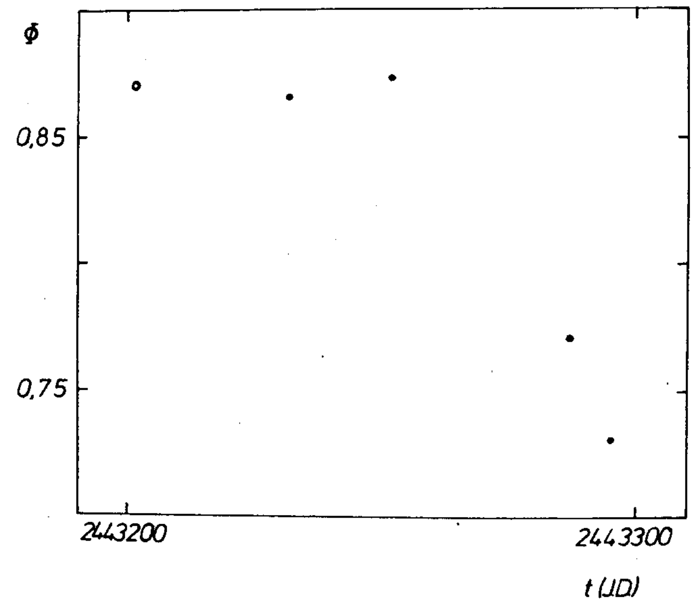


Fig.1. Phase drift of the light-curve disturbances. Circles-Duerbeck (1977), dots-this paper.

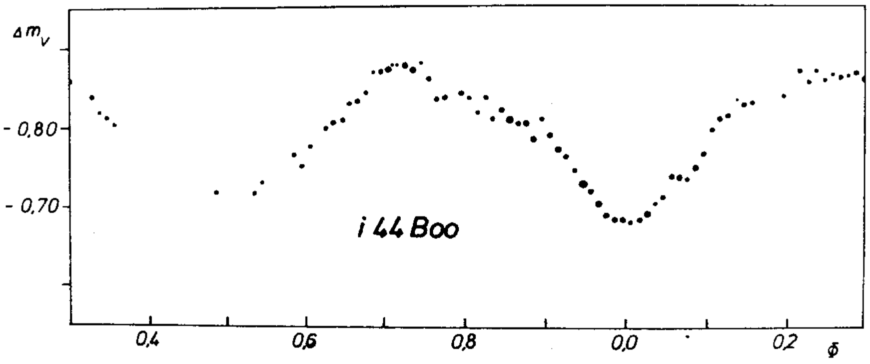


Fig.2. Mean light-curve of all observations of this paper. Diameter of dots represents the number of observations.

The "shoulders" - as named by Duerbeck (1977) - are constant in phase in Duerbeck's observations from 1975 up to J.D. 2443252^d in this paper at $0^p.870$. Then a drift started as shown in Fig.1. Also the amplitude increased. This is the reason why the disturbances in the mean lightcurve of Fig. 2 reach from the phase $0^p.75$ to $0^p.89$. At least one can notice that the maxima are of unequal height, the primary maximum is $0^m.01$ less than the secondary. Around the phase $0^p.06$ a larger scatter as usual was observed on J.D. 2443252^d and J.D. 2443287^d.

We have to thank the Fritz Haber Institut for the possibility to use their DEC 10 calculator and Dr.H. Duerbeck for supporting this work.

U. HOPP
S. WITZIGMANN
M. KIEHL
Wilhelm Foerster Observatory
Berlin

References:

Bergeat, J., Lunel, M. and Sibille, F., Astron.Astrophys.17,215, 1972
Duerbeck, H., I.B.V.S. No. 1023, 1975
Duerbeck, H., private communication, in press, 1977

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1354

Konkoly Observatory
Budapest
1977 October 24

PHOTOELECTRIC OBSERVATIONS OF THE FLARE STAR BD + $13^{O}2618$ IN 1973, 1974

Continuous photoelectric monitoring of the flare star BD $+13^{O}2618$ has been carried out at the Stephanion Observatory ($\lambda=-22^{O}49'44"$, $\varphi=+37^{O}45'15"$) during the years 1973, 1974 using the 30 inch Cassegrain reflector of the Department of Geodetic Astronomy, University of Thessaloniki. Observations have been made with a Johnson dual channel photoelectric photometer in the B colour of the international UBV system. The telescope and photometer will be described elsewhere. Here we mention only that the transformation of our ubv system to the international UBV system is given by the following equations:

for the time interval from 9-4-1973 to 25-4-1973

$$V = v_O + 0.039(b-v)_O+1.560$$
$$B-V = 0.737 + 1.033(b-v)_O$$
$$U-B =-1.365 + 1.007(u-b)_O$$

for the time interval from 5-5-1973 to 6-5-1973

$$V = v_O + 0.070(b-v)_O+1.865$$
$$B-V = 0.753 + 1.030(b-v)_O$$
$$U-B =-1.379 + 1.021(u-b)_O$$

and for the time interval from 20-4-1974 to 23-4-1974

$$V = v_O -0.011(b-v)_O+2.445$$
$$B-V = 0.848 + 0.992(b-v)_O$$
$$U-B =-1.632 + 0.999(u-b)_O$$

The monitoring intervals in UT as well as the total monitoring time for each night are given in the Tables Ia, Ib. Any interruption of more than one minute has been noted. In the fourth column of Tables Ia, Ib the standard deviation of random noise fluctuation $\sigma(\text{mag})= 2.5 \log(I_O+\sigma)/I_O$ for different times (UT) of the corresponding monitoring interval is given.

During the 10.23 hours of monitoring time no flare was observed.

Table Ia

Monitoring Intervals in 1973

Date 1973	Monitoring Intervals (U.T.)	Total Monitoring Time	σ(U.T.)
April 9-10	20^h53^m-21^h23^m,21^h27^m-21^h58^m, 22 03 -22 27,00 19 -00 31, 00 33 -00 35,00 59 -01 16.	01^h56^m	0.015(21^h01^m),0.012 (21^h55^m),0.015(22 13), 0.014(00 25).
20	19 48 -20 11	23	0.020(20 09).
22	20 53 -20 56,21 00 -21 25	28	0.015(21 12)
24-25	20 36 -21 08,21 12 -21 34, 23 12 -23 17,23 22 -23 32, 23 36 -23 48,23 50 -00 04, 00 09 -00 22,00 24 -00 38, 00 46 -01 04,01 07 -01 18, 01 22 -01 36.	02 45	0.015(20 57),0.014 (21 24),0.020(23 54), 0.024(00 27),0.034 (01 14),0.037(01 31).
25	20 18 -20 39	21	0.013(20 25)
May 5-6	22 53 -23 01,23 05 -23 24, 23 29 -23 50,23 53 -00 01, 00 10 -00 20,00 22 -00 28	01 12	0.012(22 55),0.014 (23 15),0.011(23 35), 0.015(00 16)
	Total	07^h05^m	

Table Ib

Monitoring Intervals in 1974

Date 1974	Monitoring Intervals (U.T)	Total Monitoring Time	σ(U.T.)
April 20	00^h41^m-01^h23^m,01^h48^m-01^h56^m 02 00 -02 28,	01^h18^m	0.017(01^h06^m),0.018 (02 04)
22-23	23 59 -00 30,00 33 -00 59, 01 02 -01 32,01 48 -02 12	01 51	0.012(00 12),0.015 (00 38),0.013(01 05), 0.022(01 53).
	Total	03^h09^m	

G. KAREKLIDIS, F. MAHMOUD, L.N. MAVRIDIS, D. STAVRIDIS
H.ZERVAKI - ZOEROU
Department of Geodetic Astronomy
University of Thessaloniki

Reference:

Andrews, A.D., Chugainov, P.F., Gershberg, R.E. and Oskanian,V.S. 1969, I.B.V.S. No. 326

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1355

Konkoly Observatory
Budapest
1977 October 24

PHOTOELECTRIC OBSERVATIONS OF THE FLARE STAR BD +16°2708 IN 1973, 1974

Continuous photoelectric monitoring of the flare star BD +16°2708 has been carried out at the Stephanion Observatory ($\lambda=-22^{\circ}49'44''$, $\varphi=+37^{\circ}45'15''$) during the years 1973, 1974 using the 30 inch Cassegrain reflector of the Department of Geodetic Astronomy, University of Thessaloniki. Observations have been made with a Johnson dual channel photoelectric photometer in the B colour of the international UBV system. The telescope and photometer will be described elsewhere. Here we mention only that the transformation of our instrumental ubv system to the international UBV system is given by the following equations:

for the time interval from 6-5-1973 to 6-6-1973

$$V = v_o + 0.070(b-v)_o+1.865,$$
$$B-V = 0.753 + 1.030(b-v)_o,$$
$$U-B =-1.379 + 1.021(u-b)_o.$$

for the time interval from 11-5-1974 to 31-5-1974

$$V = v_o-0.011(b-v)_o+2.445,$$
$$B-V = 0.848 + 0.992(b-v)_o,$$
$$U-B =-1.632 + 0.999(u-b)_o.$$

The monitoring intervals in UT as well as the total monitoring time for each night are given in the Tables Ia, Ib. Any interruption of more than one minute has been noted. In the fourth column of Tables Ia, Ib the standard deviation of random noise fluctuation $\sigma(\text{mag})=2.5\,\log(I_o+\sigma)/I_o$ for different times (UT) of the corresponding monitoring interval is given.

During the 40.18 hours of monitoring time 1 flare was observed the characteristics of which are given in Table II. For this flare following characteristics (Andrews et.al. 1969) are given:

Table Ia

Monitoring Intervals in 1973

Date 1973	Monitoring Intervals (U.T.)	Total Monitoring Time	σ(U.T.)
May 6-7	20^h50^m-21^h24^m,21^h28^m-22^h00^m 2208-2233,2329-2338,2340-2351, 2357-0008,0010-0021,0034-0040, 0042-0058,0108-0119.0121-0131.	02^h56^m	0.012(21^h17^m),0.021 (21 32),0.021(22 18 , 0.015(22 33),0.019 (00 01),0.016(00 50) 0.016(01 16).
7-8	2046-2106,2110-2138,2142-2153, 2155-2206,2215-2238,2330-2334, 2337-2346,2348-2357,0002-0010, 0012-0022,0027-0036,0039-0048, 0051-0101,0109-0117,0119-0128, 0133-0143,0145-0152.	03 15	0.019(20 59),0.023 (21 26),0.019(21 47), 0.018(22 22),0.014 (23 42),0.016(00 16), 0.021(00 32),0.018, (01 21),0.028(01 38).
8-9	2025-2039,2041,2053,2058-2130, 2133-2144,2146-2200,2202-2211, 2256-2331,2334-2355,0000-0011, 0013-0025,0033-0046,0048-0058.	03 14	0.032(20 46),0.025 (21 07),0.020(21 56), 0.020(23 25),0.017 (23 50),0.021(00 17), 0.017(00 44).
10-11	2040-2106,2109-2140,2143-2157, 2159-2210,2259-2308,2310-2323, 2327-2336,2339-2348,2351-2358, 0002-0010,0015-0025,0036-0045, 0047-0055,0102-0111,0114-0123.	03 02	0.020(21 00),0.028 (21 23),0.022(22 02), 0.019(23 16),0.019 (23 44),0.015(00 18), 0.020(00 41),0.017 (01 16).
11-12	2040-2107,2110-2146,2149-2212, 2258-2321,2325-2331,2335-2343, 2347-2354,0000-0008,0015-0114, 0118-0129,0132-0136.	03 01	0.028(20 47),0.024 (21 43),0.029(21 52), 0.015(23 05),0.022 (23 39).
21-22	2008-2020,2022-2030,2033-2048, 2049-2051,2053-2108,2111-2136, 2138-2140,2228-2238,2241-2305, 2309-2317,2319-2340,2343-2354, 2356-0011,0019-0042.	03 11	0.021(20 23),0.023 (20 58),0.024(21 25), 0.034(22 55),0.031 (23 34),0.037(23 49), 0.035(00 34).
June 1-2	2016-2047,2049-2100,2102-2114, 2116-2123,2213-2222,2223-2229, 2231-2242,2246-2302,2303-2318, 2323-2332,2334-2347,2348-2357, 0005-0015,0017-0027,0030-0035, 0038-0113.	03 29	0.018(20 28),0.021 (21 04),0.021(22 36), 0.022(23 06),0.025 (23 35),0.027(00 18), 0.026(01 04).
5-6	2245-2254,2256-2306,2310-2318, 2319-2329,2331-2334,2338-2345, 2348-2356,2358-0005,0015-0024, 0026-0035,0037-0042,0045-0055, 0057-0105.	01 43	0.019(23 01),0.018 (23 15),0.019(23 41), 0.023(00 28),0.028 (00 59).
	Total	23^h51^m	

Table Ib

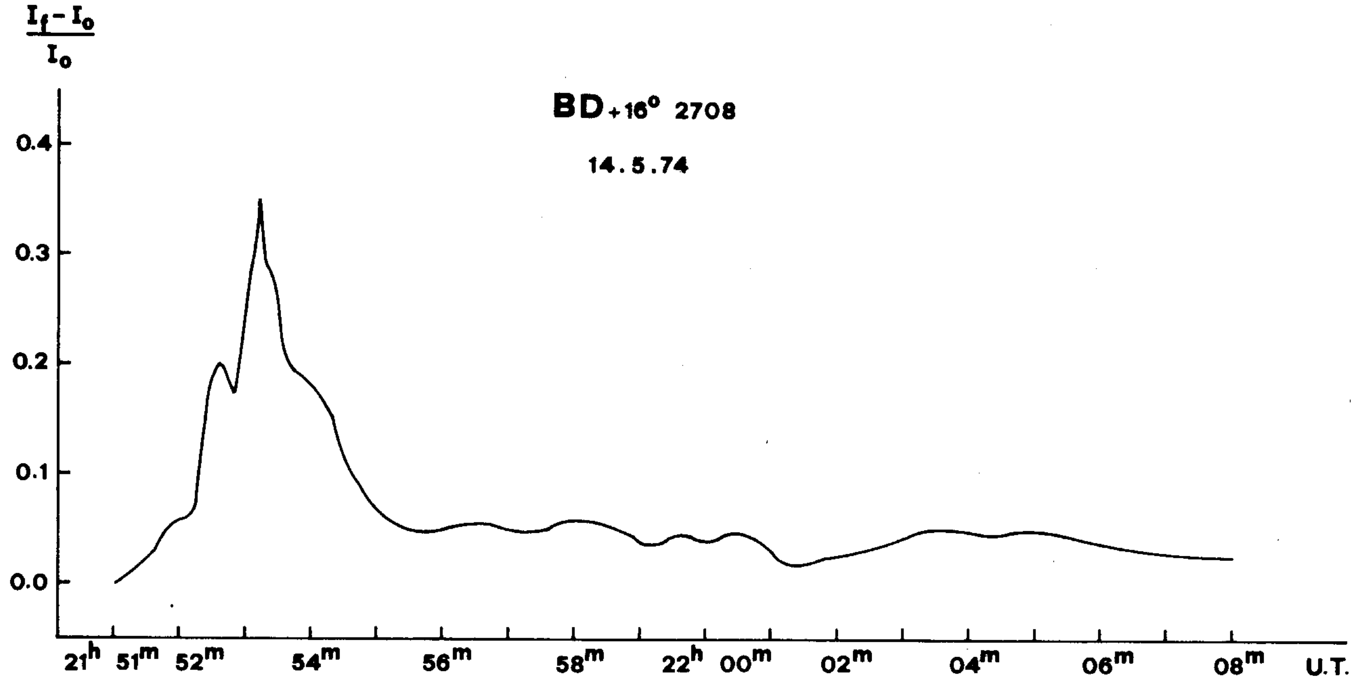
Monitoring Intervals in 1974

Time 1974 May	Monitoring Intervals (U.T.)	Total Monitoring Time	σ(U.T.)
11-12	$23^{h}42^{m}-23^{h}45^{m}$,$23^{h}47^{m}-00^{h}00^{m}$, 0002-0011,0015-0028,0030-0042, 0046-0058,0101-0113,0130-0140, 0142-0147.	$01^{h}29^{m}$	0.019($23^{h}57^{m}$),0.020 (00 18),0.025(00 51), 0.027(01 37).
12-13	2226-2229,2230-2247,2248-2303, 2306-2318,2319-2327,2329-2340, 2344-2355,2357-0013.	01 33	0.015(22 43),0.017 (23 24),0.021(00 02).
14-15	2141-2210,2216-2227,2229-2245, 2249-2302,2303-2315,2317-2331, 2347-2356,2359-0007,0009-0019, 0026-0036,0040-0050,0053-0058.	02 27	0.012(21 42),0.017 (22 22),0.015(22 51), 0.016(00 02),0.021 (00 32).
16-17	2124-2139,2140-2147.	22	0.013(21 33).
21-22	1938-1949,1951-2010,2038-2044, 2046-2053,2058-2118,2121-2131, 2204-2219,2221-2244,2341-2353, 0028-0036,0039-0046.	02 18	0.017(19 53),0.016 (20 49),0.013(21 09), 0.014(22 16),0.018 (23 43),0.016(00 32).
22-23	2103-2125,2131-2140,2147-2200, 2250-2300,2315-2324.	01 03	0.015(21 14),0.013 (21 50),0.012(22 54).
23-24	2138-2158,2203-2215,2220-2229, 2231-2246,2252-2300,2302-2309, 2311-2323,2348-2358,0000-0009, 0012-0021,0027-0031,0034-0040, 0100-0106,0110-0118.	02 15	0.014(21 53),0.015 (22 25),0.014(23 04), 0.017(00 05),0.019 (00 36),0.019(01 04).
24-25	0029-0037,0039-0046,0048-0056,	23	0.014(00 41).
25-26	2205-2220,2222-2233,2235-2245, 2250-2300,2303-2316,2323-2333, 2336-2341,2344-2355,0011-0020.	01 34	0.016(22 27),0.014 (23 06),0.013(23 40), 0.018(00 16).
26-27	2126-2147,2148-2201,2204-2239, 2242-2254,2255-2305,2307-2320, 2334-2347,2348-2359,0001-0011.	02 18	0.016(21 54),0.014 (22 08),0.015(23 00), 0.018(23 52).
28-29	2227-2240,2242-2254,2301-2313, 2315-2332,2340-2350,2356-0005, 0028-0032,0034-0042,0047-0054.	01 32	0.022(22 33),0.015 (23 07),0.018(23 59), 0.017(00 36).
30-31	1953-1959,2002-2020,2022-2036, 2040-2108.	01 06	0.026(20 14),0.028 (20 47).
	Total	$18^{h}20^{m}$	

Table II

Characteristics of the Flare Observed

Date 1974 May	UT max.	t_b min.	t_a min.	Duration min.	$(I_f-I_o)/I_o$ max.	P min.	Δm mag.	σ mag.	Air Mass
14	$21^{h}53^{m}.2$	2.2	14.8	17.0	0.35	1.53	0.33	0.012	1.08


$\frac{I_f - I_0}{I_0}$
BD+16° 2708
14.5.74
0.4
0.3
0.2
0.1
0.0
21h 51m
52m
54m
56m
58m
22h 00m
02m
04m
06m
08m
U.T.

a) the date and universal time of flare maximum, b) the duration before and after the maximum (t_b and t_a, respectively), as well as the total duration of the flare, c) the value of the ratio $(I_f-I_o)/I_o$ corresponding to flare maximum, where I_o is the intensity deflection less sky background of the quiet star and I_f is the total intensity deflection less sky background of the star plus flare, d) the integrated intensity of the flare over its total duration, including pre-flares, if present, $p=\int(I_f-I_o)/I_o dt$, e) the increase of the apparent magnitude of the star at flare maximum $\Delta m(b)=2.5 \log(I_f/I_o)$, where b is the blue magnitude of the star in the instrumental system, f) the standard deviation of random noise fluctuation $\sigma(mag)=2.5 \log(I_o+\sigma)/I_o$ during the quiet state phase immediately preceding the beginning of the flare and g) the air mass at flare maximum. The light curve of the observed flare in the b colour is shown in Fig.1.

G. KAREKLIDIS, F. MAHMOUD, L.N. MAVRIDIS, D. STAVRIDIS,
H. ZERVAKI-ZOEROU
Department of Geodetic Astronomy
University of Thessaloniki

Reference:
Andrews, A.D., Chugainov, P.F., Gershberg, R.E. and Oskanian,V.S.:
1969, I.B.V.S. No. 326

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1356

Konkoly Observatory
Budapest
1977 October 24

PHOTOELCETRIC OBSERVATIONS OF THE FLARE STAR BD+55°1823 in 1974

Continuous photoelectric monitoring of the flare star BD+55°1823 has been carried out at the Stephanion Observatory (λ=-22°49′44″ φ=+37°45′15″) during the year 1974 using the 30inch Cassegrain reflector of the Department of Geodetic Astronomy, University of Thessaloniki. Observations have been made with a Johnson dual channel photoelectric photometer in the B colour of the international UBV system. The telescope and photometer will be described elsewhere. Here we mention only that the transformation of our instrumental ubv system to the international UBV system is given by the following equations:

$$V = v_o+0.053(b-v)_o+2.380,$$
$$(B-V)= 0.858 + 1.043(b-v)_o,$$
$$(U-B)=-1.782 + 1.020(u-b)_o.$$

The monitoring intervals in UT as well as the total monitoring time for each night are given in the Table I. Any interruption of more than one minute has been noted. In the fourth column of Table I the standard deviation of random noise fluctuation $\sigma(mag)=2.5 \log(I_o+\sigma)/I_o$ for different times (UT) of the corresponding monitoring intervals is given.

During the 39.42 hours of monitoring time one flare was observed the characteristics of which are given in Table II.For this flare following characteristics (Andrews et al. 1969) are given: a) the date and universal time of flare maximum, b) the duration before and after the maximum (t_b and t_a,respectively), as well as the total duration of the flare, c) the value of the ratio $(I_f-I_o)/I_o$ corresponding to flare maximum, where I_o is the intensity deflection less sky background of the quiet star

Table I

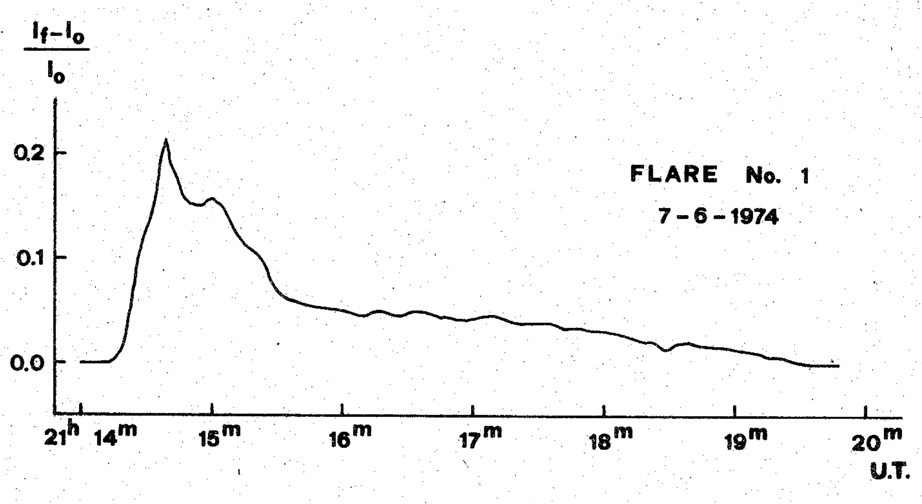
Date 1974 June	Monitoring Intervals (U.T.)	Total Monitoring Time	σ(U.T.)
5	20^h34^m-21^h03^m,21^h07^m-21^h35^m, 2138-2208,2257-2325.	1^h55^m	0.03(20^h40^m),0.02 (21 23),0.03(21 57), 0.03(23 13).
7-8	2004-2030,2035-2107,2110-2121, 2125-2139,2254-2324,2327-2358, 0001-0020.	2 43	0.02(20 12),0.02 (20 57),0.02(21 11), 0.02(23 11),0.02 (23 48),0.02(00 13).
9-10	2046-2112,2116-2148,2151-2213, 2231-2300,2303-2327,2331-2342, 2344-0015.	2 55	0.02(21 01),0.02 (21 33),0.02(22 02), 0.02(22 46),0.02 (23 18),0.02(00 01).
11-12	2149-2216,2219-2248,2251-2326, 2341-0019.	2 09	0.02(22 07),0.02 (22 33),0.02(23 14), 0.02(00 03).
13	2031-2058,2101-2129.	0 55	0.01(20 41),0.02 (21 21).
14-15	2018-2047,2050-2121,2320-2351, 2354-0006,0011-0023,0025-0052, 0106-0131.	2 47	0.01(20 28),0.01 (21 07),0.01(23 30), 0.02(00 14),0.01 (00 36),0.02(01 17).
15-16	2055-2122,0015-0045,0049-0123.	1 31	0.01(21 07),0.02 (00 28),0.02(01 05).
17-18	2117-2141,2147-2218,2225-2236, 2239-2250,2303-2334,2338-2348, 2351-0001,0006-0025,0028-0038.	2 37	0.01(21 32),0.01 (22 01),0.02(22 41), 0.02(23 26),0.02 (23 45),0.01(00 29).
19-20	2211-2239,2242-2255,2257-2308, 2313-2323,2326-2332,2334-2344, 2356-0010.	1 32	0.01(22 20),0.01 (23 00),0.02(23 36), 0.02(00 08).
20-21	2103-2129,2131-2152,2154-2200, 2236-2351,2353-2400,0002-0038, 0041-0056,0059-0115.	2 32	0.01(21 12),0.01 (21 45),0.01(23 36), 0.01(00 12),0.01 (00 53).
24-25	2006-2035,2038-2043,2047-2109, 2158-2219,2222-2231,2235-2302, 2306-2334,2355-0023,0026-0033.	2 57	0.01(20 21),0.01 (20 54),0.01(22 13), 0.01(22 56),0.01 (23 27),0.01(00 19).
25-26	2017-2021,2022-2057,2158-2222, 2225-2248,2250-2300,2303-2315, 2317-2329,2331-2333,2343-2400, 0002-0008,0011-0037.	2 51	0.01(20 33),0.01 (22 08),0.01(22 40), 0.01(23 19),0.01 (23 52),0.01(00 24).
26-27	2033-2107,2151-2221,2223-2245, 2247-2253,2311-2338,2341-2350, 2352-0006,0010-0028,0030-0039.	2 49	0.01(20 52),0.01 (22 02),0.01(22 36), 0.01(23 21),0.01 (23 54),0.01(00 20).
27	2149-2220,2222-2233.	0 42	0.02(22 05).

Table I (cont.)

Date 1974	Monitoring Intervals (U.T.)	Total Monitoring Time	σ (U.T.)
June 30	20^h10^m-20^h43^m,20^h45^m-21^h19^m, 2158-2210,2212-2232,2251-2321, 2325-2334,2336-2343.	2^h25^m	0.01(20^h31^m),0.02 (21 01),0.02(22 15), 0.02(23 04),0.02 (23 31).
July 1-2	2014-2042,2045-2113,2154-2225, 2236-2258,2300-2308,2310-2332, 2334-2340,2342-2349,2352-0004, 0006-0017,0022-0030.	3 03	0.02(20 30),0.02 (21 05),0.03(22 07), 0.03(22 50),0.02 (23 24),0.02(23 54), 0.02(00 24).
2-3	2023-2059,2139-2208,2211-2233, 2236-2242,2252-2316,2317-2325, 2328-2345,2347-2355,0002-0024, 0025-0035.	3 02	0.02(20 39),0.03 (21 57),0.02(22 27), 0.02(23 06),0.03 (23 38),0.02(00 15).
	Total	39^h25^m	

Table II
Characteristics of the Flare Observed

Flare	Date 1974 June	U.T. max.	t_b min.	t_a min.	Duration min.	$\frac{(I_f-I_o)}{I_o}$ max.	P min.	Δm mag.	σ mag.	Air mass
1	7	$21^h14^m38^s.4$	0.44	5.00	5.44	0.21	0.29	0.21	0.02	1.06



and I_f is the total intensity deflection less sky background of the star plus flare, d) the integrated intensity of the flare over its total duration, including pre-flares, if present, $p = \int (I_f - I_o)/I_o dt$, e) the increase of the apparent magnitude of the star at flare maximum $\Delta m(b) = 2.5\log(I_f/I_o)$, where b is the blue magnitude of the star in the instrumental system, f) the standard deviation of random noise fluctuation $\sigma(mag)=2.5\log(I_o+\sigma)/I_o$ during the quiet - state phase immediately preceding the beginning of the flare and g) the air mass at flare maximum. The light curve of the observed flare in the b colour is shown in Fig.1.

G. KAREKLIDIS, L.N. MAVRIDIS, D.C. STAVRIDIS
Department of Geodetic Astronomy
University of Thessaloniki

Reference:

Andrews A.D., Chugainov, P.F., Gershberg, R.E. and Oskanian,V.S.: I.B.V.S. No. 326 ,1969

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1357 *

Konkoly Observatory
Budapest
1977 October 25

A PROBABLE ECLIPSE IN HD 165590

One component of the visual binary HD 165590 (ADS 11060) has been found by Morbey et al. (1977) to be a spectroscopic binary with period $0\overset{d}{.}879511$. At their suggestion the present writer undertook photometric observations, to check for possible light variations arising from distortions of the stars.

The observations were made between 1977 August 16 and October 3 using a single channel photometer on the 0.3 m telescope of the University of Victoria and are in the V band only. HD 165569 was used as a comparison star and HD 165524 as a check star. Both visual components of HD 165590 were unavoidably observed together.

The observations reveal variations of the order of $0\overset{m}{.}05$ from night to night, which are apparently correlated with phase in the spectroscopic orbit. In addition a very shallow eclipse ($0\overset{m}{.}05$) was observed at about 5^h0^m UT August 16 and again at about 7^h45^m UT September 6. Neither was covered completely and so the times are accurate to ± 10^m only. However they occurred very close to the expected phase for primary eclipse in the orbit.

---

*A most unfortunate typographical error occurred in I.B.V.S. No. 1357: some very important words were omitted from the bulletin. Here we publish the correct version of Dr. Scarfe's note. Please replace I.B.V.S. No. 1357 published earlier with this.

(Editor)

At present observations have been obtained at nearly all phases of the orbit including the phase at which secondary eclipse might be expected, and no such eclipse is detectable.

Further observations are planned to elucidate the nature of the out-of-eclipse variation, to obtain light curves in other colours, and to detect any changes that may arise in connection with the forthcoming periastron passage in the very eccentric visual orbit.

C.D. SCARFE

University of Victoria
Victoria, B.C., Canada

Reference:

Morbey, C.L., Batten, A.H., Andrews, D.H., and Fisher, W.A. 1977. Pub.Ast.Soc. of the Pacific, in press

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1358

Konkoly Observatory
Budapest
1977 October 27

PHOTOELECTRIC MINIMA OF ECLIPSING BINARIES

The following Table gives photoelectric minima obtained during the year 1976 at the Ege University Observatory,Izmir (Turkey) and the Nürnberg Observatory (Germany). Minima of eclipsing binaries observed at both observatories 1960-1975 were published in Astr.Nachr. 288, 69(1964); 289, 191 (1966); 291, 111 (1968);IBVS 456 (1970), 530 (1971), 647 (1972), 937 (1974), 1053 (1975) and 1163 (1976).

The Table gives the heliocentric minima, two different O-C's, the type of filter (UBV), the abbreviations of the names of the observers and the type of the instruments used (Izmir: 48 cm Cassegrain, Nürnberg: 34 cm Cassegrain, both with phototube 1P21).

Abbreviations of the observers' names:

Ad = A. Durgut
Ar = G. Arneth
Be = G. Besold
Bl = A. Blenner
Bo = G. Bode
Eb = J. Ebersberger
Ek = S. Ertükel
Er = A.Y. Ertan
Gr = R. Gröbel
He = W. Hetterich
Kä = H. Kästner
Me = T. Mertelmeier
Rd = E. Roderer
Sb = R. Sendelbeck
Si = B. Schieweck
Sr = C. Sezer
We = Th. Weber

Remarks:

O-C (I) : GCVS, Moscow 1969/70 or First or Second or Third Supplement to the Third Edition of the GCVS. Moscow 1971, 1974 and 1976
O-C (II) : SAC 48, Krakow 1976

The (O-C)'s for secondary minima (Min II) were calculated on the supposition that they are symmetric between primary minima (if no special data are given).

m: only the elements I or the elements II give secondary minimum.

The sign = between O-C(I) and O-C(II) indicates, that the elements (I) and (II) are equal.

The sign : means that the time of minimum (last decimal) is uncertain.

Star	Min.hel.	O-C (I)	O-C (II)	Filt.	Obs.	Instr.	Rem.
	2442 -2443						
AB And	962.492	+0.004 =	+0.004	V	He/Si	34	
BX And	012.4755	+0.0021=	+0.0021	V	Kä/Me	"	
KP Aql	989.447	-0.003	-0.001		Kä/Me/Si	"	
OO Aql	960.4541:	-0.0003:	+0.0112:(m)		Gr/Si	"	
BF Aur	808.4555:	+0.0030:	-0.0062:		Eb/Gr/Si	"	
	139.350 :	+0.005 :	-0.004 :		Eb/Si	"	
i Boo	828.4615:	-0.0009:	+0.0131:		Eb	"	
	841.585	0.000	+0.014		Bl/Eb/Gr	"	
	849.354	+0.002	+0.016		Bl/Bo/Gr	"	
	849.486 :	0.000 :	+0.014 :		Bl/Bo/Gr	"	MinII
	869.4358:	-0.0024:	-0.0120:	V	Eb/Bl	"	
	869.4371:	-0.0011:	+0.0133:	B	"	"	
	869.5685:	-0.0036:	+0.0108:	V	"	"	MinII
	869.5675:	-0.0046:	+0.0098:	B	"	"	"
	886.442	-0.003	+0.012	V	Bl/Si	"	
	886.442	-0.003	+0.012	B	"		
	886.578	0.000	+0.014	V	Bl/Si	"	
	937.462	-0.002	+0.014		Eb/Si	"	
SV Cam	138.461	-0.009	-0.004		Kä/Si	"	
VZ CVn	889.435 :	+0.001 :			Bl/Gr/He	"	
RZ Cas	907.4718	-0.0024	-0.0090		Bl/Eb/Si	"	
	078.3906	-0.0044	-0.0112		Bo/We	"	
TV Cas	016.424	-0.021	-0.019		Me/Si	"	
U Cep	806.4320	-0.0096	+0.0018		Eb/He	"	
	963.4980	-0.0079	+0.0044		He/Me/Si	"	
VW Cep	787.4140	-0.0034	+0.0022	B	Ek/Sr	48	MinII
	787.4126	-0.0048	+0.0008	V	"	"	"
	888.4409:	-0.0052:	+0.0011 :		Be/Gr/Si	34	"
	913.4887:	-0.0058:	+0.0007 :	V	Gr/He/Si	"	
	050.4218	-0.0043	+0.0032	B,V	Ad/Sr	48	"
XX Cep	063.4348	+0.0071	+0.0134		Eb/Me	34	
EG Cep	961.4578	+0.0040	+0.0150	V	Eb/Si	"	
MR Cyg	955.497	-0.002	0.000		Gr/Si	"	
MY Cyg	013.4850:	+0.0094:=	+0.0094 :	V	Bl/Gr	"	
477 Cyg	053.3216	+0.0075 =	+0.0075	B,V	Ad/Er	48	
548 Cyg	927.460	0.000	-0.012		Bl/Si	34	

Star	Min.hel. 242-2443	O-C (I)	O-C (II)	Filt.	Obs.	Instr.	Rem.
1034 Cyg	938.459	+0.026	-0.006		Bl/Eb/Si	34	
TW Dra	898.4621:	+0.0013:=	+0.0013:		Bl/Bo/Sb	"	
TZ Dra	966.482	+0.003	+0.011	V	Eb/Gr	"	
AI Dra	880.4335	-0.0025 =	-0.0025		Eb/Si	"	
TX Her	939.4743	-0.0041	+0.0055		Bl/Eb/Si	"	
AK Her	914.4284:	-0.0005:=	-0.0005:		Ar/He/Si	"	
HS Her	956.448	-0.004			Eb/He/Si	"	
UV Leo	838.4473	-0.0047	+0.0072		Eb/He/Rd	"	Min II
XY Leo	841.4395:	-0.014:=	-0.014 :		Eb/Gr	"	
XZ Leo	866.395 :	+0.024 :	+0.024 :		Eb/We	"	
AM Leo	815.4721	-0.0026	-0.0097		Eb/Si	"	Min II
DI Peg	015.4802	-0.0019	-0.0134		Eb/Si	"	
W UMa	815.378	-0.001	-0.011		Eb/He/Si	"	
TX UMa	829.3771	-0.0023	-0.0021		He/Si	"	
VV UMa	842.427	+0.007 =	+0.007		Bo/We	"	
AH Vir	858.4003	+0.0354	+0.0341		Eb/Rd	"	Min II
Z Vul	947.4777	-0.0038	+0.0129	V	Bo/He	"	

E. POHL

Nürnberg Observatory
Regiomontanusweg 1,
85 Nürnberg, F.R.G.

A. KIZILIRMAK

Ege University Observatory
Bornova/Izmir P.K.21,Turkey

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1359

Konkoly Observatory
Budapest
1977 November 4

B AND V PHOTOMETRY OF X PERSEI (=2U 0352 +30?)

X Per was observed at Tallinn Observation Station beginning from 28 Dec. 1973 on 50 nights. The star HD 23478 (B3 IV, V=$6^{m}.66$, B-V=$+0^{m}.07$ - Publ.of the U.S. Naval Obs.Sec.Ser.Vol.XXI, 1968) served as a comparison star and HD 23625 as a check star. All the observations were corrected for differential extinction by using the mean coefficients and transferred to the U,B,V system as described in Tartu Astrophys.Obs.Publ., 43,96, 1975. Several consecutive measurements were averaged to obtain the normal points given in the Table and plotted in the Figure.The mean-root-square error of the normal point is $\pm 0^{m}.001$ ...$\pm 0^{m}.002$ for ΔV and $\pm 0^{m}.002$...$\pm 0^{m}.004$ for Δ(B-V). From the extreme values of extinction coefficients in the cases of the best and worst atmospheric conditions it results that the extinction corrections can differ from the mean no more than by $-0^{m}.002$...$+0^{m}.004$ and $-0^{m}.001$...$+0^{m}.002$ for ΔV and Δ(B-V), respectively. Therefore the real error of the normal point in both colours is about $\pm 0^{m}.005$.

Some conclusions: (1) From measurements made during four and half hours on 28 Dec. 1973 and seven hours on 10 Jan. 1974 (integrating time nearly 1 minute) no light variations were recorded, whereas the error of a single measurement in V was $\pm 0^{m}.004$ and in B ± 0.006.
(2) The amplitude of light variations between Dec. 1973 and March 1977 was about $0^{m}.07$ in V and $0^{m}.05$ in B.
(3) By Sept. 1977 the brightness of X Per has risen $0^{m}.24$ in V and $0^{m}.17$ in B in comparison with the mean from the last 4 years. It well may be, that there has been continuous brightening since Febr. 1977.

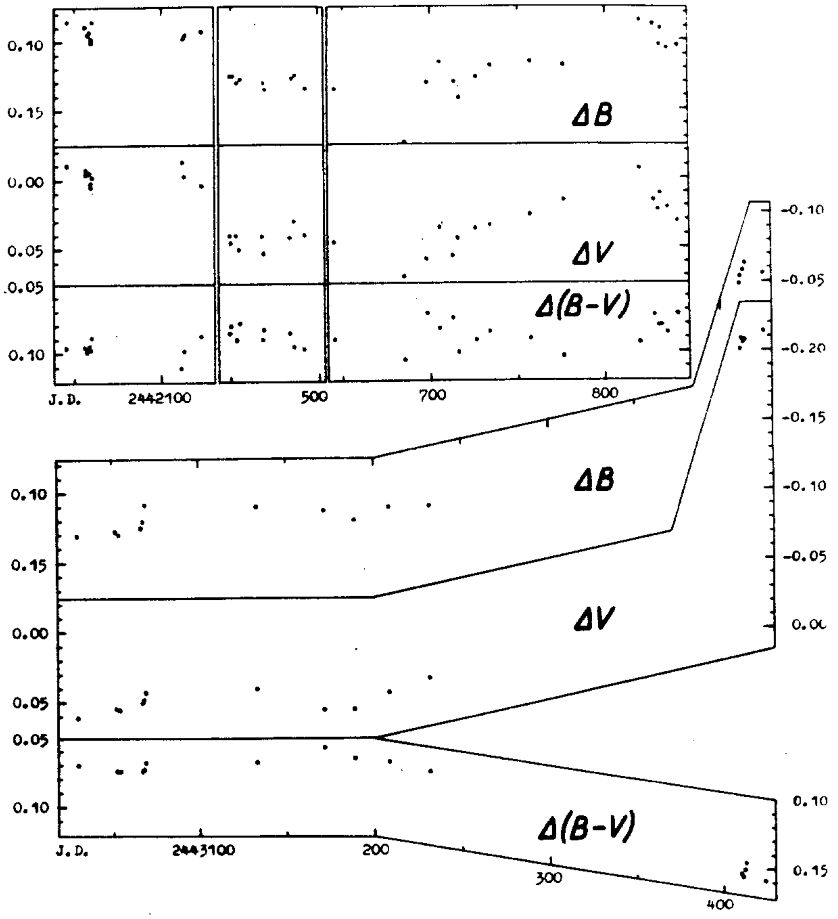
(4) Light variations are more pronounced in V than in B.

(5) 29 Sept. 1975, the time of the lowest brightness, coincides with the supposed time of increasing of anomalies in emission spectrum of hydrogen on 3.Oct. ±22^{d} (Mamatkazina, Sov.Astron. Circ., No.867, 4, 1975). Besides, only in that case consequence (4) is invalidated and the fall of brightness is accompanied by reddening of light.

J.D. 2400000+	ΔV	Δ(B-V)	n	J.D. 2400000+	ΔV	Δ(B-V)	n
42045.3721	-0.011	0.096	22	42728.4089	0.035	0.091	4
056.3951	-0.007	096	4	734.4170	0.033	084	5
057.2522	-0.004	099	6	757.4809	0.025	089	5
058.3582	-0.004	097	34	776.4849	0.015	102	4
059.3153	0.002	096	4	820.3155	-0.008	092	4
.4012	0.006	095	5	828.2923	0.014	073	5
060.3495	-0.003	088	5	831.3924	0.022	080	5
112.2373	-0.013	110	4	832.2735	0.010	080	5
113.2325	-0.003	098	4	836.3784	0.019	086	5
123.2475	0.004	088	2:	842.3209	0.030	072	5
449.3068	0.041	085	1:	43030.4804	0.061	070	5
450.2261	0.046	080	5	052.4582	0.054	074	5
453.2645	0.041	090	5	054.4235	0.056	074	4
455.2182	0.050	078	5:	067.4563	0.050	074	5
468.3004	0.041	090	4	068.4223	0.048	073	5
469.3207	0.053	082	4	069.4901	0.042	066	5
484.2738	0.042	086	4	133.3085	0.041	068	5
486.2878	0.031	095	4	172.2671	0.055	058	4
492.2749	0.039	097	4	189.2375	0.054	065	4
645.5328	0.044	090	5	209.2975	0.043	068	4
685.3100	0.069	104	3	232.2885	0.033	076	5
698.4050	0.058	072	3	411.4711	-0.202	153	6
705.4961	0.034	082	5	412.5524	-0.209	154	4
713.4056	0.056	074	4	413.4383	-0.208	149	5
716.4786	0.042	099	5	414.5027	-0.209	144	5
				425.4809	-0.215	158	4:

P. KALV

W.Struve Tartu Astrophys.Obs.
Tallinn Observation Station:
Tähetorn, Tallinn, Estonian S.S.R.
U.S.S.R. 200016


0.10
0.15
0.00
0.05
.0.05
0.10
J.D.
2442100
500
700
800
ΔB
ΔV
Δ(B-V)
-0.10
-0.05
-0.20
-0.15
-0.10
-0.05
0.00
0.10
0.15
0.05
0.05
0.10
0.15
0.00
0.05
0.05
0.10
J.D.
2443100
200
300
400
ΔB
ΔV
Δ(B-V)

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1360

Konkoly Observatory
Budapest
1977 November 4

AN RR LYRAE STAR IN NGC 288

In August 1975, one of us (MHL) obtained 17 B plates of the globular cluster NGC 288 on 9 nights with the 1-m Yale reflector at Cerro Tololo Inter-American Observatory. Blinking of 10 pairs of plates revealed one new variable star, V2, in addition to the long period variable discovered by Oosterhoff (1943). V2 lies approximately 36" north and 20" east of the center of the cluster as defined by Oosterhoff. The locations of V1 and V2 in the cluster are shown in Fig.1.

With a sequence from the photometry of Cannon (1974), we made visual estimates of the B magnitudes of V2 on our plates. Table 1 lists the heliocentric Julian Dates and magnitudes. With a period search computer program provided by E.L. Wright, we determined the period of V2 to be $0\overset{d}{.}679$ with epoch of maximum J.D. $2443011\overset{d}{.}853$. The corresponding light curve is given in Fig.2.

The mean B magnitude for V2 is about $15\overset{m}{.}4$. If $B-V \sim +0\overset{m}{.}3$, $E_{B-V} = 0\overset{m}{.}0$ (Harris, 1976) and $V_{HB} \sim 0\overset{m}{.}6$, then $(m-M)_V \sim 14\overset{m}{.}5$, which is only $0\overset{m}{.}2$ different from Harris's value of $14\overset{m}{.}70$. Thus it seems probable that V2 is a member of NGC 288.

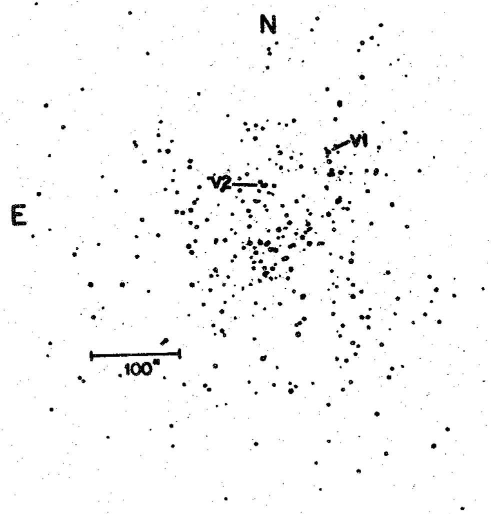
LINDA M. HOLLINGSWORTH
MARTHA H. LILLER*
Center for Astrophysics
Harvard College Observatory
and Smithsonian Astrophysical
Observatory, Cambridge,
Mass. 02138, U.S.A.

*Visiting Astronomer,
Cerro Tololo Inter-American Observatory, supported by the National Science Foundation under contract No. NSF-C866.

Table 1
B Magnitudes for V2

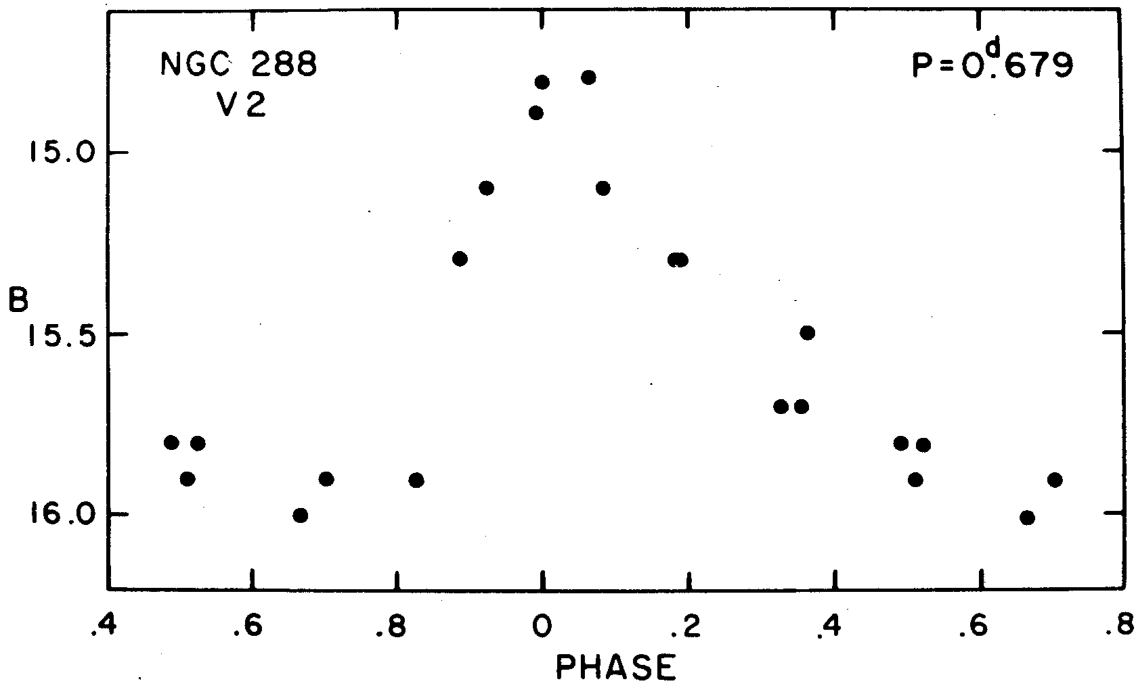
$JD_{hel.}$	B
2443003^{d}742	14^{m}8
.833	15.3
3004.731	15.9
.837	16.0
3005.690	15.1
.797	15.1
3009.739	15.3
.810	14.9
3010.743	15.5
.850	15.8
3011.737	15.9
.853	14.8
3012.754	15.7
.866	15.8
3013.689	15.9
3014.694	15.3
.812	15.7

Fig.1



References:
Cannon, R.D. 1974, Mon.Not.R.Astron.Soc. 167, 551
Harris, W.E. 1976, Astron.J. 81, 1095
Oosterhoff, P.Th. 1943, Bull.Astron.Inst.Netherlands 9, 397

Fig.2



COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1361

Konkoly Observatory
Budapest
1977 November 7

SIX NEW RR LYRAE STARS IN NGC 1261

Periods for 13 RR Lyrae variables in NGC 1261 ($\alpha=13^h10^m.9$, $\delta=-55^o25"$, 1950; $\ell=271^o$, $b=-52^o$) were recently published by Wehlau and Demers (Astr.Astroph., 57, 251, 1977) using the same plate material as was used for the present paper. Fourteen pairs of the plates taken with the 60-cm telescope of the University of Toronto located on the site of the Las Campanas Observatory of the Hale Observatories were blinked at the University of Western Ontario and six new variables were discovered.

Because all the new variables are close to the center of the cluster magnitudes had to be estimated by eye. Table 1 lists the estimates made from the plates available to Wehlau and Demers as well as estimates made by Bartolini from his plates (Bartolini et al., I.B.V.S. 662, 1972). All these values are strongly affected by blending on the plates. Estimates could not be made on plates of poorer quality, therefore less measures were available for period determination than were used in the previous study.

All of the new variables appear to be RR Lyrae stars, bringing the number of known RR Lyrae variables in NGC 1261 to 19. Coordinates and light curve parameters are given in Table 2. For some variables the values of B_{min}, B_{max}, and B_{mean} are systematically too bright because of blending. Blue light curves for variables 16 and 21 are shown in Fig. 1 in which phase 0 corresponds to J.D.2442000.

When measuring the coordinates for these stars it was discovered that incorrect coordinates for variable 4 are given in the Third Catalogue of Variable Stars in Globular Clusters (Sawyer Hogg, Publ. David Dunlap Obs. 3, No. 6, 1973). This can probably be attributed to an incorrect identification on the chart published by Fourcade et al. (Atlas y Catalogue de Estrellas Variables en Cumulos Globulares al sur de -29°, Cordoba,1966). The correct values for variable 4 are X=+22.2 and Y=-31.8. There is an additional error in the sign of Y for variable 12 which should be +10.5.

The addition of 4 more ab-type RR Lyrae stars brings the number known in this cluster to 14 and yields a value of $\langle P_{ab} \rangle$ of 0.555, only slightly lower than the value of 0.563 given in the earlier paper. Five c-type variables are now known in this cluster with a value of $\langle P_c \rangle = 0.328$ hardly changed from the value of 0.323 given earlier. The ratio N_c/N_{ab} now stands at 0.36 well within the range expected for an Oosterhoff type I cluster.

The authors would like to thank the National Research Council of Canada for its support of this research.

A. WEHLAU, T. FLEMMING
Department of Astronomy
University of Western
Ontario, London
Canada

S. DEMERS
Département de
physique
Université de
Montréal
Montréal, P.Q.,
Canada

C. BARTOLINI
Observatorio
Astronomico dell'
Universita di
Bologna

Table 1

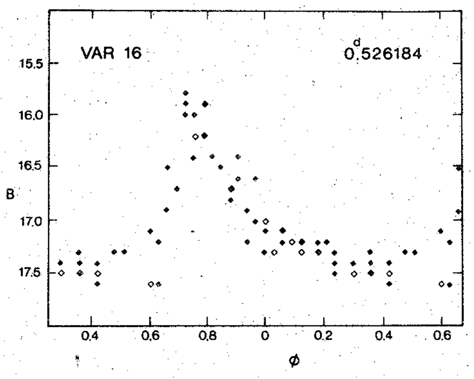
Heliocentric J.D.	16	17	18	19	20	21
2440569.644	17.2	16.6	17.2	-	17.0	17.0
40569.662	16.5	17.1	17.1	-	16.1	17.3
40570.584	17.6	16.6	17.2	-	17.0	17.1
40570.690	17.6	17.1	17.3	-	17.2	17.2
40813.203	17.3	16.85	17.2	17.1	-	17.4
40814.180	17.3	-	17.2	16.4	-	-
40837.072	16.7	16.8	17.0	16.0	-	17.2
40837.100	16.9	16.8	17.0	16.1	-	17.2
40837.173	17.1	16.8	17.1	16.3	-	16.8
40837.207	17.2	16.85	17.1	16.4	-	16.8
40837.233	17.3	16.65	17.1	16.55	-	16.9
40837.258	17.4	16.65	-	16.7	-	17.0
40841.219	16.4	-	-	17.0	-	16.9
40841.244	16.4	-	-	17.0	-	16.8
40841.270	16.5	-	-	17.0	-	16.8
41299.543	15.9	16.5	17.0	16.4	16.5:	17.1
41300.550	16.7	16.5	16.8	16.0	16.3:	17.1
41301.551	17.1	16.6	16.8	16.6	16.0	16.9
41305.547	17.2	16.8	16.9	16.7	16.9	16.8
41625.852	17.2	16.6	17.6	17.0	16.7	17.0
41626.796	16.0	16.5	17.1	16.1	16.1	17.2
41627.694	17.4	17.0	17.0	16.5	-	17.2:
41627.722	17.3	16.8:	17.1	16.6	16.8:	17.2:
42327.707	16.2	16.7:	16.8	16.6	16.0	17.4
42327.748	16.8	16.8:	17.2	16.8	16.5	17.3
42327.789	17.0	17.0:	17.0	17.0	16.7	17.0
42327.807	16.8	17.1	17.6	16.8	16.8	16.9
42327.823	17.3	17.0	17.6	17.4	16.8	17.1
42328.739	16.0	16.6	17.2	17.6	16.7	17.2
42328.755	15.9	16.7:	17.1	17.5	16.2	17.2:
42328.803	16.7	17.0:	17.3	16.7	16.0	17.1
42329.779	15.9	16.5	17.3	16.7	16.9	17.1
42339.590	17.4	16.8:	17.2	16.7	16.0	16.9:
42340.575	17.3	16.7	17.0	17.1	17.1	16.9
42340.641	17.5	16.8	17.5	16.2	16.7	16.9
42392.703	17.5:	16.9:	17.0:	-	-	17.0:
42392.730	17.5:	16.5:	16.9:	-	-	16.8:
42392.756	17.5:	16.4:	17.0:	-	-	17.1:
42393.540	16.4	17.2	17.1	16.8	16.8	17.4
42393.567	16.6	16.9	17.0	16.2	16.8	17.4
42393.594	17.1	17.1	16.9	16.0	16.9	17.4
42393.621	17.2	17.2	16.8	15.9	16.8	17.1
42393.661	17.2	17.1	17.1	16.3	16.8	17.0
42393.690	17.2	17.2	16.9	16.1	16.2	16.8
42393.717	17.5	16.9	17.1	16.4	15.9	16.8
42393.744	17.4	16.9	17.3	16.4	16.0	16.7
42394.641	17.0:	-	16.9:	-	-	17.1:
42394.670	17.1:	-	17.0:	16.5:	-	17.0:
42394.706	17.3:	-	16.6:	16.7:	-	16.9
42394.733	17.3:	-	17.0:	16.6:	-	16.7
42395.542	15.8	16.9	17.1	16.3	16.8	17.3:
42395.569	16.2:	17.2:	17.2:	15.9:	-	17.3

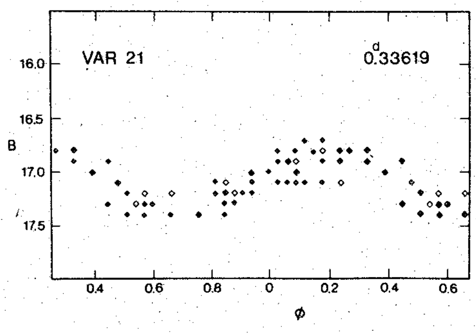
Table 1 (cont.)

Heliocentric J.D.	16	17	18	19	20	21
2442395.648	16.6	17.2	16.8	16.3	16.8	17.3
42395.718	17.3:	17.1:	17.1:	16.3:	-	17.1
42395.744	17.2:	17.1:	17.0:	16.5:	-	17.1
42396.540	17.6:	17.0:	17.1:	16.8:	-	17.4
42396.567	16.9	17.0	17.0	16.8	16.6	17.3
42396.639	16.2	17.1:	17.0:	16.7:	-	17.2

Table 2

Var.	X"	Y"	Type	Period	Epoch of Max.2400000+	B_{min}	B_{max}	B_{mean}
16	-17.7	-16.1	RRab	0.52618	42395.542	17.4	16.0	16.95
17	- 3.9	+20.1	RRab	0.51303	42392.756	17.1	16.5	16.85
18	-18.5	+16.7	RRc	0.33653	42395.648	17.5	16.9	17.1
19	+19.3	+11.9	RRab	-	42395.718	17.4	16.0	16.6
20	+28.8	- 3.8	RRab	0.54123	42393.717	17.0	16.0	16.55
21	-12.5	+25.5	RRc	0.33441	42394.733	17.2	16.9	17.05





COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1362

Konkoly Observatory
Budapest
1977 November 18

ETOILES PROCHES SUSPECTEES DE VARIABILITE

A plusieurs reprises (Petit, 1976,1977) j'ai publié des listes de variables confirmées ou suspectes dont la parallaxe est supérieure à 0"045, et qui sont contenues dans le "Catalogue of Nearby Stars" de Gliese (1969).

Voici une dernière liste de 35 étoiles dont la variabilité a été soupçonnée. La position (1950), la magnitude (V) et le type spectral sont extraits du catalogue de Gliese. La dernière colon e fournit le numero du "Catalogue of Suspected Variables" (CSV).

Dans cette liste on trouve un certain nombre d'étoiles dont la variabilité possible a été signalée par des observateurs d'étoiles doubles. Pour trois d'entre elles (Gl 127,351 et 767.1) la variabilité semble très probable. Trois autres étoiles observées photoélectriquement sont egalement variables (Gl 475,699 et 771) mais de type inconnu. Pour les autres la variation demande a être confirmee par de nouvelles observations.

Ajoutons enfin que Gl 886.2=Π PsA peut être considérée définitivement comme invariable.

MICHEL PETIT

Gl	Designation	AR	Dec	V	Sp	CSV
19	β Hyi	$0^h33^m09^s$	$-77^\circ22'1$	2.79	Gl IV	100028
83.2	$+2^\circ311$	1 57 33	+ 2 51 5	5.87	dGl	100157
127	α For B	3 09 57	-29 11 0	6.5	-	6016
127.1	$-69^\circ177$ A	3 10 04	-68 47 2	11.40	DA	102408
160.1	$+37^\circ878$ B	4 04 14	+37 56 2	9.3	dK2	102431
174.1	α Cae A	4 38 57	-41 57 5	4.45	F2V	
231.1	$+5^\circ1668$ A	6 14 36	+ 5 07 0	5.70	dGO	100726
239.1	ν CMa	6 34 30	-19 12 7	3.92	Kl IV	100752
286	β Gem	7 42 16	+28 02 9	1.14	KO IIIe	100892
335	σ_2 UMa B	9 06 01	+67 20 4	8.44	-	101024
345	$-80^\circ328$	9 25 51	-80 19 3	10.10	sdG	
351	ϕ Vel B	9 28 44	-40 14 8	4.65		6723
426	$+19^\circ2443$A	11 19 12	+18 27 9	8.14	dKO	101197
475	β CVn	12 31 22	+41 37 7	4.27	GOV	
501	α Com AB	13 07 33	+17 47 6	4.32	F5V	102722
541	α Boo	14 13 23	+19 26 5	0.05	K2IIIep	101433
550.2	φ Vir A	14 25 37	- 2 00 3	4.84	G2 III	101450
598	λ Ser	15 44 01	+ 7 30 5	4.43	GOV	101527
616	$-7^\circ4242$	16 12 54	- 8 14 3	5.49	GIV	101566
624.1	η Dra A	16 23 18	+61 37 6	2.74	G8III	102880
624.1	η Dra B	16 23 18	+61 37 6	8.8	dK2	101587
635	ζ Her A	16 39 24	+31 41 5	2.89	GOIV	101603
699	Barnard	17 55 23	+ 4 33 3	9.54	dM5	7737
700.1	τ Oph B	18 00 21	- 8 10 9	5.94	dF	
700.1	τ Oph C	18 00 21	- 8 11 8	9.4	-	
759	$+11^\circ3833$	19 22 35	+11 50 2	5.16	G8IV	101833
764	σ Dra	19 32 28	+69 34 6	4.69	KOV	101868
765.4	$+33^\circ3582$AB	19 43 39	+33 29 1	7.69	dK5	102960
767.1	$+33^\circ3589$B	19 44 34	+33 36 8	8.56	dK6	8290
771	β Aql A	19 52 51	+ 6 18 8	3.72	G8IV	101909
785	$-27^\circ14659$	20 12 10	-27 11 0	5.73	KOV	101960
848.2	α Gru	22 05 05	-47 12 2	1.73	B5V	103076
871	$-47^\circ14307$A	22 39 39	-47 28 1	6.01	GIV	
882	$+19^\circ5036$	22 55 00	+30 30 0	5.50	G4V	102222
886.2	π PsA	23 00 44	-35 01 2	5.10	FOIV	π PsA

Remarques

127 variabilité signalée par de nombreux observateurs (voir Baize 1962)
127.1 naine blanche; varie de mpg 11.1 à 12.5 (Thackeray 1961)
160.1 suspectée par Couteau (1955) et Baize (1962)
174.1 pourrait être du type δ Sct
345 discordance entre les mesures photoelectriques; il s'agit d'une sous-naine
351 variabilité annoncée par Eggen (1955) confirmée par plusieurs observateurs
475 varie de 0.05 V (Jackisch 1963); type inconnu
501 variabilité non confirmée par Baize (comm. privée)
699 observée photoélectriquement par Kron et al (1957), Evans et al (1957). Amplitude 0.2 m, type inconnu
700.1 les deux composantes ont eté suspectées (voir Gliese 1969)
767.1 selon Baize (1962) B varie de 0.8 m
771 varie de 0.05 V
871 varie de mpg 6.43 à 6.53 (Cousins 1950)

886.2 considérée d'abord comme cepheide (Strohmeier et al.,1965); Petit (1972) a signalé qu'elle n'ést pas variable, ce qui est confirmé par Janot-Pacheco (1974) et Bond (1976).

Références:

Baize, P. 1962 Journ.Obs. 45. 117
Bond, H.E., 1976 I.B.V.S. No. 1215
Cousins, A.W.J., 1950 Monthly Not.Roy.Astr.Soc. 110.531
Couteau, P. 1955 Journ. Obs. 38. 241
Eggen, O.J. Astron. J. 60. 65
Evans, D.S., Menzies, A., Stoy, R.N. 1957, Monthly Not.Roy.Astron. Soc. 117. 52
Gliese, W. 1969 Heidelberg Veröff. No.22
Jackisch, G. 1963, Veröff.Sternw.Sonneberg 5 No.5
Janot-Pacheco, E. 1974, I.B.V.S. No. 918
Kron, G.E., Gascoigne, S.C.B., White, H.S. 1957, Astron.J.62. 205
Petit, M. 1972, I.B.V.S. Nos.680, 695
Petit, M. 1976, I.B.V.S. No. 1135
Petit, M. 1977, I.B.V.S. Nos.1242, 1267
Strohmeier, W., Knigge, R., Ott, H., 1965, I.B.V.S. No. 86
Thackeray, A.D. 1961 Monthly Not.Roy.Astron.Soc.South-Africa 20,4,40

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1363

Konkoly Observatory
Budapest
1977 November 18

OMICRON ANDROMEDAE: ANOTHER RECURRENT PHENOMENON ?

Horn (1977) has reported that the absorption-shell components of the hydrogen lines have disappeared and that the emission components of Hα have weakened and are below the continuum level.

We remark that this phenomenon has occurred about two years after the appearance of the shell spectrum and of Hα emissions. Furthermore, during the past shell-phase of o And, Slettebak (1952) observed a disappearance of the Hα emissions in 1949, three years after the beginning of the shell phase, that is at about the middle of this phase.

Now, if the shell features shall develop again, we may suppose that the dramatic changes claimed by Horn are a recurrent phenomenon during the shell phases of o And. Its recurrence would be of 28-29 years. A value close to this periodicity results from the recurrent appearance of the shell spectrum (Fracassini and Pasinetti, 1975). A rough value of this size is also exhibited by a period analysis of the radial velocities from 1900 to 1976 (Fracassini et al., 1977).

If the emphasized phenomenon is really recurrent, it may be of interest for the right understanding of this shell phenomenon and for the construction of a suitable model.

M. FRACASSINI and L.E. PASINETTI

Osservatorio Astronomico di
Milano-Merate, Via Brera n.28
20121 Milano, Italia

References:

Fracassini, M.,Pasinetti,L.E.,1975,I.B.V.S. No.1044
Fracassini, M.,Pasinetti,L.E.,Pastori, L.,1977 Astrophys.and Sp. Sci., 49, 145
Horn, J. 1977, IAU Circular No. 3122
Slettebak, A. 1952, Astrophys. J., 115, 573

ERRATUM

In I.B.V.S. No. 1348 one of the references was incorrectly printed. It should read :

Lorenzi, L.: 1977, Astron Astrophys. 55, 295

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1364

Konkoly Observatory
Budapest
1977 November 21

HR 239 AND HR 8676 : TWO δ Sct - TYPE VARIABLES

During an observing run at the 50 cm ESO-telescope at La Silla (Chile), HR 239 (HD 4849, -44°216) was observed as a program star and HR 8676 (HD 215874, 70 Aqr) as a comparison star. Both stars are classified as FO. For HR 239 this classification was verified in essence by a coudé-spectrogram obtained at the 1.5 m ESO telescope by Mr.F. Spite. The standard ESO photometer with an EMI 6256, cooled by Peltier elements to -20° relative to ambient temperature, was used for the observations.Diaphragms of 21" and 30" were used. B and V colours have been measured for HR 239 in the night of Sept. 6/7, 1977 and UBV for HR 8676 in the night of Sept. 28/29, 1977. In addition, Mrs. B.E. Helt from Copenhagen University Observatory covered one cycle of HR 239 in the night of Sept. 24/25, 1977 with a simultaneous 4-colour photometer in the Strömgren system at the 50 cm Danish telescope at La Silla.

A sophisticated telescope control system and a convenient preliminary on-line reduction system, developed by J. Fluxá and D. Hofstadt enabled the writer to switch rapidly from one star to the other and check for constant brightness and colour. The latter was done by using mean extinction and a zero-point for the colour transformation which was determined at the beginning of every night. Both have proven to be sufficient for a preliminary check of the magnitudes on-line.

HR 239 as a program star was observed in the sequence: comparison 1 (HD 5042), program star, comparison 2 (HD 5062), comparison 1, program star, etc. The magnitude difference in V between the two comparison stars was constant to within $\sigma=0^{m}.003$ for a total of 33 measurements. This value corresponds also to the internal accuracy with which the light curve for HR 239 has been determined in V. The V light curve using extinction corrected and colour transformed magnitudes is shown in Figure 1. The colour difference (B-V) for the variable was constant during the nearly 3 hrs of observations to within 0.0034 mag. For the comparison star a σ of 0.0037 mag was determined, this being essentially the same as for the variable.

A raw estimate for the amplitude range of the V light curve is 0.015 mag with a period of about 80 min. The measurements in y obtained 18 days later by B.E. Helt confirmed the first results concerning the shape of the light curve, the amplitude and the period. However, the scatter of her measurements has been almost twice as much as for the Johnson colours.

HR 8676 was observed during a night of very poor seeing. The first 9 measurements have been obtained with a 21" diaphragm, but then it was necessary to change to a 30" diaphragm. The comparison stars have been HD 216494 (74 Aqr), originally a program star, and HD 215874 (75 Aqr). The correction for changing the diaphragm in V was obtained by averaging the first 9 measurements of 74 Aqr which resulted in $V=5\overset{m}{.}80$ (σ=0.0044 mag) and averaging the following 9 measurements, which have been obtained already with the 30" diaphragm. The latter observations gave a mean $V=5\overset{m}{.}78$ (σ=0.0021 mag). Thus, a correction of -0.020 mag was applied to the first 9 measurements of HR 8676 in V. The resulting light-curve using on-line reduced magnitudes can be seen in Figure 2. Although the seeing was poor during this night, the relative photometric accuracy was slightly better than in the night of Sept. 6/7 1977. A first inspection of the light curve results in an amplitude in V of 0.025 mag and a period of about 125 min.

Considering the rather late spectral type which is published for these stars and which is confirmed by their Strömgren indices, one is tempted to classify HR 239 and HR 8676 as δ Sct type variables. This might be less evident for HR 8676, if one uses the Period - Spectral type diagram for Dwarf Cepheids and δ Sct type stars, as published by M.S. Frolov (1976). However, both stars are located in the M_V - Sp diagram very close to the ZAMS and the cool limit of the instability strip (Breger et al., 1975). Thus fundamental mode pulsation should be expected. It is evident, that more and better observations, especially spectra, are needed to clarify this point.

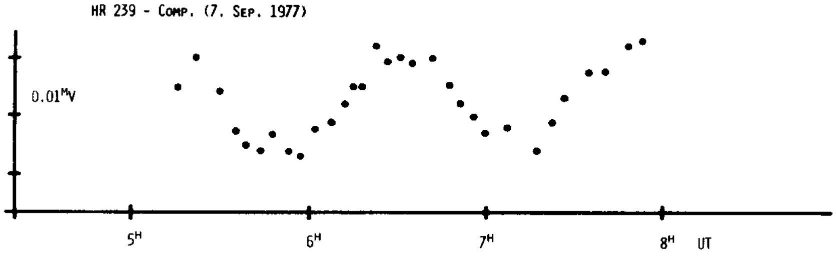


Figure 1. V-magnitudes for HR 239 and the comparison (HR 245).

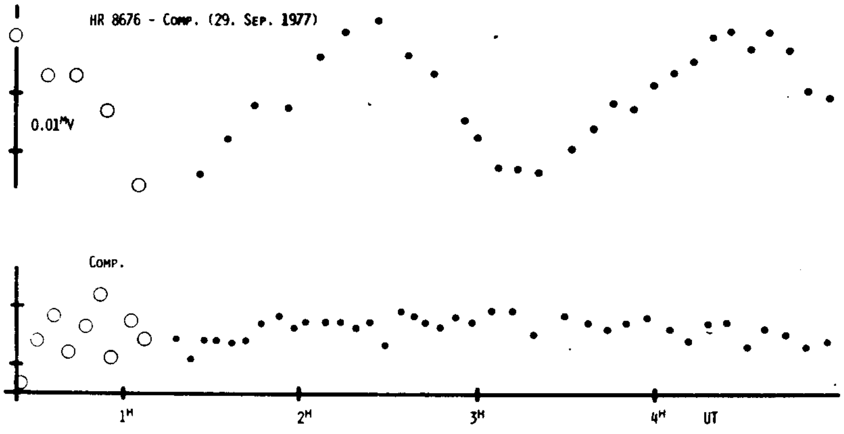


Figure 2. Raw V-magnitudes for HR 8676 and the comparison (74 Aqr).

Acknowledgements:

This observations have been collected at the European Southern Observatory, La Silla, Chile. The writer is indebted to the Gen. Director, Prof. L. Woltjer, for the kind hospitality at La Silla and for making telescope time available. He also has to thank Mr's Fluxá, Hofstadt Suter and Vidal for their continuous help during the observing run. The writer gratefully acknowledges that Mrs. B.E. Helt spent nearly two hours of her telescope time on HR 239 and that Mr. F. Spite friendly took a spectrogram of this star. This work is part of the project No. 2339, supported by the Austrian "Fonds zur Förderung der wissenschaftlichen Forschung".

WERNER W. WEISS
University Observatory, FOA,
Vienna, Austria

References:

Breger, M., Bregman, J.N. 1975, Astrophys. J. 200, 343

Frolov, M.S. 1976, IBVS No. 1096

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1365

Konkoly Observatory
Budapest
1977 November 25

OBSERVATIONS OF THE STAR GAMMA BOOTIS AND OF THE NEW VARIABLE STAR HR 5441

The star Gamma Bootis (HR 5435, A7 III, m_V= 3.03) is a known intermittent variable. When the light variations of this star can be detected its period is about 0.29 day and the amplitude seems to vary between the detection limit and 0.1 magnitude in B.A detailed bibliography on this star may be found in Sareyan et al. (1971).

The classification of Gamma Bootis is not yet clear. Baglin et al. (1973) classified it as "peculiar" in their review paper on Delta Scuti stars. This star falls on the blue edge of the instability strip. Its location in the H.R. diagram indicates that Gamma Bootis may be a Delta Scuti star.

We observed it in May 1977 at the new one meter telescope in the Chiran station (1900 meters height above sea level) of the Haute-Provence Observatory. The photoelectric photometer of the station was equipped with an unrefrigerated EMI 5256 photomultiplier. The data were obtained on an analogic recorder. We used only one narrow band filter centered at λ4670, Δλ=100 Å described in Le Contel et al., (1974). Two comparison stars have been used; C_1, HR 5441 (F5, m_V=6.4) and C_2, HR 5373 (A2 V,m_V=6.3). As the studied variable is three magnitudes brighter than the two comparison stars, a neutral density filter (D=1.2) was used in order to avoid fatigue effects of the photomultiplier. Our observational sequence was: C_1, sky, variable, C_2 .... The treatment of the data was made in the usual way. The differences in magnitude, Gamma Bootis minus HR 5373, Gamma Bootis minus HR 5441 and HR 5373 minus HR 5441 are plotted in Figure 1. From this figure it appears that:

1) There is no variation in the light of Gamma Bootis during the

three hours we have been observing it. Any variations with an amplitude greater than 0.01 magnitude should be detected. This result confirms the intermittence in the pulsation of Gamma Bootis. (Jerzykiewicz, 1968; Sareyan et al.,1971).

2) The star HR 5441 is clearly variable with an amplitude of at least 0.02 magnitude and a period longer than three hours, From its spectral type F5 this star is a probable Delta Scuti type variable. So we may derive (Baglin et al.,1973) that if the star is in the instability strip, it must be a giant which is consistent with a value of the period between two and four hours.

AUVERGNE M., LE CONTEL J.M., SAREYAN J.P., VALTIER J.C.
Groupe Etoiles variables à courtes périodes
Observatoire de Nice, B.P. 252,06007 Nice Cedex
France

DAGUILLON J.
Observatoire de Haute-Provence
04300 Forcalquier, France

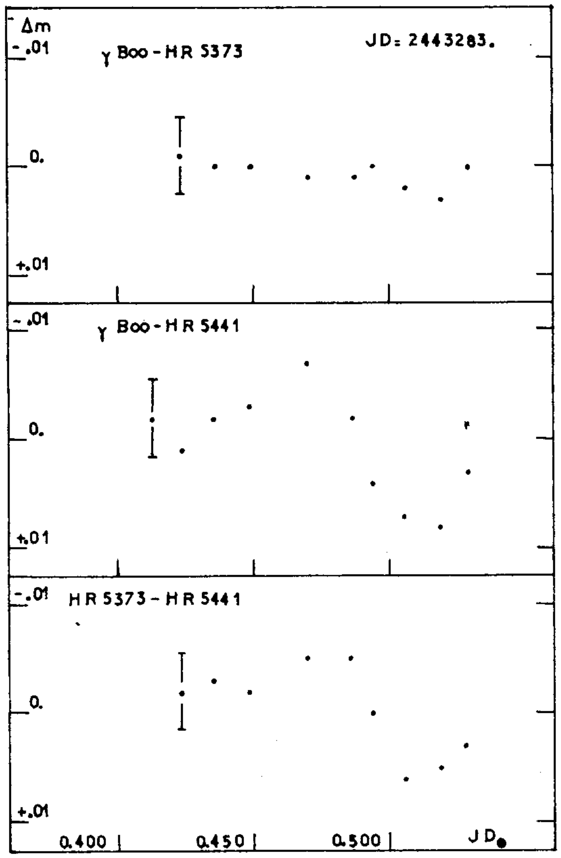
References:

Baglin, A., Breger, M., Chevalier, C., Hauck, B., Le Contel, J.M., Sareyan, J.P., Valtier, J.C., 1973, Astron. and Astrophys. 23, 221

Jerzykiewicz, M., 1968, Inf.Bull.Var. Stars No. 319

Le Contel, J.M., Valtier, J.C., Sareyan, J.P., Baglin, A., Zribi, G., 1974, Astron. and Astrophys. Suppl. 15, 115

Sareyan, J.P., Zribi, G., Bijaoui, A., 1971, Inf. Bull. Var. Stars No. 531


Δm
-.01
γ Boo - HR 5373
JD= 2443283.
0.
+.01
-.01
γ Boo - HR 5441
0.
+.01
-.01
HR 5373 - HR 5441
0.
+.01
0.400
0.450
0.500
JD⊙

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1366

Konkoly Observatory
Budapest
1977 December 1

SUPPLEMENTARY PROGRAMME OF COOPERATIVE FLARE STAR OBSERVATIONS FOR 1977

The Working Group on Flare Stars after consultation with the Nuffield Radio Astronomy Laboratories, University of Manchester announces the following Supplementary programme of cooperative optical and radio observations for the period December 10 to 17 inclusive:

UV Ceti	16^h30^m	to	24^h00^m	UT
YZ CMi	00^h30^m	to	08^h00^m	UT

L.N. MAVRIDIS
Chairman Working Group
on Flare Stars

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1367

Konkoly Observatory
Budapest
1977 December 5

CPD -55° 5216: A COOL Ap STAR SHOWING EXTREMELY LARGE VARIATIONS AT 4100Å

In 1971-72 a large programme of uvby photometry of bright southern stars was carried out by Grønbech and Olsen (1976). Many visual companions brighter than about 9^m were also observed for the purpose of a later investigation of visual double stars. CPD -55° 5216 (=CoD -55° 4778 = SAO 240236 = GC 17353 = = IDS 12406S5556B) is a companion to HR 4848 (about 53" distant) for which two very discordant measures were obtained. Our immediate reaction was that two different companions had been measured, and since the magnitude and indices of the last measure fitted very well to the information in the Henry Draper catalogue concerning HD 110910 (8.9, A5), which is about 150" from HR 4848, this measure was ascribed to HD 110910 and so published in the catalogue.

To settle the matter beyond doubt two more uvby observations and two β observations were made of each star in 1976. Again, the two uvby measures of CPD -55° 5216 disagreed violently, and it was concluded that the two measures from 1972 did indeed both refer to CPD -55° 5216 (cf. Olsen, 1977).

In March-April 1977 twelve uvby observations were made and in the Table the 16 available measures are listed. The magnitudes u, v and b on the standard system have been computed by combining the y (= V) magnitude with the indices. The photometric variations are very remarkable, but not unique. In the u(3500Å) and b(4700Å) bands the range of variation is relatively small, $0^m.08$ and $0^m.05$, respectively, and the variations are approximately in the same sense, as shown by a graph or by the scatter in the (u-b) index, which is only $0^m.019$. In sharp contrast to this behaviour the v(4100Å) band, situated between u and b, shows a photometric range of $0\overset{m}{.}25$, while the y (5500Å) band has a more moderate range of $0\overset{m}{.}12$. However, the variations in v and y are in the opposite sense, as shown by the scatter in $y + v/2$, which is only $0\overset{m}{.}019$.As a consequence of the described variations, the indices (b-y) and m_1 vary together, with ranges $0\overset{m}{.}12$ and $0\overset{m}{.}16$ respectively, while the Balmer discontinuity index c_1 varies in the opposite sense with the range $0\overset{m}{.}45$. When the star is brightest, it is also reddest, has the largest m_1 value, and the smallest c_1 value. In the $([m_1],[c_1])$ diagram the star jumps back and forth in a narrow band between the two extremes: the point $(0\overset{m}{.}20,\ 0\overset{m}{.}90)$ corresponding approximately to an A7 type star near the ZAMS, and the point $(0\overset{m}{.}39,\ 0\overset{m}{.}43)$, which lies in a region populated by composite stars and cepheids, and on the red border of the region of cool Ap stars (cf. Figs. 3 and 5 in Cameron 1967).

Thackeray (1966) has obtained four spectra of CPD -55° 5216 (=HD 110956f) in order to determine the radial velocity, which is -4 km/s. Thackeray classifies the spectrum A3p and comments: "CaII weak. Some signs of spectral variation with mild features of a Cr star". Later, Andrews and Thackeray (1973) have published UBV photometry for CPD -55° 5216, but they do not refer to any photometric variability.

Andersen (1977, private communication) has obtained a 20Å/mm coudé spectrogram (ESO 1.5 m telescope, HJD = 2443271.695). He gives the following description: "The spectrogram shows a late A type spectrum, but with the CaII K line far too weak. Several CrII lines are considerably strengthened, as are possibly also MnI $\lambda\lambda$ 4030-33 and EuII $\lambda\lambda$ 4205, 4129. The SiII and SrII lines do not appear enhanced, and the ScII lines not abnormally weak. There is a noticeable broadening of the lines, with $v \cdot \sin i$ about 30 km/s. A rough measurement yields a radial velocity of -3 km/s, in good agreement with the value by Thackeray (1966). There is thus no indication of appreciable variation of the radial velocity".

There is no doubt that CPD -55° 5216 is a cool Ap star with very large photometric variations. It is very reminiscent of Osawa's star HD 221568, which has a smaller range in m_1 and c_1, but a similar range in V and (b-y) (cf. Osawa 1967). Somewhat smaller variations in the v band relative to neighbouring bands have also been found in HD 71866 and 125248, and, to an even lesser degree, in several other stars (cf. Adelman et al. 1976 and references therein). Adelman et al. explain this as partly due to two EuII bound-free discontinuities at 4200Å. The periods of the three stars just mentioned range from 7 to 159 days, while the period for CPD -55° 5216 (if it has a period) is considerably shorter, probably about 2 days. The star thus seems to be the most extreme in this group of Ap stars.

HR 7575 has also been found to show variations in the v band. In Cameron's (1967) investigation it was the Ap star with the largest m_1 value, and his photometry was confirmed by Grønbech and Olsen (1976). However, a single measurement in August 1976 has yielded $(V, (b-y), m_1, c_1) = (5^{m}.66, 0^{m}.051, 0^{m}.370, 0^{m}.665)$. The u, b, and y magnitude thus show no changes, while v has changed by $0^{m}.06$. In this connection attention is drawn to Grønbech and Olsen's (1976) Table 4 and their notes to Table 2, which contain many variable Ap stars.

Since no further observations of CPD -55° 5216 are being planned at this observatory, we strongly recommend this noteworthy object to other observers. Simultaneous spectrographic and photometric observations should prove particularly valuable in investigations of the sources of the observed variations.

ERIK HEYN OLSEN
Copenhagen University Observatory
Brorfelde, Denmark

References:

Adelman, S.J., Shore, S.N., and Wolken, P.R. 1976, Physics of Ap Stars, IAU Colloquium No.32. eds. Weiss, Jenkner and Wood, Vienna Univ.Obs., p. 189
Andrews, P.J. and Thackeray, A.D. 1973, MNRAS, 165, 1
Cameron, R.C. 1967, The Magnetic and Related Stars, ed. R.C. Cameron, Mono Book Corporation, Baltimore, p. 471
Grønbech, B. and Olsen, E.H. 1976, Astron.Astrophys.Suppl. 25, 213
Olsen, E.H. 1977, Astron.Astrophys.Suppl. 29, 313
Osawa, K. 1967, The Magnetic and Related Stars, ed. R.C. Cameron, Mono Book Corporation, Baltimore, p.363
Thackeray, A.D. 1966, Memoirs Roy.Astron.Soc. 70, 33

HJD 2440000+	V	b	v	u	b-y	m_1	c_1
1367.79664	$8^{m}.716$	$8^{m}.895$	$9^{m}.408$	$10^{m}.387$	$0^{m}.179$	$0^{m}.334$	$0^{m}.466$
1368.80087	8.778	8.871	9.163	10.328	0.093	0.199	0.873
2831.85748	8.792	8.889	9.171	10.331	0.097	0.185	0.878
2832.80867	8.704	8.889	9.369	10.373	0.185	0.295	0.524
3220.77962	8.712	8.894	9.406	10.400	0.182	0.330	0.482
3222.81860	8.794	8.890	9.204	10.355	0.096	0.218	0.837
3226,71967	8.704	8.901	9.398	10.383	0.197	0.300	0.488
3228.81928	8.773	8.906	9.267	10.376	0.133	0.228	0.748
3230.76144	8.806	8.903	9.174	10.365	0.097	0.174	0.920
3232.70323	8.732	8.914	9.358	10.385	0.182	0.262	0.583
3233,72544	8.821	8.920	9.201	10.389	0.099	0.182	0.907
3234.79941	8.755	8.914	9.354	10.411	0.159	0.281	0.617
3236.64818	8.802	8.884	9.176	10.347	0.082	0.210	0.879
3237.71561	8.720	8.894	9.339	10.391	0.174	0.271	0.607
3238,56246	8.757	8.922	9.320	10.372	0.165	0.233	0.654
3238.64723	8.767	8.925	9.300	10.377	0.158	0.217	0.702

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1368

Konkoly Observatory
Budapest
1977 December 7

PHOTOELECTRIC MINIMA OF U Oph, AB And AND X Tri

Following are the results of observations made at the Ankara University Observatory with a 30 cm Maksutov telescope, an EMI 6256 S photomultiplier tube and standard B, V filters:

U Oph	Hel.Min.J.D.	m.e.	Min.	O-C
	2443319.3964	±.0004	I	+.0026
	34.4917	.0012	I	.0018
	35.3291	.0005	II	.0005
	40.3622	.0003	II	.0016
	45.3950	.0008	II	.0024
	56.2978	.0005	I	.0024
	61.3304	.0006	I	.0030
	66.3629	.0005	I	.0034
AB And	2443369.3904	±.0015	I	+.0022
	70.3873	.0004	I	.0035
	71.3827	.0005	I	.0032
	73.3744	.0003	I	.0035
	75.3653	.0002	I	.0031
X Tri	2443379.5316	±.0020	II	+.0096
	80.5006	.0012	II	.0070
	98.4753	.0006	I	.0085

SAC 1977 formula Min.I.=J.D. 2436727.424 + $1\overset{d}{.}6773460 \cdot E$.
Quester's formula Min.I.=J.D.2436109.57928+0.33189215·E (IBVS 190)
and SAC 1977 formula Min.I.=J.D. 2440984.2205+0.9715277·E
were used, respectively, in the calculations of O-C's.

ZEKİ TÜFEKÇİOĞLU
Ankara University Observatory
A.Ü. Fen Fakültesi
Ankara-Turkey

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1369

Konkoly Observatory
Budapest
1977 December 19

ON ECLIPSING BINARY CSV 5384= HV 10663

Based on observations performed on Odessa and Simeis plates I have received the following elements of this β Lyrae-type star:

$$\text{Min.hel.JD} = 2437882.531 + 0.8893836 \cdot E.$$

Moments of minima are, as follows :

Min. JD	E	O - C	Min. JD	E	O - C
2428847.27	-10159	-0.01	2440859.33	+3347	+0.03
37882.48	0	- .05	2248.50	+4909	- .02
7932.35	+ 56	+ .01	2281.43	+4946	+ .01
9050.29	+ 1313	.00	2339.27	+5011	+ .04
9058.26	+ 1322	- .04	2355.22	+5029	- .02
9412.30	+ 1720	+ .03	2363.17	+5038	- .08
40069.52	+ 2459	- .01	2667.38	+5380	- .03

V. TSESSEVICH
Odessa Astronomical
Observatory

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1370

Konkoly Observatory
Budapest
1977 December 19

ON FIVE RR LYRAE-TYPE STARS

Based on numerous estimates obtained from the sky patrol plates of the Moscow and Odessa observatories, as well as from visual observations resulting elements of five variable stars have been derived (Table 1). One of these, DI Lyr, has not been studied earlier. Elements of three stars FK Vul, BH and DR Lyr, found earlier proved to be erroneous.

In investigating BH Lyr the old observations by N.F. Floria and E. Kheilo have also been used and reduced anew. Jumping variations in the periods of BH and DI Lyrae have been detected; therefore for them several systems of elements are found designated with (A), (B) and (C) in Table 1.

Moments of maxima are given in Tables 2-6 which have been obtained from seasonal mean light-curves. Mean light-curves are plotted in Fig.1.

V. TSESSEVICH
Odessa Astronomical
Observatory

Table 1

Elements of five RR Lyrae-type stars

Star	Interval JD	Max.hel.JD	Period	Note
BH Lyr	2413712-2427927	2413712.358	0.6129028	A
"	2434472-2436102	2434472.547	0.6128941	B
"	2436423-2441888	2437164.365	0.6128864	C
DI Lyr	2437160-2439293	2437160.310	0.4174486	A
"	2439293-2440768	2439293.468	0.4178451	B
"	2440768-2442000	2440768.442	0.4174492	C
DR Lyr	2437100-2442000	2437168.403	0.8313502	
FH Vul	2418565-2442665	2436027.454	0.4054185	*
FK Vul	2416729-2442638	2436076.423	0.4340529	**

Notes: *-the value of period changes;**-strong Blazhko phenomenon.

Table 2

Mean moments of maxima of BH Lyrae

Observer	Max.hel.JD	E	O-A	O-B	O-C
Florja	2413712.342	-38264	-0.016	-	-
"	4224.117	-37429	- .015	-	-
"	4935.133:	-36269	+ .034	-	-
Kheylo	27927.410	-15071	- .003	-0.041	-
"	34472.544:	- 4392	- .056:	- .003	-
"	5011.284:	- 3513	- .059:	+ .003	-
"	6102.235:	- 1733	- .075	+ .003	-
"	6423.385	- 1209	-	- .003	0.000
"	6790.506	- 610	-	- .006	+ .002
Tsessevich	7164.371	0	-	- .007	+ .006
"	8142.521	+ 1596	-	- .036	- .011
"	9031.216	+ 3046	-	- .037	- .001
"	40381.410	+ 5249	-	- .049	+ .004
"	1486.437	+ 7052	-	- .070	- .003
"	1888.495	+ 7708	-	- .071	+ .002

Table 3

Mean moments of maxima of DI Lyrae

Max.hel.JD	E	O-A	O-B	O-C
2437160.312	0	+0.002	-	-
7761.427	1440	- .009	-	-
8196.427	2482	+ .010	-	-
8560.433	3354	.000	-	-
8904.412	4178	+ .002	-	-
9293.469	5110	- .003	+0.001	-
9716.380	6123	+ .032	.000	-
40768.444	8643	+ .126	+ .001	+0.002
1486.449	10363	+ .119	- .068	- .006
1873.434	11290	+ .129	- .092	+ .004

Table 4

Mean moments of maxima of DR Lyrae

Max.hel.JD	E	O-C
2437168.409	0	+0.006
8938.338	2129	- .010
9377.296	2657	- .004
9998.321	3404	+ .002
40801.405	4370	+ .002
1486.453	5194	+ .017
1920.389	5716	- .012

Table 5

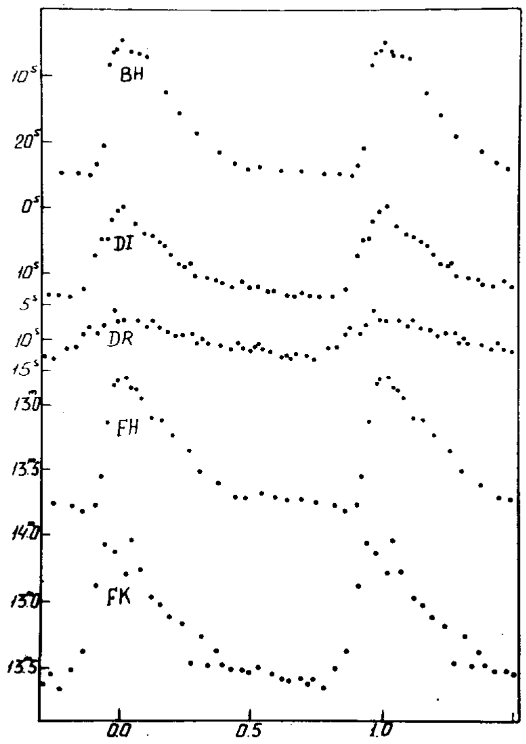
Mean moments of maxima of FH Vulpeculae

Max.hel.JD	E	O-C	Note
2418568.27	-43065	+0.16	Moscow
36027.450	0	- .004	vis.
7176.413	+ 2834	+ .003	Odessa
7883.456	+ 4578	- .004	"
8638.358	+ 6440	+ .009	"
9024.309	+ 7392	+ .001	" +Moscow
40121.370	+10098	.000	Odessa
2665.368	+16373	- .003	"

Table 6

Mean moments of maxima of FK Vulpeculae

Max.hel.JD	E	O-C	Note
2416729.31:	-44573	-0.07:	Moscow
29170.30:	-15911	+ .09:	"
36076.414	0	- .009	Odessa
6465.328	+ 896	- .006	"
7172.406	+ 2525	- .001	"
7886.432	+ 4170	+ .008	"
8291.404	+ 5103	+ .009	"
9029.294	+ 6803	+ .009	"
9689.487	+ 8324	+ .008	Moscow
42276.414	+14284	- .021	Odessa
2638.444	+15118	+ .010	"


10^s
20^s
0^s
10^s
5^s
10^s
15^s
13.0
13.5
14.0
13.0
13.5
BH
DI
DR
FH
FK
0.0
0.5
1.0

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1371

Konkoly Observatory
Budapest
1977 December 19

ON TWO SEMIREGULAR VARIABLE STARS RS SAGITTAE AND RZ VULPECULAE

Observations of these variable stars have been obtained by me from plates of Moscow and Simeis Collections. Most observations were published (1).

Both stars appear to show properties similar to those of RV Tau (b)-type variables; i.e. fast periodic variations superimposed upon slow fluctuations of mean light. The slow variations of mean light of RS Sge (see above) are given in Fig.1. The amplitudes are rather large. Besides, they are variable too. If these variations are cyclic, the cycles may exceed 6000 days. Smooth variation of amplitude in RZ Vul is of particular interest. It is a phenomenon never observed in RV Tau(b)-type stars. The elements of slow variations are given in Table 1.

Fast fluctuations are superimposed upon slow ones, the amplitudes of which reaches 1.5 mag. The elements of fast variations are summarized in Table 2. The period of RZ Vul has been noticed to vary throughout the observations, so one has to use two systems of elements.

In Fig.2 and 3 the fragments of the light curve are given which characterize the fast fluctuation in the light of RZ Vul.

V. TSESSEVICH
Odessa Astronomical
Observatory

Reference:

(1) V.P. Tsessevich and B.A. Dragomoretska, "RW Aurigae stars. Photographic Observations of Brightness", Kiev, 1973, Naukòva Dumka

Table 1

Elements of slow variations

Star	Interval JD	Max.	Min.	Period
RS Sge	2436000-2443000	2435999	2436596	1124^d
RZ Vul	2436000-2443000	2437807	2438458	1196

Table 2

Elements of fast fluctuations superposed on slow ones

Star	Interval JD	Max.	Min.	Period
RS Sge	2436000-2443000	2436057.2	2436077.7	41.1975
RZ Vul	2436074-2440815	2436434.4	2436416.1	39.8415
"	2441429-2442961	2441454.1	2441433.9	40.2156

Fig.1

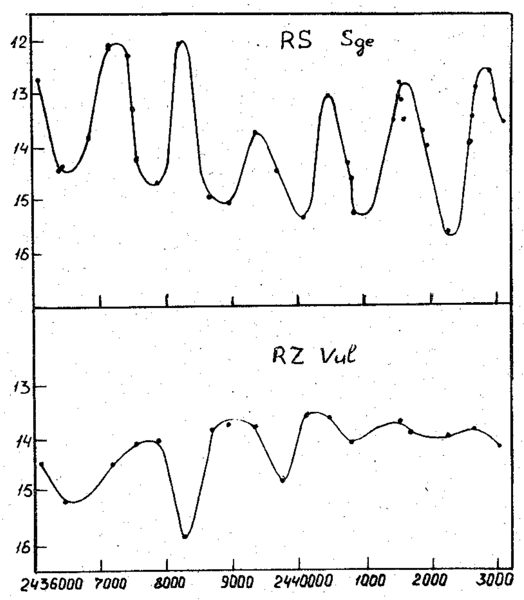


Fig.2

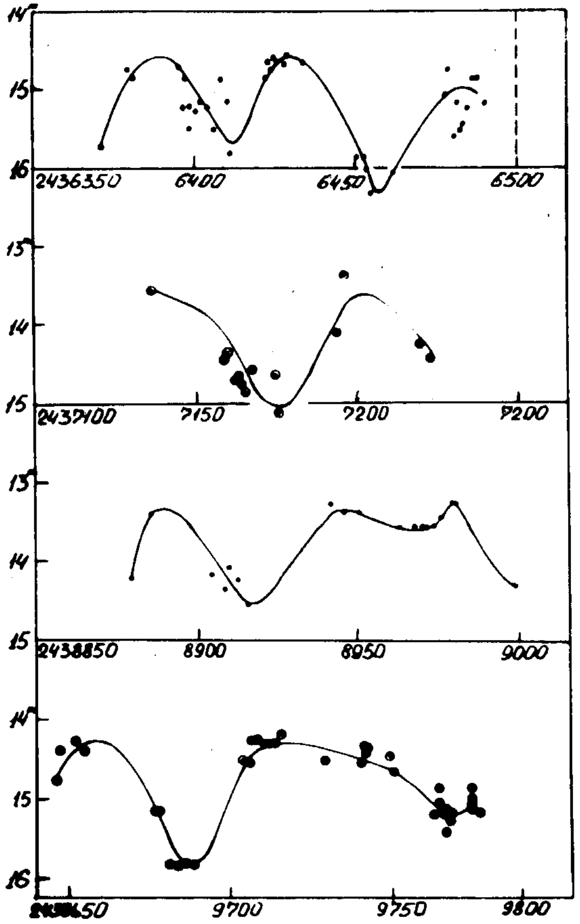
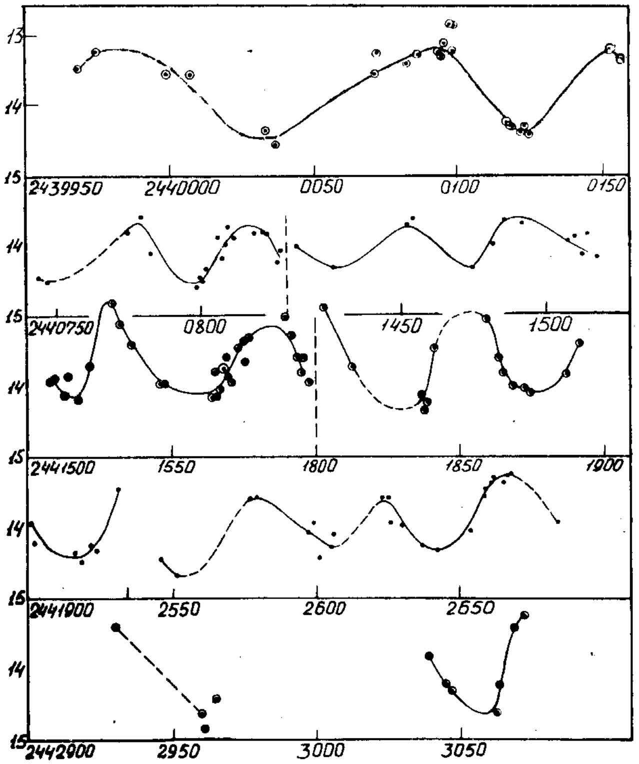

14
15
16
2436350
6400
6450
6500
15
14
15
2437100
7150
7200
7200
15
14
15
2438850
8900
8950
9000
14
15
16
9700
9750
9800

Fig.3


13
14
15
2439950
2440000
0050
0100
0150
14
15
0800
1450
1500
2440750
14
15
2441500
1550
1800
1850
1900
14
15
2441900
2550
2600
2650
14
15
2442900
2950
3000
3050

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1372

Konkoly Observatory
Budapest
1977 December 19

ON THE VARIABLE STAR BE HERCULIS

This star was observed by us on photovisual and photographic plates of the Odessa Sky-patrol collection within JD 2436350-2442650. Observations have been reduced to the photometric system close to V and B. Moments of maxima (Table 1) and minima (Table 2) have been determined.

Based upon these data it was shown that at different intervals the star's light variations were periodical, the period values being variable. The set of elements is as follows:

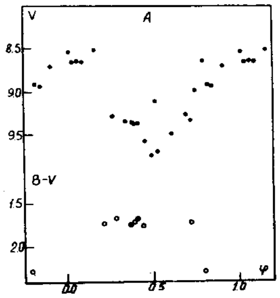
Max. JD	Min. JD	Period	Des.
2436728.4	2436769.4	74^{d}.21	A
7050.2	7089.9	71.51	B
7811.5	7845.4	71.41	C
8856.2	8886.9	72.52	D
9973.7	40024.5	72.64	E
41034.4	1088.8	67.46	F

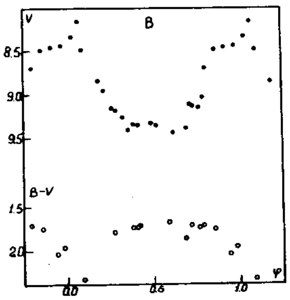
Residuals of these elements are given in the corresponding columns of Tables 1 and 2.

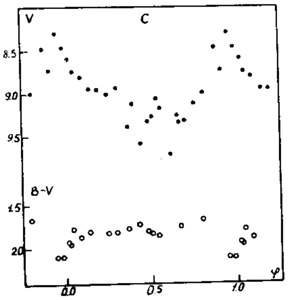
Seasonal light and colour curves have been plotted (Fig.1). The amplitude is variable. The amplitude decrease is fairly pronounced throughout seasons E and F.

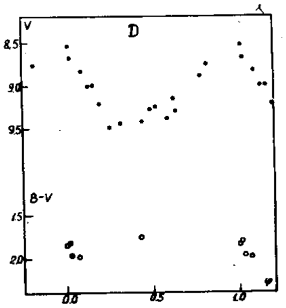
Within the first four seasons when the light variation amplitude was marked, colour index changed in antiphase with light variation. The moments of maximum light and minimum colour index do not precisely coincide. The star became red at maximum light. In the seasons E and F colour index fluctuations nearly ceased.

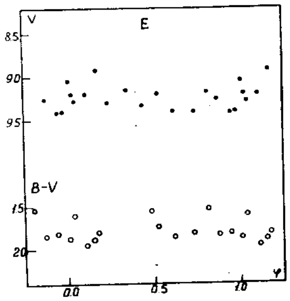
B. POCHINOK
Odessa Astronomical
Observatory


V
A
8.5
9.0
9.5
B-V
1.5
2.0
0.0
0.5
1.0
φ


V
B
8.5
9.0
9.5
B-V
1.5
2.0
0.0
0.5
1.0
φ


V
C
8.5
9.0
9.5
B-V
1.5
2.0
0.0
0.5
1.0
φ


V
D
8.5
9.0
9.5
B-V
1.5
2.0
0.0
0.5
1.0
φ


V
E
8.5
9.0
9.5
B-V
1.5
2.0
0.0
0.5
1.0
φ

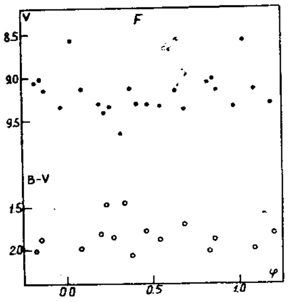

V
F
8.5
9.0
9.5
B-V
1.5
2.0
0.0
0.5
1.0
φ

Table 1

BE Her. Moments of maxima.

Max. JD	E_A	O-A	Max. JD	E_D	O-D
2436363	-5	+5.6	2438858	0	+1.8
6648	-1	-6.2	8927	1	-1.8
6730	0	+1.6			
Max. JD	E_B	O-B	Max. JD	E_E	O-E
2437048	0	-2.2	2439980	0	+6.3
7122	1	+0.3	40040	1	-6.3
7405	5	-2.8			
7484	6	+5.7			
Max. JD	E_C	O-C	Max. JD	E_F	O-F
2437749	-1	+8.9	2441040	0	+5.6
7808	0	-3.5	1113	1	+11.1
7875	1	-7.9	1430	6	-9.2
8105	4	+7.9	1510	7	+3.4
8168	5	-0.5	1833	12	-10.9
8235	6	-4.9			

Table 2

BE Her. Moments of minima.

Min. JD	E_A	O-A	Min. JD	E_D	O-D
2436393	-5	-5.4	2438887	0	0.0
6700	-1	+4.8	8959	1	-0.5
6769	0	-0.4	9250	5	+0.4
Min. JD	E_B	O-B	Min. JD	E_E	O-E
2437084	0	-6.0	2439957	-1	+5.2
7163	1	+1.5	40017	0	+7.5
7378	4	+2.0	0390	5	-2.3
Min. JD	E_C	O-C	Min. JD	E_F	O-F
2437770	-1	-4.0	2441082	0	-6.8
7846	0	+0.6	1161	1	+4.8
8135	4	+3.9	1462	6	-31.6
8202	5	-0.5	1797	10	-33.8

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1373

Konkoly Observatory
Budapest
1977 December 23

PHOTOMETRIC VARIATIONS OF THE B6 STAR HR 3440

HR 3440 (=HD 74071=GC 11917=51 G.Vel, Hogg 12 in IC 2391, B6V (Feinstein 1961)) was used as comparison star for the *uvby* measurements of HR 3413 by Hensberge et al. (1976), but the results did not allow to find the period. The situation remained the same after adding 13 measurements obtained later by Sterken (November 26 - December 3, 1975) still with HR 3440 as comparison star. But the periodic variation curves in *uvby* have now been established for HR 3413 (Renson et al. 1977) from observations with other comparison stars (HR 3300 and HD 73127). By subtracting these variations from the measured differences HR 3413-HR 3440, residual deviations are found, ascribable to HR 3440, which is thus slightly variable.

Use of the method described elsewhere (Renson 1977) with the residuals given by Sterken's measurements shows that the most probable period is somewhat more than $0\overset{d}{.}261$. Comparison with the residuals deduced from the 9 observations by Hensberge in January 1975, and from the 7 observations by Zuiderwijk in March 1975 (Hensberge et al. 1976) gives the value $P=0\overset{d}{.}26145 \pm 0\overset{d}{.}00003$.

The range is only a little more than $0\overset{m}{.}02$ in *y*, *b* and *v* and $0\overset{m}{.}03$-$0\overset{m}{.}04$ in *u*. Figure 1 is obtained from the Nov.-Dec. 1975 observations with the hereabove period. Phase 0.0 corresponds to JD 2442745.000. The ordinates are the magnitude differences HR 3440 - (HR 3300+HD 73127)/2. The curves show a secondary maximum, and are similar in all colours.

However the curves deduced from the measurements made in early 1975 are somewhat different : the maxima were then equal, and the minima different; the range seems somewhat larger in

Nov.-Dec. As far as it can be estimated despite the small number of observations, the shape of the curves changed somewhat even between January and March. Such variations of low amplitude and changing shape are rather common among early and mid B type stars (see e.g. references cited in Smith 1977). Several periods are probably present, the beats of which give rise to the observed changes.

Because of these changes, it is difficult to bring the curves deduced from the different series of measurements in accordance, and especially to distinguish between the main and secondary extrema. So the period could be $0\overset{d}{.}26133$ instead of the value quoted above.

Sterken's measurements may be obtained by writing to the Commission 27 depository (librarian of the Royal Astronomical Society, Burlington House, London W1, England).

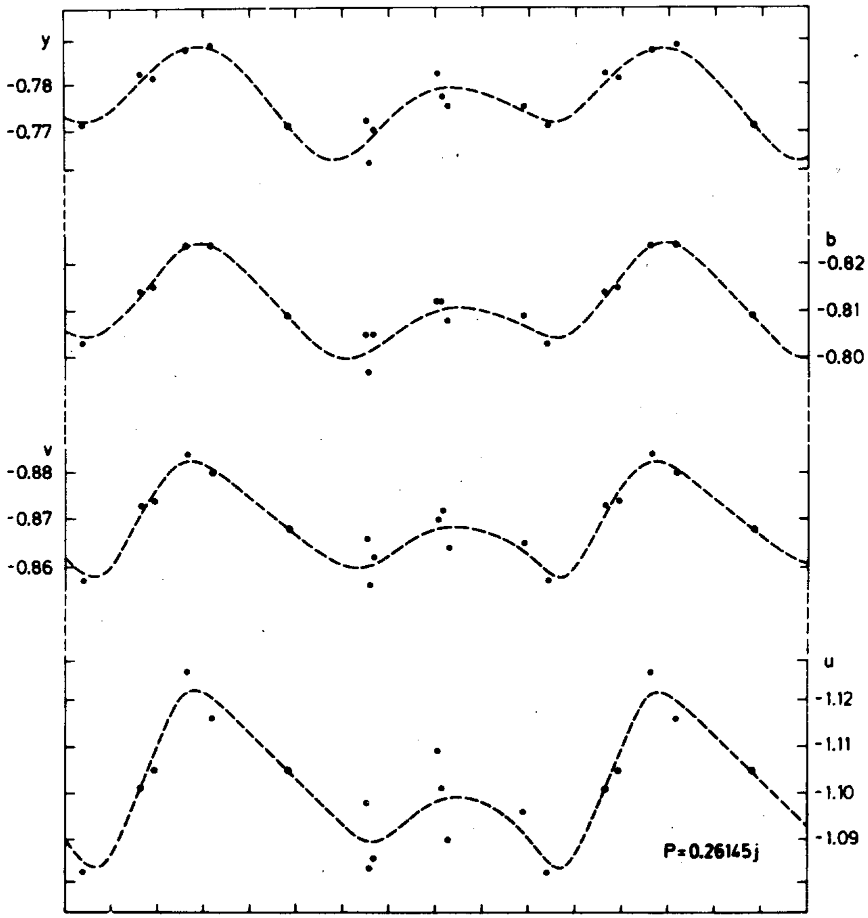
The observations being not numerous enough and badly distributed for studying a variation with a period as short as $6\frac{1}{4}^{h}$, the results cannot be considered as definitively established. More extensive measurements are necessary to establish the stability or instability of the variation. In order to study the possible variations in radial velocity and in line profiles, spectroscopic observations are also desirable.

P. RENSON
Institut d'Astrophysique de l'Université
de Liège
5, avenue de Cointe, B-4200 Cointe-Ougree,
Belgium

C. STERKEN
Astrophysical Institute, Vrije Universiteit
Brussel, Belgium

References:

Feinstein, A., 1961, Publ.astron.Soc.Pacific 73, 410
Hensberge, H., De Loore, C., Zuiderwijk, E.J. and Hammerschlag-Hensberge, G., 1976, Astron. and Astrophys. 48, 383
Renson, P., 1977, Astron. and Astrophys., in print
Renson, P., Manfroid, J. and Heck, A., 1977. Astron. and Astrophys. Suppl., in print
Smith, M.A., 1977, Astrophys.J. 215, 574


y
-0.78
-0.77
b
-0.82
-0.81
-0.80
v
-0.88
-0.87
-0.86
u
-1.12
-1.11
-1.10
-1.09
P=0.26145j
J.8
0
0.2
0.4
0.6
0.8
0
0.2

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1374

Konkoly Observatory
Budapest
1977 December 23

THE LIGHT CURVE OF i BOOTIS IN FEBRUARY 1975

The peculiar W UMa variable i Bootis, which is one of the components of the visual binary ADS 9494, is distinguished mainly by two most remarkable properties: 1) Among W UMa type stars this variable displays the strongest light curve variations observed. 2) Besides a smooth period variation, which is caused by the light time effect, reflecting the orbital motion of the variable around its visual component, certain period jumps have been observed, which may be caused by time dependent peculiarities of the mass transfer between the W UMa components. Both "activities" may be correlated in time, as suggested by Bergeat et al. (1972). This should be a motivation for the observers to monitor continuously the photometric behaviour of this most interesting object. In this paper two nearly complete light curves of i Boo are presented together with new minimum times.

The observations have been obtained in February 6/7 and 9/10 in 1975 with a photoelectric photometer, attached to the 36 cm (f/19) Cassegrain telescope of Hoher List Observatory. In combination with an RCA 1P21 photomultiplier and the filters UG 2 (1mm), BG 12 (1mm) + GG 385 (2mm) and GG 495 (2mm), respectively, a good realization of the Johnson UBV-system has been obtained. The nearby star BD +47^{o}2192 (m_{pg}=6.16, AOp) was used as comparison star. Whereas the variability of the magnetic field of this Ap-star has been demonstrated (Babcock and Cowling, 1953), the question of a possible photometric variability is rather controversial. Extensive photoelectric measurements by Schmidt and Schrick (1957), who used it as a secondary comparison star for their photometry of i Boo and who discussed its photometric behaviour thoroughly, and an earlier photometric investigation by Provin (1953) did not reveal any indication of variability. Measurements by Abt and Golson (1962) could also not clearly demonstrate a variable brightness. Nevertheless, because of two discordant measurements (one announced in the Cape Mimeogram No.12, 1961, the other made by Osawa and Hato, 1962), which differ by $0\overset{m}{.}08$, BD +47°2192 has been listed in the General Catalogue of Variable Stars, 1974, as BX Boo with an amplitude of $0\overset{m}{.}08$. Though the variability of this star has not at all been demonstrated, we will be very cautious in the interpretation of our observations. In particular, the reality of any light curve anomaly has been examined by a closer inspection of the magnitude versus air mass plot for the comparison star.

The UBV data for i Boo, corrected for differential extinction and colour extinction, were plotted over phases based on the ephemeris given by Dürbeck (1975):

$$\text{Min I} = JD_{hel}\ 2439852.4903+0.2678159 \cdot E,$$

yielding the light curves shown in Fig.1 and 2. Because of the above described uncertainties about the variability of the comparison star, we will distinguish carefully between certainly real light curve disturbances and those, which may be doubtful. Obviously, two kinds of disturbances are real, because they occur rapidly in both nights at exactly the same phases.

1) Absorption features at phases ±0.125 from primary and secondary minima (that is exactly in the middle between the minima and the maxima), each of which can be recognized at least in one of the 6 light curves.

2) A larger disturbance after reaching the first maximum, namely between phases 0.25 and 0.35.

Moreover, as can be seen from Fig.1 and 2, these light curve anomalies vary considerably with wavelength and with time. It is quite interesting that similar disturbances like the second one is sometimes observed at different phases. For example, nearly just the same absorption feature like the one observed here appears in the light curve of Hopp et al. (1977) at the equivalent phases after reaching the <u>second</u> maximum (that means, it is shifted in phase for exactly half a period). For another example, similar light curve anomalies are also present in the observations of Schmidt and Schrick (1957), this time, however, at phases just <u>before</u> reaching first <u>and</u> second maxima. Whereas the physical reason for this kind of variable absorption effects has still to be investigated, it is rather unquestioned that the first kind of features, namely the absorptions at phases 0.125, 0.375, 0.625 and 0.875 are caused by absorbing matter between the two stars. Actually, numerical calculations of Breinhorst and Reinhardt (1974) have shown that in the case of W UMa a gaseous stream with reasonable properties, which is assumed to originate from the inner Lagrangian point, is able to produce at just these particular phases the observed absorption effects of the order of $0\overset{m}{.}01$ to $0\overset{m}{.}02$.

In contrary to the above discussed disturbances, two kinds of light curve peculiarities may be doubtful:

1) Strong variations of the shapes of the minima with wavelength and with time. This is well pronounced in the observations of the primary minimum on Febr. 6/7, which seem to become considerably sharper with decreasing wavelength.

2) Strong variations of the relative height of the maxima with wavelength and with time. Comparing the observations of both nights, the wavelength dependence of the relative height of the maxima seem to run in opposite direction.

By application of the method of bisecting chords (Pogson's method) the times of primary and secondary minima have been determined for all light curves. After averaging over all three colours, O-C values have been calculated on the basis of the ephemeris of Dürbeck (1975). They are given in Table 1. Here the O-C values of the secondary minima have been derived under the assumption that they occur at phases 0.5 from primary.

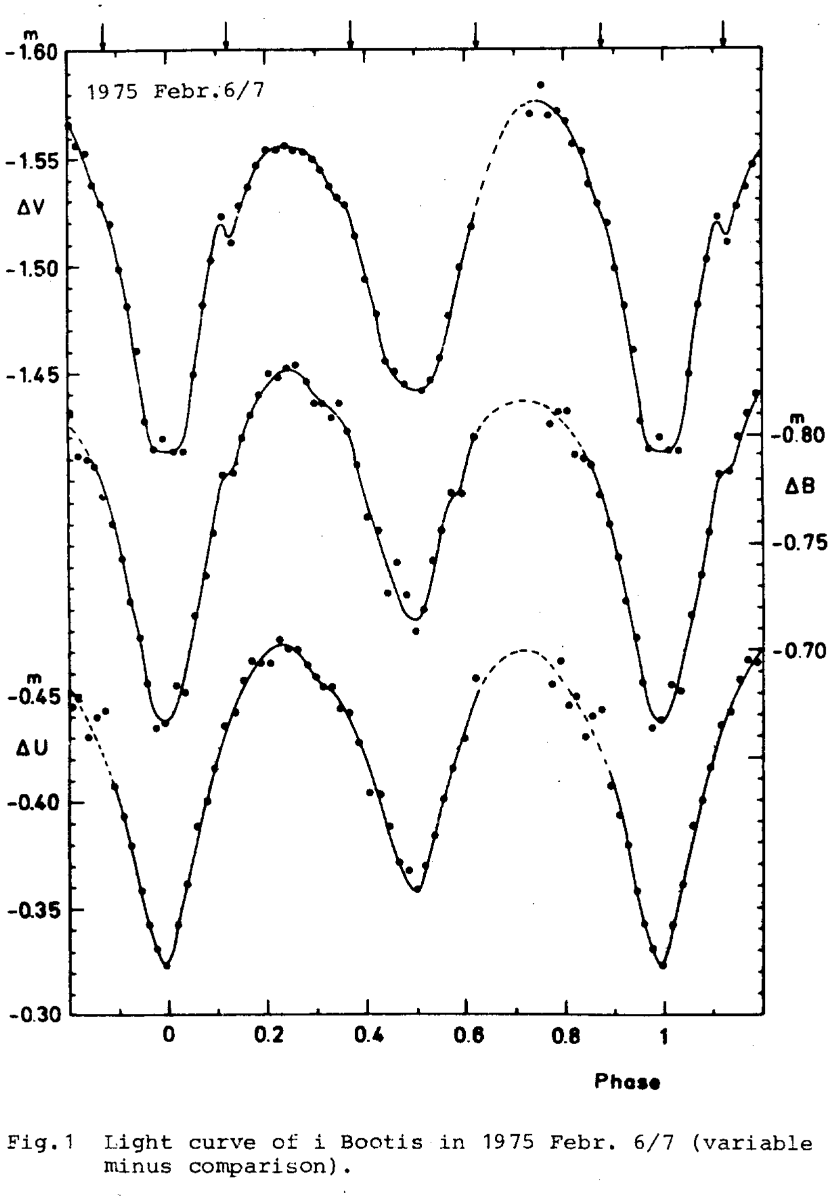


Fig.1 Light curve of i Bootis in 1975 Febr. 6/7 (variable minus comparison).

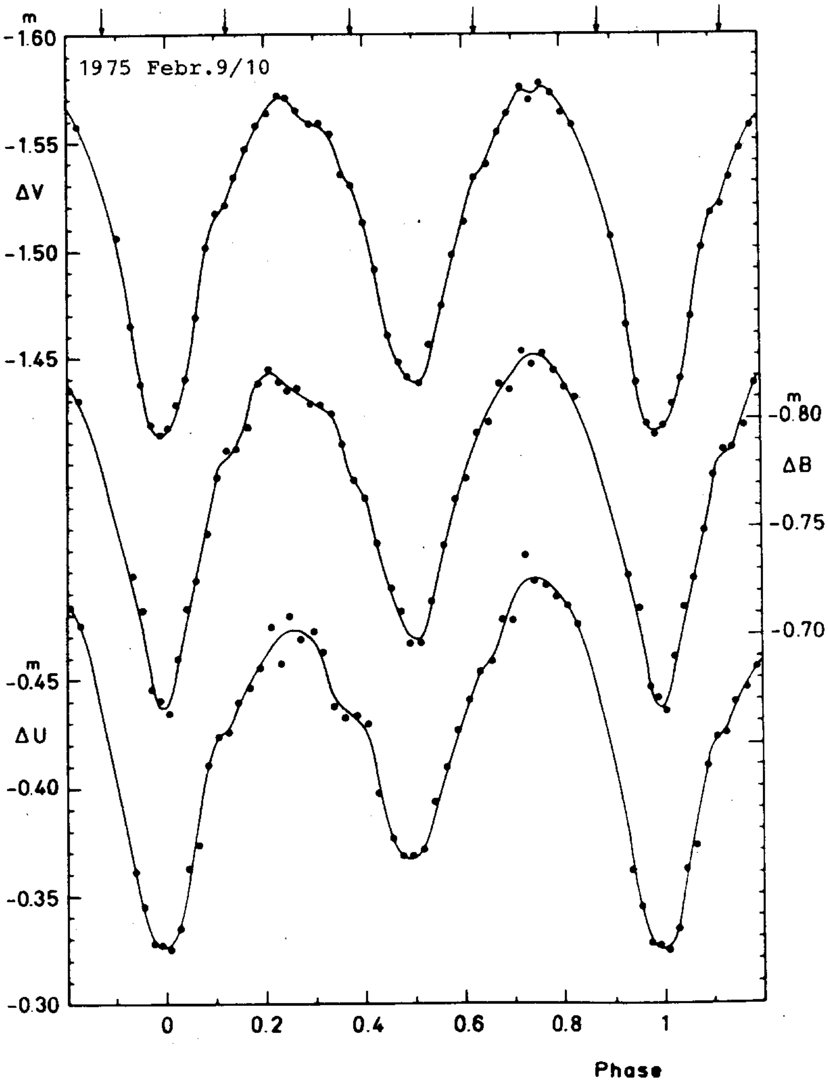


Fig.2 Light curve of i Bootis in 1975 Febr. 9/10 (variable minus comparison).

Table 1

Times of primary and secondary minima, averaged over all three colours

Epoch	Min.	JD_{hel}	O-C	ε_1	ε_2
9701	I	2442450.5712	-0.0011	±0.0006	±0.0005
	II	2442450.7059	-0.0004	0.0002	0.0006
9712	I	2442453.5168	-0.0015	0.0005	0.0004
	II	2442453.6511	-0.0011	0.0010	0.0004

ε_1 means the average error derived from the internal agreement of the three values

ε_2 means the error resulting from the estimated errors of the single minimum time determinations.

FRANK GIESEKING
Observatorium Hoher List
der Universitäts-Stern-
warte Bonn
D-5568 Daun

References:

Abt, H.A., Golson, J.C.: 1962, ApJ 136, 35

Babcock, H.W., Cowling, T.G.: 1953, MN 113, 368

Bergeat, J., Lunel, M., Sibille, F.,van't Veer, F.: 1972, A & A 17, 215

Breinhorst, R.A.,Reinhardt, M.: 1974, Acta Astron. 24, 377

Dürbeck, H.W.: 1975, IBVS No.1023

Hopp, U., Witzigmann, S., Kiehl, M.: 1977, IBVS No. 1353

Osawa, K., Hato, S: 1962, Tokyo Ann. 7, No.4

Provin, S.S.: 1953, ApJ 118, 489

Schmidt, H., Schrick, K.W.: 1957, Z.Astrophys. 43, 165

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1375

Konkoly Observatory
Budapest
1977 December 27

PROGRAMME OF COOPERATIVE FLARE STAR OBSERVATIONS FOR 1978

The Working Group on Flare Stars announces the following programme of cooperative observations for the year 1978:

YZ CMi	2-16 January
AD Leo	31 January - 14 February
V 1216 Sgr	28 June - 12 July
EV Lac	26 August - 9 September
UV Cet	25 September - 9 October

L.N. MAVRIDIS
Chairman Working Group
on Flare Stars

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1376

Konkoly Observatory
Budapest
1978 January 2

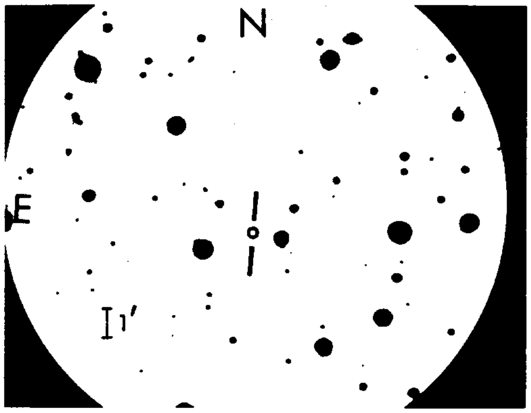
AN APPARENT ERUPTIVE VARIABLE STAR IN SCORPIUS

On objective-prism plates taken with the Curtis Schmidt telescope at the Cerro Tololo Inter-American Observatory, we note a 14th magnitude, strong emission-line star at $\alpha = 17^h40^m32\overset{s}{.}6$, $\delta = -36^{\circ}\ 02'\ 07''$ (1950), which appears to be previously unreported. The Hα emission was exceedingly strong relative to the continuum in July 1967 and was still moderately strong in May 1968. On blue-sensitive plates, covering the period from June 11 to Aug. 4, 1967, the spectrum contained, in addition to the Balmer series, emission lines of [OIII] at λ5007 (somewhat weaker than Hβ) and at λ4363 (about equal to Hγ), and a broad emission band in the λ4640-86 region. The relative intensities of these features did not vary significantly over this two month interval. The hydrogen lines showed some evidence of broadening but not as much as would been seen in a fast nova. Conceivably, this might be a slow nova. Because of the crowded field, we are unable to positively identify the image of this star on the Palomar Sky Survey chart and thus cannot estimate the amplitude of the light variation. However, we have provided a chart showing the position of this object.

N. SANDULEAK

C.B. STEPHENSON
Warner and Swasey Observatory, E. Cleveland, OH., U.S.A.

D.J. MacCONNELL
CIDA, Apartado 264, Merida, Venezuela


N
E
1'

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1377

Konkoly Observatory
Budapest
1978 January 3

PHOTOMETRY OF HD 193793

Williams, Stewart, Beattie, and Lee (1977) have recently drawn attention to the Wolf-Rayet star HD 193793. Their photometry in the J, H, K, and L bands has indicated that the star has brightened by about two magnitudes in the near-infrared, and they suggest that an optically thick dust shell has formed around the star. If this were so it should also be apparent in the visible spectral region, and since Demers and Fernie (1964) had earlier obtained UBV photometry of the star, it seemed worthwhile to repeat this photometry now.

UBVRI observations were obtained on the night of October 17/18, 1977 (JD 244 3434.575) with the 0.6-metre telescope of the David Dunlap Observatory. The results, together with the earlier photometry are as follows:

	1977	1964
V:	6.87	6.86
U-B:	-0.29	-0.31
B-V:	0.41	0.42
V-R:	0.54	-
V-I:	0.81	-

Although the present observations were made on only one night, they are thought to be accurate to about 0.01 or 0.02 mag. In any case, the differences between the present and earlier observations are not significant and do not support the suggestion of an optically thick dust shell.

J.D. FERNIE

David Dunlap Observatory
Richmond Hill, Ontario
Canada

References:
Demers, S. and Fernie, J.D. 1964, P.A.S.P. 76, 350
Williams, P.M., Stewart, M.J., Beattie, D.H., and Lee, T.J. 1977
I.A.U. Circular, No. 3107

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1378

Konkoly Observatory
Budapest
1978 January 6

α SCULPTORIS - A LONG PERIOD BINARY

This prototype (HD 5737, B8III, V = 4.30) of the α Scl-subgroup of weak helium line stars has been investigated e.g. by Jugaku and Sargent (1961), Guthrie (1965), Norris (1971), Vilhu (1972) and Schmitt (1973). Bernacca and Molnar (1972) found it to be a photometric variable on the basis of UV-observations (2 observations). According to Bernacca and Molnar the strengthening of TiII, CrII and SrII lines around 2400 Å appears to redistribute flux longwards of the Balmer discontinuity. It is not known whether this strengthening is periodic or accidental, and what is its reason.

Figure 1 shows radial velocity variations of α Scl. Old Lick Observatory measurements (Campbell and Moore, 1928) were supplemented by new measurements of four Mt. Wilson plates from years 1944 and 1955 (Ce 3656, 10092, 10097, 10161, 2.8 Å/mm). These same spectrograms have previously been analysed for abundances (Vilhu, 1972). Radial velocities were measured from several lines of HeI, MgII, SiII and FeII with accuracy ±2 km/s.

One point obtained from ultraviolet observations with Copernicus-satellite (Upson and Vilhu, 1975) is included. This point represents the mean value of several lines in regions 1046-1051 Å, 1154-1166 Å and 1300-1305 Å (ArI, CI, OI, FeII, FeIII, CrIII). The known interstellar line ArI 1048 seems to follow the velocity variation. Thus it probably originates from a circumstellar cloud participating in orbital motion.

Due to the apparent long period, the variability cannot be related with the rotation of the star as is the case in many Ap stars (for α Scl V sin i =15 km/sec, Vilhu (1972)).The binary

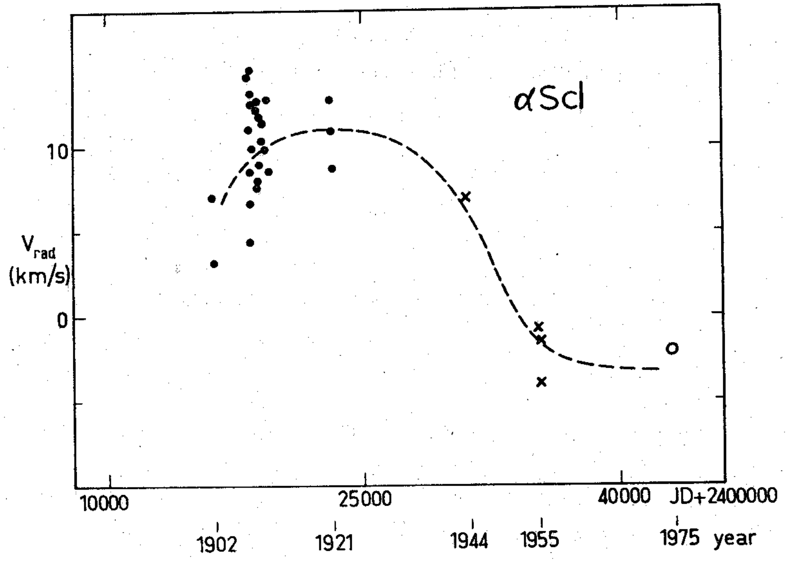


Fig. 1. Radial velocity variations of α Scl. Points: old Lick Observatory measurements (Campbell and Moore, 1928).Crosses:new measurements of Mt. Wilson plates (this paper). Circle:a value from UV-region (see text, Upson and Vilhu, 1975).

motion is then the most probable reason for the variability. From the radial velocities of Fig. 1 it is rather difficult to derive the period and amplitude. Estimating P = 100 years and K_1 = 6 km/s, a value 0.8 for the mass function f(M) can be calculated (assuming e = 0). If the mass of α Scl is about 7 $M_\odot$ (Norris, 1971), this gives a minimum mass 4 $M_\odot$ for the companion (if i = 90^o). If the eccentricity is different from zero,smaller companion masses will result. The 4 $M_\odot$ companion would thus be a B9 star having 7 times smaller luminosity than α Scl (assuming main-sequence). With these values it is quite reasonable that the companion is not seen in the spectrum.

Further, using the above values for P and K_1 we obtain for the semi-major axis a_1 sin i a value of 4000 $R_\odot$. This means that the system is very wide. Even for the so called case C evolution of close binaries the system is rather wide, if the orbit is not eccentric. It is not, of course, precluded that the period and separation may have increased (for instance mass and angular momentum loss and kick from the companion by supernova-explosion). If the secondary is more massive than 4 $M_\odot$, it should then be a black hole.

More radial velocity measurements are clearly needed to get better estimates for the orbital parameters and for the companion mass.

O. VILHU
Observatory and Astrophysics Laboratory
University of Helsinki
Finland

References:

Bernacca, P.L., Molnar, M.R. 1972, Astrophys.J. 178, 189
Campbell, W.W., Moore, J.H. 1928, Lick Obs. Publ. XVI, p.12
Guthrie, B.N.G. 1965, Publ.Roy.Obs. Edinburgh 3, 264
Jugaku, J., Sargent, W.L.W. 1961, P.A.S.P. 73,249
Norris, J. 1971, Astrophys. J. Suppl. 23, 213
Schmitt, A. 1973, Astron. Astrophys. Suppl. 9, 427
Upson, W.L., Vilhu, O. 1975, as guest investigators using the Princeton telescope on the satellite Copernicus (unpublished observations)
Vilhu, O. 1972, Ann.Acad.Sci. Fennicae,Ser. A VI Physica, No.394

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1379

Konkoly Observatory
Budapest
1978 January 9

TIMES OF MINIMA OF ECLIPSING VARIABLES

This bulletin lists times of minima determined at this observatory in 1973, 1974, 1975 and 1976. The equipment was the same as used for the minima listed by us in IBVS 844, 1973. However, in 1974 the d.c. output of the photometer was replaced by a photon counter designed and built by J.R. Stilborn, and all subsequent observations have been obtained with this new system. The computer programme for reduction by the method of Kwee and van Woerden (BAN 12, 327, 1956) was modified by one of us (D.J. B.) to use the digital output data directly and to calculate and print out magnitude differences in the process of determining the times of minima.

The ephemerides used to calculate O-C were the same as those used in IBVS 844 for the stars 44i Boo, VW Cep, MR Cyg, AI Dra, Z Her, RX Her, U Oph, and U Sge. Ephemerides for the other stars are given in Table 2. Some remarks on individual systems follow the tables.

Table 1. Observed Times of Minima.

Star	H.J.D. (2,440,000+)	E	O-C (days)	Observer
OO Aql	2986.8086±0.0003	4200	±0.0130	S
44i Boo	1900.7444±0.0005	12648	±0.0131	B
	2196.8176±0.0004	13753.5	±0.0176	S
	2218.7782±0.0005	13835.5	±0.0175	B
	2228.8212±0.0003	13873	±0.0174	B
	2635.7667±0.0006	15392.5	±0.0191	B
	2947.7702±0.0008	16557.5	±0.0189	R

Table 1. Observed Times of Minima, (Cont.)

Star	H.J.D. (2,440,000+)	E	O-C (days)	Observer
ZZ Boo	2551.8384±0.0004	798.5	+0.0116	S
RZ Cas	2266.8220±0.0001	10367	+0.0030	B
	3001.8946±0.0002	10982	-0.0014	B
	3019.8240±0.0004	10997	-0.0008	B
TV Cas	1919.8125±0.0004	5016	-0.0049	S
VW Cep	1895.8309±0.0004	9095	+0.0098	B
	2198.7773±0.0007	10183.5	+0.0116	S
	2256.8019±0.0002	10392	+0.0078	S
	2268.7702±0.0002	10435	+0.0086	S
	2269.7467±0.0006	10438.5	+0.0110	B
	2290.7587±0.0006	10514	+0.0103	B
	2290.8973±0.0005	10514.5	+0.0098	B
	2557.8039±0.0003	11473.5	+0.0135	B
	2563.7854±0.0003	11495	+0.0113	B
	2977.7824±0.0003	12982.5	+0.0166:	R
XX Cep	1894.7619±0.0016	152	-0.0003	S
	2289.7776±0.0007	321	+0.0107	S
MR Cyg	2252.8221±0.0005	5281	+0.0007	B
	2273.7832±0.0013	5293.5	-0.0012	B
AI Dra	1881.8234±0.0002	3618	+0.0005	B
	1890.8109±0.0010	3625.5	-0.0031	B
	2255.8543±0.0007	3930	+0.0011	S
	2270.8314±0.0012	3942.5	-0.0070:	B
Z Her	2217.8226±0.0005	7296	-0.0030	B
RX Her	2259.7932±0.0006	5554.5	+0.0005	S
	2267.7942±0.0004	5559	-0.0020:	B
	2564.8175±0.0004	5726	-0.0003	S
	3031.6935±0.0004	5988.5	+0.0006	B
TX Her	2226.7781±0.0003	5778	+0.0002	B
	2262.8256±0.0005	5795.5	+0.0011	S
	2570.7668±0.0004	5945	+0.0008	A
	2985.8213±0.0007	6146.5	+0.0038	R
AK Her	2596.8128±0.0003	9644.5	+0.0016	S
AR Lac	2287.8275±0.0003	1468	-0.0014	B
	2288.8215±0.0007	1468.5	+0.0010	B
CM Lac	1893.7814±0.0003	9265	-0.0003	B
	1905.8139±0.0006	9272.5	-0.0030	B
	2636.7537±0.0002	9728	-0.0001	B
	2989.7850±0.0004	9948	-0.0009	R
U Oph	2942.8337±0.0003	20665.5	-0.0029	B
V566 Oph	2215.8078±0.0002	927.5	-0.0003	B
	2216.8320±0.0003	930	-0.0002	Bl
	2241.8201±0.0003	991	-0.0005	S
	2248.7844±0.0002	1008	-0.0002	S
	2265.7848±0.0003	1049.5	-0.0001	S
	2572.8131±0.0004	1799	-0.0012	A
	2581.8262±0.0002	1821	-0.0003	B
	2614.8044±0.0012	1901.5	+0.0011	B
	2938.8340±0.0003	2692.5	+0.0013	S
	2987.7861±0.0003	2712	+0.0009	R

Table 1. Observed Times of Minima, (Cont.)

Star	H.J.D. (2,440,000+)	E	O-C (days)	Observer
U Sge	2207.8447±0.0001	7418	+0.0023	B
	2633.8033±0.0002	7544	+0.0030	B

Observers: A= S.B. Alers
R= J. Regan
B= D.J. Barlow
S= C.D. Scarfe
Bl= B.W. Baldwin

Table 2. Ephemerides

Star	H.J.D. (2,400,000+)	Period	References
OO Aql	40858.291	0.5067868	Herczeg IBVS 699, 1972
ZZ Boo	38565.9192	4.991744	McNamara et al.PASP 83,192,1971
RZ Cas	29875.6902	1.1952473	Herczeg&Frieboes-Conde, A.&Ap. 30, 259, 1974
TV Cas	32827.7665	1.81260983	Frieboes-Conde&Herczeg, A.&Ap. Supp. 12, 1, 1973
XX Cep	41539.4917	2.3373059	Battistini et al.,IBVS 1325, 1977
TX Her	30326.2006	2.05980915	Vetesnik&Papousek, BAC 24, 57, 1973
AK Her	38531.4318	0.42152309	Kurutac&Ibanoglu, IBVS 369, 1969
AR Lac	37376.4979 ±5	1.9831955 ±10	present work
CM Lac	27026.3159	1.6046914	Alexander, A.J. 63, 108,1958
V566 Oph	41835.8617 ±3	0.40964569 ±25	present work

Notes on individual systems:

1. OO Aql The trend of recent is to later times than predicted by the ephemeris of Herczeg.
2. ZZ Boo An increase of the period since the observations of McNamara et al. is indicated.
3. RZ Cas Our data and those of Surkova (IBVS 1335, 1977),and Pohl and Kizilirmak (IBVS 1358, 1977) indicate a new change in the period since the observations of Chambliss (PASP 88, 22, 1976).
4. TV Cas Recent minima, including those of Tremko and Bakos (BAC 28, 41, 1977), Grauer et al. (A.J. 82, 740,1977) and Pohl and Kizilirmak (IBVS 1163, 1976, and IBVS 1358, 1977) leave undecided the question of the nature of the period changes, ie. abrupt as proposed by Grauer et al., sinusoidal as suggested by Frieboes-Conde and Herczeg (A.&.Ap.Supp.12,1, 1973),or possibly

steady.

5. XX Cep Our data and those of Pohl and Kizilirmak (IBVS 1358, 1977), support the suggestion of Battistini et al. (IBVS 1325, 1977), that an increase in the period may have occurred a few years ago.

6. AR Lac A new ephemeris has been calculated by least-squares from the present minima and those listed in IBVS 201, 456,817,873 and 937 and in.A.A. 27, 93, 1977.

7. U Oph Three additional minima are listed by Batten and Scarfe (Revista Mexicana de A. y Ap. 1978, in press).

8. V566 Oph A new ephemeris has been calculated by least-squares using the present minima and those since 1972 given in IBVS 844, 937, and 1053 by Bookmyer (PASP 88, 473, 1976) and by Dawson and Narayanaswamy (PASP 89, 47 1977). The ephemerides given in both of these latter papers give substantial O-C's for the most recent minima. The present ephemeris fits the 1972-76 data nearly as well as that of Bookmyer (A.J. 74, 1197, 1969) fitted the pre-1969 data. The minima in the interval 1969-71 while the period was changing show a very large scatter.

C.D. SCARFE and D.J. BARLOW
University of Victoria Observatory
Victoria, B.C. Canada

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1380

Konkoly Observatory
Budapest
1978 January 11

A NEW VARIABLE STAR IN NGC 5139

By 15 blinking pairs of 103a-D+GG 11 and 103a-0+GG 13 plates obtained in the Newtonian focus of the 1.54 m reflecting telescope (diaphragmed to 1.10 m) of the Astrophysical Station at Bosque Alegre, Cordoba, Argentina, a new long-period variable was found in NGC 5139. The location of V 184 in our cluster according to "A Third Catalogue of Variable Stars in Globular Clusters" by Helen Sawyer Hogg (1973) is shown in Figure 1 and its coordinates in seconds of arc x"=-412.5; y"=+22.0.

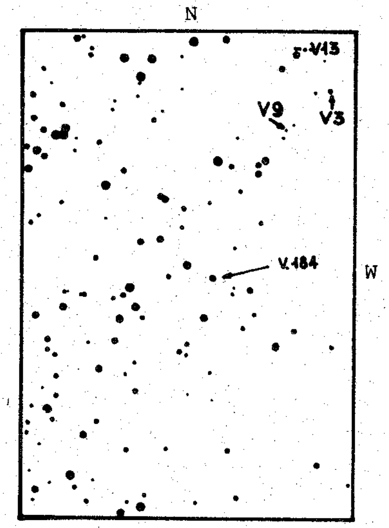


Fig. 1

The photographic plates are of very short exposure (5^m) so that the centre of the cluster is not overexposed and the stars it is composed of, can be seen. This new variable star is near the centre of the cluster which is probably the reason it had been overlooked.

The position of the new variable in the colour-magnitude diagram is shown in Figure 2.

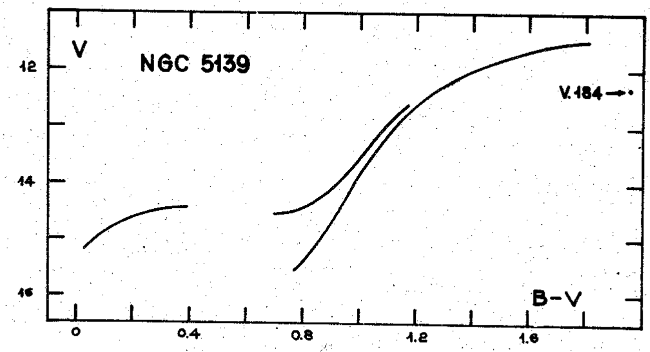


Fig. 2

CARLOS RAUL FOURCADE JOSE R. LABORDE ERNESTO YURQUINA
Observatorio Astronomico de la Universidad Nacional de Cordoba
Republica Argentina

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1381

Konkoly Observatory
Budapest
1978 January 18

UV Psc - A SHORT PERIOD RS CVn STAR

UV Psc has been listed by Hall (1976) in Table 3 (the Short-Period Group) of his paper on the RS CVn binaries.The inclusion comes from the discussion of Oliver (1974) who argued in favour of a subgiant companion to the primary G2V star. Oliver's light curve was itself incomplete outside the minima, while Carr's light curve (private communication cited by Oliver), though showing a greater coverage outside of the minima, appears to be incomplete around the primary minimum.

Light curves of the system in B and V colours were obtained at the Kottamia station of Helwan Observatory (Egypt) during the first two weeks of November 1977. The desert location of the observatory offers special advantages for high-grade photometry. The main comparison star was BD+6° 197. The stars BD+6° 195, BD+6° 191 were used for occasional checks.

The photometer and associated equipment used in this work have been described by Mikhail (1968) and Awadallah (1975).

The reduction procedure follows along the lines discussed by Hardie (1962), and has been extensively automated allowing the digitization measurement, computer data processing and graphical output systems of the University of Manchester Regional Computer Centre to be made use of.

Preliminary results are shown in the diagrams below.

The essential asymmetry of the out-of-eclipse portions is obvious, though it is not yet certain whether this corresponds strictly to a "wave" in the sense discussed by Hall (1976).The asymmetry can also be seen to be more pronounced in the B than the V light curve. A similar asymmetry in the same sense is indicated in Carr's light curve, though it is not obvious in the observations of Oliver.

Further observations of the system are planned for January 1978 to confirm the reality of the asymmetry and other features.

The author would like to make special mention of the help and cooperation of the staff of Helwan Observatory during this program.

A.R. SADIK
University of Manchester,
Department of Astronomy,
Manchester, England

References:

Awadallah, N.S. 1975, M.Sc. Thesis, University of Cairo,(unpublished)

Hall, D.S. 1976, Proc. of I.A.U. Coll. No. 29 (Budapest),Part 1, p.287,Reidel, Dordrecht

Hardie, R.H. 1962, in Astronomical Techniques, p.178, ed.W.A. Hiltner, Chicago

Mikhail, J.S. 1968, Icarus, 8, 117

Oliver, J.P. 1974, Ph.D. Thesis, University of California, Los Angeles, (unpublished)

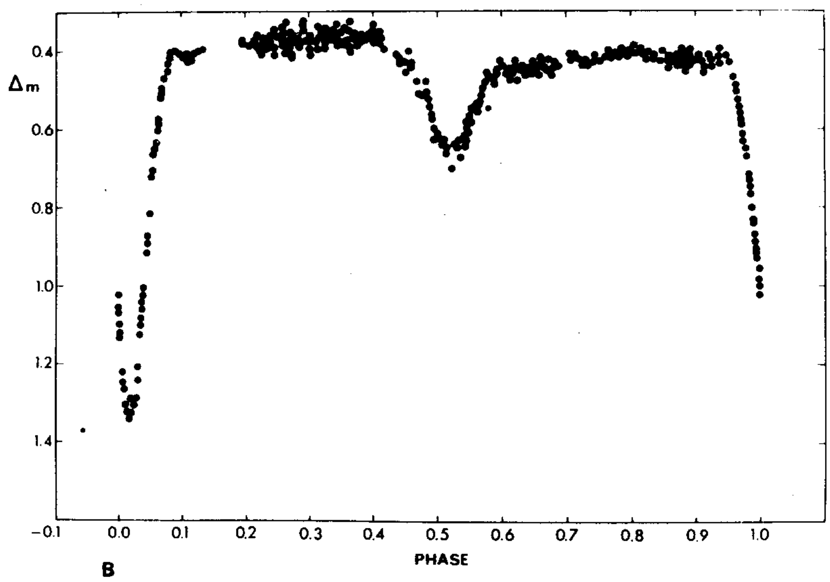

0.4
Δm
0.6
0.8
1.0
1.2
1.4
−0.1
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
PHASE
B

Fig.1.

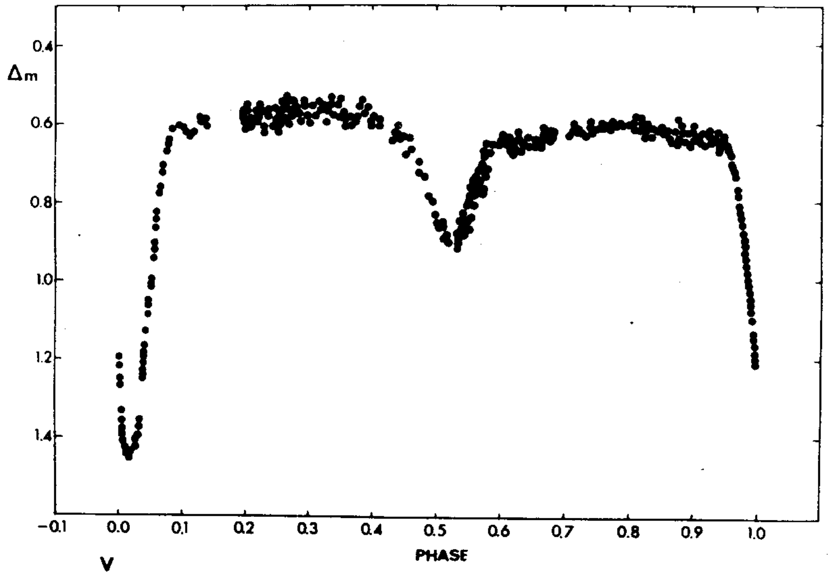

0.4
Δm
0.6
0.8
1.0
1.2
1.4
−0.1
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
PHASE
V

Fig.2.

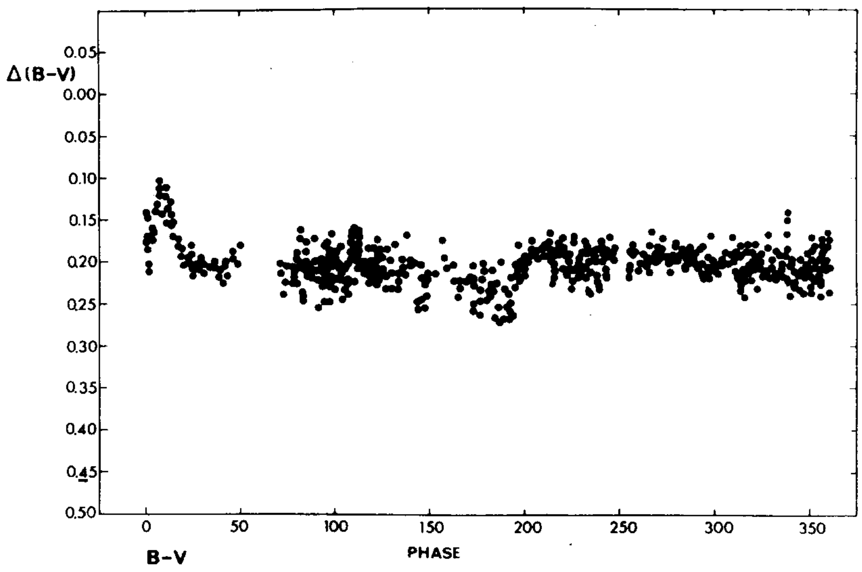

Δ(B-V)
0.05
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.50
0
50
100
150
200
250
300
350
PHASE
B-V

Fig. 3.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1382

Konkoly Observatory
Budapest
1978 January 30

SOME COMMENTS ON AB Cas

AB Cas is one of the very interesting eclipsing systems known to-day to have pulsating components. P. Tempesti (I.B.V.S.No. 596, 1971) announced for the first time the bright component of AB Cas to be a Delta Scuti star using many photoelectric observations.

This star was observed photoelectrically at Gissar station of the Astrophysical Institute in Dushanbe during two nights in October, 1976 using the 70 cm reflector. The observations confirm the existence of a pulsating variable of Delta Scuti type as the bright component, showing pulsations in the secondary minimum (during the second night). The light amplitude in V band of the UBV system and approximately the period of pulsations are the same as P.Tempesti has found.

Carefully analysing the mean light curve of AB Cas in V band shown in I.B.V.S., No. 596, 1971 we arrived at the following logical conclusion (unfortunately the present observations are very few and are distributed during too short time interval).

P. Tempesti has plotted all his observations during the years 1967-1971 according to phases of the eclipsing binarity (orbital period is roughly equal to 1.3 days). If the pulsation period ($0\overset{d}{.}058$ roughly) would not be strictly equal to P_{orb}/N (N is a whole number), then we could not see any separated pulsation cycles on the mean eclipsing curve of AB Cas. Indeed, on the time basis of Tempesti's observations, containing roughly 25000 pulsation cycles, even such a small value of the deviation $\delta = |P_{puls} - P_{orb}/N|$ as about 10^{-6} days leads to the error in pulsation phases equal roughly to half of the value of the pulsation period. If so, we shall see on every orbital phase only occasional (from minimum to maximum) values of magnitude of intrinsic light variability instead of more or less clearly separated pulsation cycles as P. Tempesti has shown in his paper.

From this we can conclude that in the case of AB Cas the strict synchronization of the pulsation period (and the beat one, if it is present) with the orbital period must exist. If so, in the case of beat phenomenon in this Delta Scuti star the mean length of the main pulsation period and the value of beat period must be extremely constant.

Now one of us (M.S.F.) discovered the same effect in Y Cam. Both pulsation periods (P_o and P_{beat}) are indeed synchronized (in the same sense) with the orbital one. The paper on Y Cam will be published in complete form somewhat later.

The synchronization (in both cases) of pulsation periods with the orbital one means the synchronization with the rotation period of the Delta Scuti component, if the rule of equality of P_{orb} and P_{rot} is fulfilled in these binary systems. So, it probably indicates a non-radial pulsation of Delta Scuti stars.

The authors are grateful to Dr. N.M. Shakhovskoj for fruitful discussion.

B.N. IRKAEV
O.A. CHEKANIKHINA
Dushanbe Astrophysical
Institute of Tadjik Academy
of Sciences, U.S.S.R.

M.S. FROLOV
Astronomical Council
of the USSR Academy
of Sciences
U.S.S.R.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1383

Konkoly Observatory
Budapest
1978 February 6

PHOTOELECTRIC MINIMA OF ECLIPSING VARIABLE VW CEPHEI

The following list contains minima of the eclipsing variable VW Cephei, obtained at the Bucharest Observatory. The observations were made with a 50 cm Cassegrain reflector and a photometer employing an unrefrigerated EMI 9502 B photomultiplier tube.

All the time of minima and the mean errors σ were calculated by the method of Kwee and van Woerden.

The table gives the heliocentric minima, the mean error σ, the different (O-C), the type of filter, the observer and remarks. The (O-C) is referred to the Second Supplement to the GCVS (Moscow, 1974).

Abbreviations of the observers' names:
Cr - Cristescu Cornelia
Op - Oprescu Gabriela
Su - Suran Marian Doru

J.D. hel. 2443	σ	(O-C)	Filt.	Obs.	Rem.
395.4722	±0^{d}.0003	+0^{d}.0101	U	Op.	
399.2870	±0.0005	+0.0118	U,B	Cr.	
417.3786	±0.0004	+0.0129	U,B,V	Op.	
421.2737	±0.0005	+0.0116	U,B,V	Su.	
421.4126	±0.0005	+0.0114	U	Su.	Min.II
424.3332	±0.0004	+0.0097	B,V	Cr.	
436.3029	±0.0003	+0.0119	U,B,V	Cr.	
441.3090	±0.0003	+0.0083	V	Cr.	
448.2663	±0.0007	+0.0077	B,V	Cr.	
459.2635	±0.0004	+0.0119	U,B,V	Op.	Min.II

C. CRISTESCU
Bucharest
Center of Astronomy
and Space Sciences

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1384

Konkoly Observatory
Budapest
1978 February 7

ON THE PERIOD OF THE Ap VARIABLE HR 8861

Photoelectric observations of the Ap star HR 8861 (=HD 219749=ET And) have been carried out at the Ege University Observatory from June 1977 to December 1977, a total of 19 nights. The observations were obtained in the u,v,b colours with the 48 cm Cassegrain telescope equipped with an unrefrigerated 1P21 photomultiplier.

HR 8870 (=HD 219891) ($6^m_.4$, A2) and HR 8857 (=HD 219668) ($6^m_.4$, KO) were used as comparison and check star, respectively.

From Rakos' (1962) photometric observations, Rakos (1962) and Renson (1965, 1977) give the periods as $2^d_.604$, $0^d_.723$ and $1^d_.618$, respectively. However, none of these periods show any agreement with my observations.

Observations of four minima were received in u,v,b and a new set of light elements of HR 8861 were determined as

$$\text{Hel.Min.} = \text{JD } 24\ 43\ 337^d_.4725 + 0^d_.49925 \cdot E.$$
$$\pm 7 \qquad \pm 8$$

CENGIZ SEZER
Ege University Observatory
P.K. 21
Bornova-Izmir,Turkey

References:
Rakos, K.D. 1962, Lowell Obs. Bull. 5, 227
Renson, P. 1965, Bull.Soc.roy.Sci.Liege 34, 302
Renson, P. 1977, Astron. Astrophys. 54, 279

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1385

Konkoly Observatory
Budapest
1978 February 8

118 DAY OPTICAL VARIATIONS IN VV Cep

The long period eclipsing binary system, VV Cep, was observed on 40 nights, from August 1975 to December 1977, using Hα and Hβ wide- and narrow-band filters. The observations were made with the 38-cm telescope at Villanova University Observatory using an uncooled EMI 9558QB photomultiplier. In September 1977 this cell was replaced by an RCA C31034A cell cooled to -10°C. At this time it was noticed that the Hβ filters had suffered some deterioration and were replaced by an Oxygen I (7774Å) wide- and narrow-band filter set.

The output of the photometer amplifier is fed to an integrating system with a digital output as well as a chart recorder. The observing sequence was the usual pattern of sky-comparison-variable-comparison-sky. The integration time was typically 50 seconds per reading. The comparison star was 20 Cep and BD+62°1994 served as the check star. No significant variations were detected between comparison and check stars. Differential extinction corrections between comparison and variable were applied although the corrections were small and the time of each observation was converted to heliocentric J.D. On a given night 5 to 10 observations of the variable star were obtained in each filter. The points plotted in Figure 1 represent the nightly means for the Hα wide filter vs. JD Hel. The standard deviation for each normal is generally less than $0\overset{m}{.}006$. Similar variations are evident in the other wide-band filters.

Preliminary analysis indicates the existence of a light variation with a period of approximately 118.5 days. This period is considerably shorter than the period of ~150 days reported by Hayasaka et al. (1977) which is based on an observing interval of 248 days. It should be noted that at the wavelength of the Hα filter (6563Å), the contribution of the B star is less than 3% of the total light and the variations noted in Figure 1 inside and outside eclipse are mainly due to the supergiant M star. First contact is predicted to be JD 2443087 and second contact is predicted on 2443114.

The last eclipse of this system was in 1956-1957 and it was observed by Frederick (1960) and Larsson-Leander (1957,1959). Their data in the longer wavelength show some light variations other than that due to the eclipse. Assuming a period of 118.37 days and a minimum at JD 2443459.5 for the M star, we can predict minima in good agreement with those seen in both Frederick's and Larsson-Leander's data. The maxima although less definitive, are also in good agreement with the above period. This indicates that the period of this light variation has been stable over the last 20 years.

If we assume our period of light variation ($118\overset{d}{.}37$) to be equal to the pulsation period of the M star, a value of $\bar{\rho}/\bar{\rho}_{\odot} =$ $=1.05 \times 10^{-7}$ is found using the relationship: $Po = 0.0383\sqrt{\bar{\rho}_{\odot}/\bar{\rho}}$ given by Ledoux (1958). Combining this with the mass of 20 $M_{\odot}$ (Wright, 1977) we find a radius of $\sim$575 $R_{\odot}$ which is in agreement with the value of $\sim$580 $R_{\odot}$ given by Frederick (1960), but in conflict with the value of 1600 $R_{\odot}$ given by Wright (1977).

Superimposed on the 118 day cycle, there appears to be a cyclic variation in amplitude with a period of at least 825 days. The light variation of the M star in the VV Cep system is similar in some ways to those of α Ori and μ Cep, both supergiants.

Observations of VV Cep are continuing and a complete analysis of the light variations, including the eclipse, will be published in detail elsewhere.

We would like to thank M.Acierno, L.Casswell,R.Del Conte, O. Lupie, D. Turnshek, K. Young, for helping with the observations.

GEORGE P. McCOOK

EDWARD F. GUINAN

Department of Astronomy
Villanova University
Villanova,Pennsylvania 19085
U.S.A.

References:

Frederick, W.F., 1960, A.J. 65, 628

Hayasaka, T., Sato, H., Saito, M., Saijo, K., Kitamura, M.,1977, Tokyo Astr. Bull. Second Series, 247, 2865

Larsson-Leander, G., 1957, Arkiv Astron., 2, nr.12, 135

Larsson-Leander. G., 1959, Arkiv Astron., 2, nr.27, 301

Ledoux, P., 1958, Handbuch der Physik, Springer-Verlag, 51, 353

Wright, K.O., 1977, J.Roy.Astron.Soc.Can. 71, No.2, 152

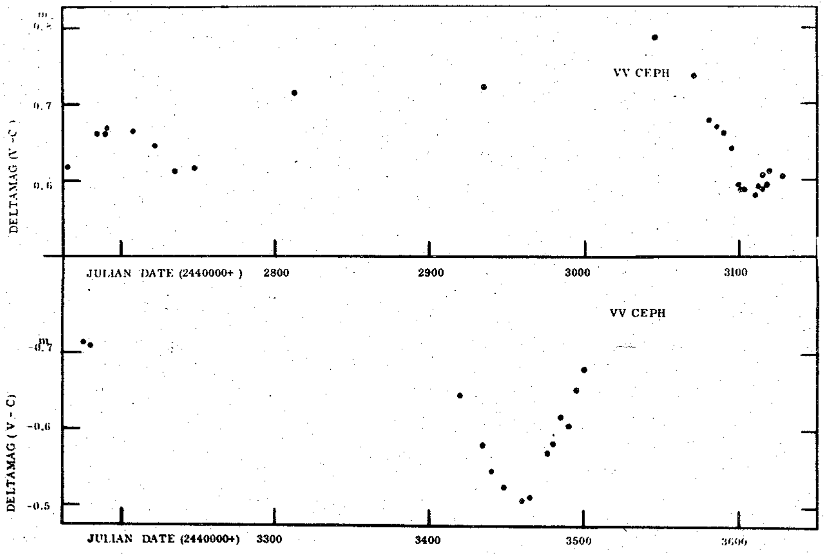


Figure 1 Hα-wide normal points plotted against Heliocentric Julian Date for VV Cephei.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1386

Konkoly Observatory
Budapest
1978 February 10

ON THE PERIOD CHANGE OF THE β CMa VARIABLE BW Vul

β CMa variable BW Vul was observed photoelectrically in uvby system at EGE University Observatory during the summer season of 1977. HD 198820 was used as the comparison star. The observations were carried out with the 48 cm Cassegrain telescope equipped with an unrefrigerated 1P21 photomultiplier.

Valtier (1976) has given the period of this star as:

$$P = 0.2010298 + 5.902 \times 10^{-10}\ t$$

and the ephemeris as:

$$\text{Max} = 24\ 27\ 999.9574 + 0.2010298\ E + 5.932\times10^{-11}\ E^2.$$

This corresponds to rate of increase of about 1.86 s/cent. A year ago, Cherewick (1975) had also found the ephemeris as:

$$\text{Max} = 24\ 28\ 802.670 + 0.201032\ E + 6.04\times10^{-11}\ E^2.$$

They admitted that the (O-C) residuals exhibit a parabolic curve using a period P_O.

The new maximum times together with those given by Valtier (1976) were used in computations.

Using the period P_O=0.20103 and the epoch T_O=24 34 247.8210, the $(O-C)_I$ residuals have been plotted against time. At first, we assumed that a parabolic curve can be fitted to the $(O-C)_I$ residuals and therefore computed the period and ephemeris as:

$$P = .20103278 + 8.129\times10^{-10}\ t$$

$$\text{Max} = 24\ 34\ 247.8214 + 0.20103278\ E + 8.1714\times10^{-11}\ E^2.$$

The rate of increase is about 2.56 s/cent.

However, when we reexamined the $(O-C)_I$ variation, we found that it would be necessary to compute a new period and ephemeris for the reason that the $(O-C)_I$ residuals did not in fact show a parabolic form, but a broken line (see Fig.1). The first segment of the broken line lies between JD 24 33 750 and 24 41 400 approximately, while the second part from JD 24 41 400 to the present time.

Therefore we assumed two linear variations for $(O-C)_I$ values and computed the following results:

For the first segment (from JD 24 33 750 to JD 24 41 400 approx.)

Max = 24 34 247.8215 + .201035135 E

Correlation coefficient r= .9981

For the second segment (from JD 24, 41 400 to the present time)

Max = 24 41 537.7724 + .20104071 E

Correlation coefficient r= .9938

We can assume that the period was constant up to the years 1970-71, but afterwards showed a sudden increase and now stays stable.

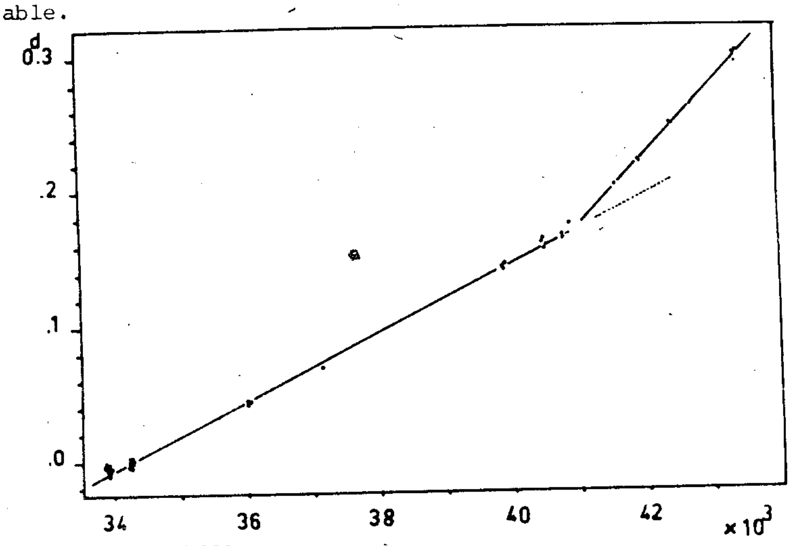


Fig. 1. The (O C)$_I$ variation.

ZEYNEL TUNCA

EGE University Observatory
Izmir,Turkey

References:
Cherewick, T.A., Young, A. 1975, Publ.Astron.Soc.Pacific 87,311
Valtier, J.C. 1976, A.Ap. 51, 465

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1387

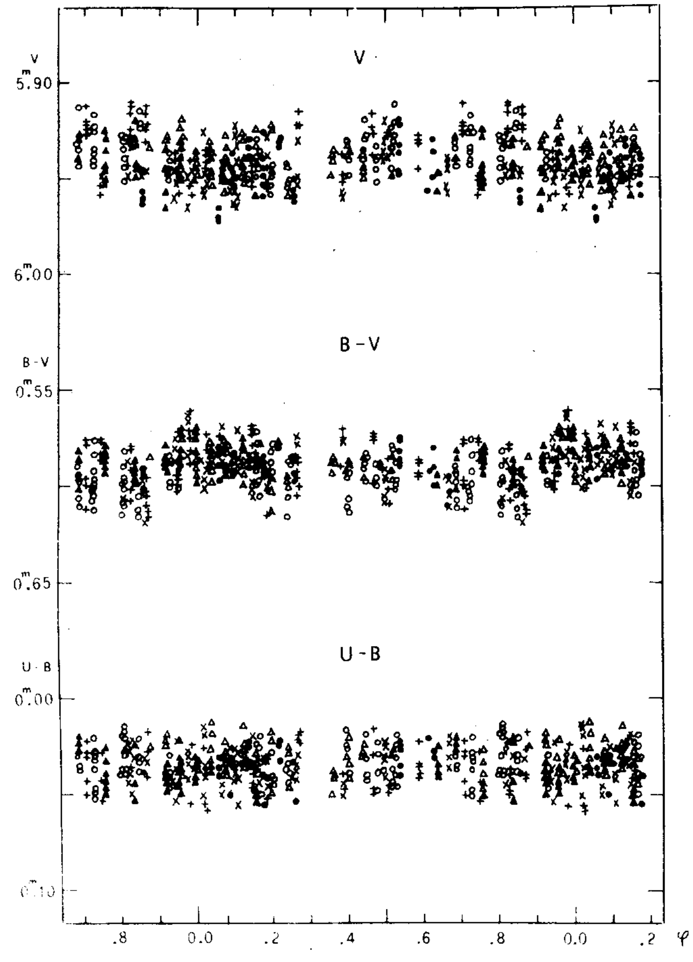
Konkoly Observatory
Budapest
1978 February 13

LIGHT VARIATIONS OF THE H AND K EMISSION STAR HD 206860

HD 206860 is a GOV star showing H and K emission core. Spectrophotometric observations by O.C.Wilson (1976) show small amplitude but definite variations of the H and K emission components indicating a chromospheric activity. No clear periodicity results from Wilson's observations carried out between 1967 and 1975.

In the framework of a research of photospheric activity in stars showing a chromospheric activity (Blanco and Catalano 1970; Blanco, Catalano and Godoli 1973), UBV observations of HD 206860 were made at the stellar station of Catania Astrophysical Observatory. The observations were performed with the 30 cm N cassegrain telescope in the years 1970, 1971, 1972 and with the 61 cm cassegrain telescope in the years 1974, 1975, 1977. The stars HD 207223, HD 212314 and HD 211976, whose UBV magnitudes were taken from the Photoelectric Catalogue (Blanco et al. 1968), allow us to transform our observations to the UBV standard system. A total of 428 measurements for each colour were obtained in 96 nights of observation. The V light measurements showed small amplitude variations. An analysis for periodicity was made using a computer programme which picks out the period minimizing the root mean square of the scatter along the light curve. We found a period of $24^{d}.90$ and an amplitude of $0^{m}.02$ in the V light. No variation is evident for the colour indices B-V and U-B. The V magnitude and colour indices versus the phase computed by the elements:

$$JD_{\odot}(\text{the light min.})=2440821.48 \pm 24^{d}.90\ E$$


V
B - V
U - B
V
$5^m.90$
$6^m.00$
B - V
$0^m.55$
$0^m.65$
U - B
$0^m.00$
$0^m.10$
.8
0.0
.2
.4
.6
.8
0.0
.2
φ

are plotted in the figure. Even if the variation amplitude is of the same order as the scatter of the observations, the V light curve repeats unchanged during the seven years of observations. The annual average of V magnitude and colour indices do not show any clear variation and give mean values of $V = 5^{m}.944 \pm 0.008$, $B-V = 0^{m}.589 \pm 0.013$, $U-B = 0^{m}.035 \pm 0.014$.

HD 206860 is known to be a single star, so the variations we observed are due to an intrinsic variability. We would like to interpret the light variations in terms of spots, or more generally active regions, connected with the observed chromospheric activity. In this hypothesis the observed period of $24^{d}.90$ would be the rotation period of the star, which applies very well to a G0 main sequence star.

C. BLANCO, S. CATALANO, E. MARILLI

Osservatorio Astrofisico
città universitaria
95125 Catania-Italia

Istituto di Astronomia
città universitaria
95125 Catania-Italia

References:

Blanco C., Catalano S. 1970, Publ.Astron.Soc.Pacific 82, 1293.

Blanco C., Catalano S., Godoli G. 1972, Mem.Soc.Astron.Ital. 43, 663.

Blanco V., Demers S., Douglass G.G., Fitzgerald M.P. 1968, Publ. U.S.Naval Obs. 21.

Wilson O.C. 1976, in Basic Mechanics of Solar Activity, Eds. Bumba and Kleczek, p. 447.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1388

Konkoly Observatory
Budapest
1978 February 13

THE BEAT PERIOD OF CY AQUARII

In order to clear up the puzzling problem of the beat phenomenon of the RRs variable CY Aqr (cf. papers of Elst (1972), Fitch (1973), Geyer and Hoffmann (1975), Percy (1975)) we organized a campaign of observation from 17 to 27 August 1976.

More than 4000 visual estimates were performed by a team of seven observers using 8 inch-reflectors (A.Figer, J.F.Le Borgne, A.Marot, Ph.Ralincourt, C.Romoli, A.Royer, G.Troispoux).

Table 1 lists the 40 means of the times of the maxima observed by several observers. The number n of observers is given in column 2. The O-C values in the third column refer to the G.C.V.S. (1976) ephemeris, i.e.:

$$\mathrm{Max} = \mathrm{J.D.hel.}\ 24\ 41\ 959.4018 + 0\overset{\mathrm{d}}{.}061\ 038\ 354\ E$$

We find a standard deviation of the 191 individual determinations between 0.0012 and 0.0026 day, varying with the concerned observer. Thus a weighting by $1/\sigma^2$ has been applied in the calculation of the mean times. The final standard deviation of each mean time of maximum is given in the last column. Using a least squares procedure we find a solution explaining the observations, the beat period being: $(3.575 \pm 0.025)P_o$ (P_o:fundamental period of light variations of CY Aqr). The resulting ratio P_1/P_o of the first overtone to the fundamental would be 0.720 or 0.781.

An ephemeris for the beat phenomenon is derived:

$$\mathrm{Max\ (O-C)} = \mathrm{J.D.hel.}\ 24\ 43\ \begin{array}{l} 013.298 + 0\overset{\mathrm{d}}{.}2182\ E \\ \quad \pm.025 \quad \pm.0015 \end{array}$$

The mean curve of Figure 1 shows the variation of the O-C with phase of the beat period. Each dot represents a mean of several values taken from Table 1.

A close inspection of the photoelectric series by Zissell (1968) or Geyer and Hoffmann (1975) does not allow the rejection

Table 1

Maxima of CY Aquarii

J.D. hel. 24 00 000 +	n	O - C	σ	J.D. hel. 24 00 000 +	n	O - C	σ
43008 . 4110	5	+.0041	.0007	43012 . 4971	6	+.0006	.0007
. 4742	6	+.0062	.0007	. 5573	5	-.0003	.0007
. 5308	6	+.0018	.0007	. 6185	3	-.0001	.0008
. 5915	6	+.0014	.0006	43014 . 5121	7	+.0013	.0006
43009 . 3870	4	+.0034	.0008	. 5732	7	+.0014	.0006
. 4461	4	+.0015	.0008	. 6326	6	-.0003	.0006
. 5065	3	+.0009	.0011	43015 . 4880	5	+.0006	.0006
. 5679	4	+.0012	.0008	43016 . 4644	3	+.0004	.0009
. 6309	4	+.0032	.0008	. 5256	4	+.0006	.0007
43010 . 3616	5	+.0014	.0007	. 5906	2	+.0045	.0011
. 4233	5	+.0021	.0007	43017 . 3802	5	+.0006	.0007
. 4838	4	+.0015	.0008	. 4416	7	+.0010	.0006
. 5440	4	+.0007	.0007	. 5012	6	-.0005	.0006
. 6047	4	+.0004	.0007	. 5618	6	-.0009	.0007
43011 . 3971	5	-.0007	.0007	. 6243	4	+.0006	.0007
. 4578	5	-.0011	.0007	43018 . 3583	4	+.0021	.0007
. 5208	5	+.0009	.0007	. 4184	2	+.0012	.0009
. 5832	5	+.0023	.0007	. 4788	4	+.0005	.0007
. 6412	7	-.0008	.0006	. 5420	4	+.0027	.0007
43012 . 4361	6	+.0006	.0006	. 6004	4	+.0000	.0007

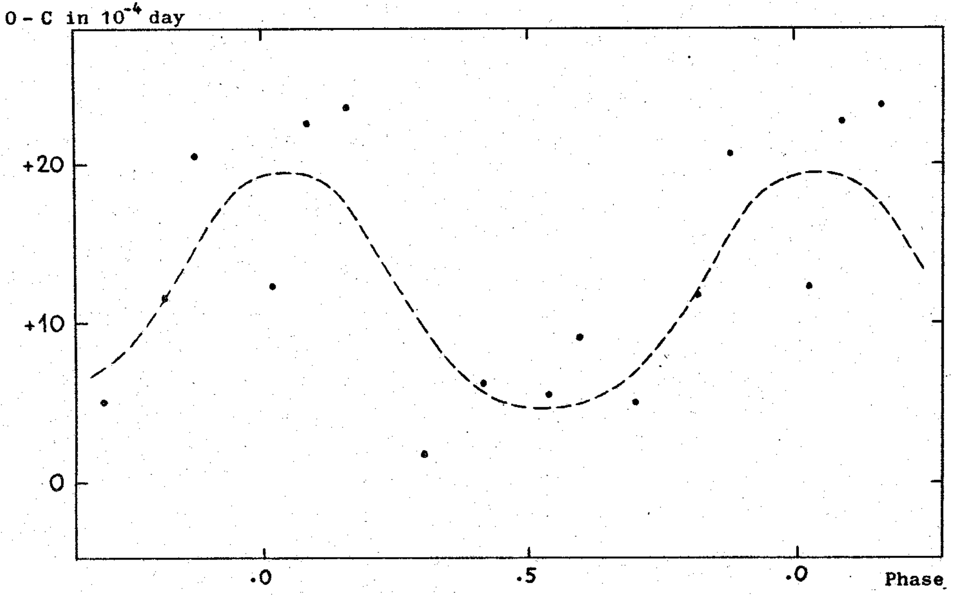


Fig. 1 - Variation of the O - C with phase of the beat period .

of the proposed 0.218 day beat period.

A. FIGER
GEOS
12 rue Bezout
F-75014 Paris

References:

Elst, E.W.,1972, Astron. Astrophys. 17, 148
Fitch, W.S., 1973, Astron. Astrophys.27, 161
Geyer, E.H., Hoffmann, M., 1975, Astron.Astrophys.Suppl. 21,177
Kukarkin et al.,Third Supplement to the Third Edition of the General Catalogue of Variable Stars, Moscow, 1976
Percy, J.R., 1975, Astron. Astrophys. 43, 469
Zissell, R., 1968, Astron.J. 73, 696

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1389

Konkoly Observatory
Budapest
1978 February 22

A SUSPECTED SYMBIOTIC STAR IN THE REGION OF THE SMALL MAGELLANIC CLOUD

On a low-dispersion Kodak IIa-O objective-prism plate, taken with the Curtis Schmidt telescope at the Cerro Tololo Inter-American Observatory on July 14, 1967, the star Henize S18 = Lindsay250 (A.J. 66, 169, 1961) shows only Balmer series emission visible to Hε. On a Kodak IIIa-J plate, taken with the same instrument on Sept. 17, 1977, the hydrogen lines appear as before and the star seems unchanged in brightness but HeIIλ4686 emerges with a strength nearly equal to that of Hβ. Nebular lines are not detected at either epoch. The marked variability in HeIIλ4686 suggests that this is a symbiotic object. However, symbiotic stars are usually thought to involve a late-type giant, whereas this star, if it is an SMC member, would have the luminosity of a supergiant. On the other hand, VV Cephei systems do contain supergiants but do not display high-excitation emission features.

Unfortunately, on a very deep IIIa-J plate, taken on Jan. 7, 1975, the spectrum is over-exposed and unclassifiable but a strong ultraviolet continuum is present extending to λ3300. The multi-color photometry of Lindsay (see above) would, therefore, indicate a composite spectrum. The late-type component might be G or K-type since TiO bands are not observed on red and infrared objective-prism plates also taken in 1967. W.P. Bidelman has noted that, if by chance this were a foreground star, it might have properties similar to the peculiar high galactic latitude star AG Dra (Ap.J. 117, 467, 1953). Clearly, a radial velocity determination and higher dispersion spectroscopic data are urgently needed in order to resolve this apparent anomaly.

N. SANDULEAK
Warner and Swasey Observatory
E. Cleveland, OH 44112, U.S.A.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1390

Konkoly Observatory
Budapest
1978 March 1

COORDINATED CAMPAIGN FOR OBSERVATIONS OF RX CASSIOPEIAE
ANNOUNCEMENT

The undersigned kindly requests to inform him on the observations (photometric, spectrophotometric, spectrographic) and on the analysis of observations or about other theoretical investigations conducted by the participants of the coordinated two year campaign for the study of RX Cas, adopted by the Commission 42 at the Grenoble meeting of the IAU.

D.YA. MARTYNOV
(The Coordinator)
Sternberg Astronomical Institute
Moscow 117234, USSR

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1391

Konkoly Observatory
Budapest
1978 March 2

NOUVELLE RECHERCHE DE PÉRIODES D'ÉTOILES Ap OBSERVÉES A L'ESO-I

Durant la seconde quinzaine de juillet 1977, neuf étoiles Ap ont été mesurées dans le système uvby avec le télescope danois situé à l'E.S.O. Par suite d'une défectuosité du matériel, le photomètre a fourni des valeurs parfois très fantaisistes, essentiellement en y ou en v, que l'observateur (J.Manfroid) a dû, après coup, éliminer des mesures faites (déjà peu nombreuses à cause des conditions atmosphériques) au détriment de la précision des moyennes correspondantes. Les résultats sont donc affectés de beaucoup d'incertitude. Ils ont néanmoins permis d'obtenir les valeurs probables suivantes pour les grandeurs des variations et les périodes.

Etoile	type spectral	grandeur de la variation (mag)				période trouvée (j)
		y	b	v	u	
HD166469=HR6802	AOpSiCrEu	0.015	0.019	0.013	0.041	2.90±0.04
HD168733=59G.Sgr	B8pSr	0.012	0.007	0.006	0.022	6.3±0.3
HD170397=HR6932	AOpSiCrEu	0.006	0.005	0.012	0.033	2.21±0.03
HD177517=138G.Sgr	AOpSi	-	-	-	-	longue ?
HD183806=63G.Tel	AOpCrEuSr	0.011	0.011	0.015	0.015	2.85±0.05
HD189832	A6pSrCrEu	-	-	-	-	>15
HD199728=20Cap	B9pSi	0.050	0.064	0.061	0.127	2.25±0.04
HD212385	A3pSr	0.013	0.010	0.015	0.009	2.48±0.04
HD221006=33G.Tuc	AOpSi	0.045	0.064	0.064	0.104	2.32±0.03

La troisième décimale est chaque fois très incertaine pour les grandeurs des variations, surtout en y et en v à cause des erreurs aléatoires dues au photomètre dans ces deux couleurs (cf. ci-dessus). Les périodes sont cependant assez sûres, sauf peut-être pour 63G.Tel et surtout HD 212385, qui a une variation extrêmement faible même en u. La variation de 63G.Tel présente une double vague, avec cette particularité que le maximum secondaire en y, b et v correspond au maximum principal en u. C'est le cas aussi pour 20 Cap, mais d'une manière moins marquée.

L'étoile HD 189832 a seulement montré une variation générale pendant la durée de la mission, ce qui signifie que sa période est plus longue que cette durée, soit 15j; elle paraît cependant être inférieure à 30j et est probablement de l'ordre de 20j. La variation de c_1 est de l'ordre de 0.03 mag pour cette étoile, $v-b$ et $u-v$ variant en sens opposés.

La variation en ultraviolet est, sauf pour HD 212385, plus grande que dans le visible, comme c'est généralement le cas pour les Ap (C'était notamment aussi le cas pour la plupart des étoiles observées lors de la mission précédente: I.B.V.S. No. 1280). De plus, c_1 montre en général une relativement grande variation, beaucoup plus grande que $b-y$ et m_1.

Pour une étoile Ap, la variation de 20 Cap est remarquablement grande; parmi les Ap dont les variations sont connues en *uvby*, elle vient au 5e rang pour l'ampleur de la variation en u. Les variations sont relativement grandes aussi pour 33 G.Tuc.

L'étoile 138G.Sgr n'a pas montré de variation significative, ce qui résulte vraisemblablement de ce que sa période est très longue. Mais l'étoile qui avait été prise comme seconde étoile de comparaison, à savoir HD 178175=HR 7249=144 G.Sgr, varie d'environ 0.04 mag. dans toutes les couleurs (peut-être un peu moins en u qu'en y,b et v) avec une période probable d'un peu plus de 1.37j. Il ne semble toute-fois pas y avoir parfaite périodicité et celle-ci est même un peu incertaine. C'est une étoile B3 selon le catalogue HD et B2Ve? d'après Slettebak et Howard (Ap.J. 121, 102, 1955), à raies assez larges (3,5 Å); elle est de plus connue comme binaire spectroscopique probable.

Un exposé plus complet avec les graphiques sera fait ailleurs ultérieurement.

P. RENSON

Institut d'Astrophysique
de l'Université de Liège
B-4200 Cointe-Ougrée-Belgique

(Observations faites par
J.MANFROID à l'"European
Southern Observatory"
La Silla, Chili).

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1392

Konkoly Observatory
Budapest
1978 March 6

ON THE LIGHT VARIABILITY OF THE MAGNETIC STAR HD 192678

The star HD 192678 was investigated by Babcock (1958) and according to him it shows a strong magnetic field of positive polarity.

Stepien (1968) made photoelectric observations of this star in U, B, V system and found light variability with a period of 18^d and amplitudes in V, B-V and U-B of 0.015,0.010 and 0.015 mag.,respectively.

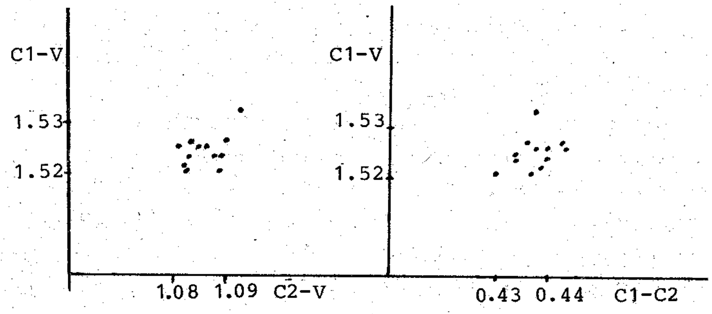
Wolff and Morrison (1973) made photoelectric observations of HD 192678 in the u,v,b,y-system and found no light variability in the years 1963, 1970 and 1971.

In order to re-examine the case of HD 192678 we decided to include this star in the observational programme of magnetic stars. During the summer of 1976 we obtained 12 photoelectric "B" observations with the 35 cm Cassegrain telescope of the Academy of Sciences of GDR, situated in the Schemacha Astrophysical Observatory, USSR. Reduction of observations was made by standard procedure. The results are listed in Table 1. The two comparison stars used are: C1 = HD 192200 and C2 = 192849.
Figure 1 displays the C1 - Var, plotted against C2 - Var, and C1 - Var versus C1 - C2. The maximum difference in "B" is only about 0.010 mag. (according to Stepien, (1968),the amplitude in "B" should be 0.025 mag.) and the error is about the same. Therefore we find no real light variation in HD 192678.

I would like to thank Dr.W. Schöneich (Central Astrophysical Institut of Acad. of Sciences of GDR) for giving me the possibility of obtaining these observations.

Table 1

JD 2442000+	C1-Var (mag.)	C2-Var (mag.)	C1-C2 (mag.)
955.4719	1.523	1.083	0.440
956.4979	1.521	1.082	0.439
959.4619	1.523	1.088	0.434
960.4352	1.526	1.090	0.436
965.5036	1.520	1.082	0.437
970.4244	1.526	1.083	0.443
974.4411	1.532	1.093	0.438
981.4454	1.525	1.081	0.444
983.4688	1.520	1.089	0.430
989.4205	1.525	1.085	0.440
991.4347	1.523	1.089	0.434
998.4139	1.525	1.086	0.438



K. PANOV
Dept. of Astronomy
Bulgarian Academy of Sciences
7 November Str.No.1., Sofia
Bulgaria

References:

Babcock, H.W., 1958, Astrophys.J.Suppl.,3,141
Stepien, K., 1968, Astrophys.J.154, 945
Wolff, S.C. and Morrison, N.D., 1973,Pub.A.S.P., 85, 141

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1393

Konkoly Observatory
Budapest
1978 March 10

A COMMENT ON THE SLOW NOVA IN SCORPIUS

An object, supposed to be a slow nova, was reported by Sanduleak, Stephenson and MacConnell in IBVS No.1376. We looked for the star in our plate files and found two plates covering the region of the nova, both taken with the Uppsala Southern Schmidt telescope at Mt Stromlo Observatory. One is a blue prism plate, taken July 18, 1966. This plate does not show any emission from the star. The other is a red direct plate, taken August 27, 1968. This plate is in Figure 1 compared with a copy from the red chart of Palomar Observatory Sky Survey (POSS), kindly submitted to us by Dr. Sanduleak. It is from this figure clear, that the star was several magnitudes brighter in 1968 than when the POSS plate was taken.If it really is a nova, it is then likely that the explosion took place during the first half of 1967, i.e. just before the period covered by the plates of Sanduleak et al. We also note that the star is below the magnitude limit in the ESO-Würzburg atlas. However, more observations are needed to settle the question of the nature of the object and it is anxious that observers search their plate files accordingly.

With the star properly identified, we measured its position with the PDS machine of Lund Observatory. The result is

$$\begin{aligned} \alpha &= 17^{h}40^{m}31\overset{s}{.}8 \pm 0\overset{s}{.}4 \\ \delta &= -36^{\circ}01'42'' \pm 6'' \quad (1950) \end{aligned}$$

which slightly deviates from the position given by Sanduleak et al.

INGEMAR LUNDSTRÖM and BJÖRN STENHOLM
Lund Observatory,Svanegatan 9
S-222 24 Lund, Sweden

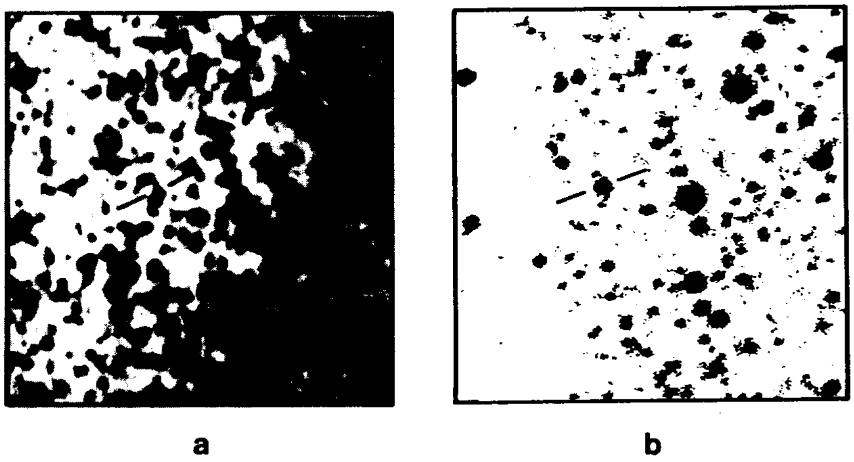


Figure 1 a) Red chart from the Palomar Observatory Sky Survey. b) Red plate (103a-E + RG 2) taken with the Uppsala Southern Schmidt August 27, 1968. The side of each chart is 3'.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1394

Konkoly Observatory
Budapest
1978 March 17

PHOTOELECTRIC OBSERVATIONS OF V 711 TAURI

According to the request expressed in IAU Circ. No 3089 the star V 711 Tau = HR 1099 was observed in Cracow Astronomical Observatory "Fort Skała".

All observations were made by M.S. using 50 cm Cassegrain telescope (f=667 cm) with the photomultiplier EMI 9789 QB with filters: Schott GG11 and GG13+BG12, and calculations were made by P.F. The star 10 Tau=HD 22484 served as a comparison star, 12 Tau=HD 22796 and HD 22819 as check stars.

Our observations corrected for differential extinction by using mean coefficients (A_B=0.55, A_V=0.4) are given in the Table.

PIOTR FLIN
MIROSŁAW SZTAJNO
Cracow University
Astronomical Observatory
"Fort Skała" 30-244 Kraków,
ul. Orla 171, Poland

J.D. hel. 2440000+	ΔV	J.D. hel. 2440000+	ΔV
$3424^{d}.4680$	$1^{m}.591$	$3426^{d}.4803$	$1^{m}.660$
.4718	1.579	.4867	1.671
.4779	1.594	.4893	1.665
.4862	1.606	.4924	1.669
.4893	1.591	.4973	1.674
.4923	1.574	.5008	1.674
.4952	1.597	.5203	1.684
.5046	1.585	.5225	1.714
.5081	1.551	.5245	1.687
.5200	1.584	.5263	1.695
3425.4975	1.569	.5363	1.682
.5000	1.641	.5385	1.670
.5034	1.644	.5633	1.640
.5060	1.608	.5662	1.654
.5125	1.673	.5680	1.657
.5143	1.655	.5704	1.640
.5164	1.663	.5725	1.657
.5192	1.606	.5746	1.672
.5218	1.633	3433.4571	1.628
.5241	1.627	.4596	1.621
.5263	1.669	.4620	1.630
.5338	1.675	.4644	1.612
.5364	1.650	.4663	1.624
.5390	1.604	.4738	1.608
.5436	1.622	.4804	1.592
.5462	1.643	.4842	1.578
.5484	1.621	.4871	1.606
.5555	1.645	.4892	1.576
.5623	1.621	.4929	1.618
.5671	1.627	.4989	1.618
.5695	1.627	.5012	1.631
.5791	1.626	.5035	1.627
.5832	1.650	.5057	1.615
.5858	1.645	.5099	1.616
.5881	1.645	.5123	1.655
.5905	1.641	.5154	1.640
.5928	1.648	.5242	1.627
.5987	1.647	.5270	1.681
.6019	1.642	.5297	1.667
.6048	1.650	.5376	1.662
.6071	1.661	.5403	1.594
.6138	1.654	.5432	1.608
.6168	1.666	.5462	1.597
3426.4492	1.687	.5498	1.607
.4514	1.645	.5526	1.610
.4530	1.658	.5634	1.589
.4548	1.665	.5666	1.604
.4568	1.663	.5745	1.595
.4588	1.679	.5771	1.626
.4666	1.673		
.4690	1.666		
.4715	1.656		
.4733	1.665		
.4756	1.641		
.4780	1.672		

J.D. hel. 2440000+	ΔB	J.D. hel. 2440000+	ΔB
3424^d.4685	1^m.982	3426^d.4775	2^m.024
.4773	1.962	.4798	2.036
.4867	1.978	.4870	2.039
.4887	1.950	.4899	2.027
.4956	1.990	.4980	2.026
.5041	1.962	.5012	2.036
.5077	1.938	.5199	2.081
.5102	1.972	.5223	2.057
.5191	1.948	.5242	2.076
3425.4807	1.935	.5261	2.081
.4855	2.009	.5295	2.030
.4936	2.035	.5366	2.024
.4967	1.969	.5388	2.052
.4994	1.981	.5637	2.065
.5031	2.011	.5665	2.040
.5057	1.979	.5684	2.057
.5133	2.036	.5709	2.077
.5147	2.029	.5729	2.048
.5167	2.040	3433.4576	1.985
.5197	1.987	.4601	1.986
.5222	2.005	.4623	2.000
.5244	1.998	.4647	1.959
.5269	1.998	.4666	1.966
.5332	2.056	.4740	1.985
.5358	1.986	.4807	1.969
.5384	1.985	.4838	1.958
.5432	1.990	.4866	1.977
.5458	2.012	.4888	1.964
.5480	2.008	.4925	2.001
.5560	2.005	.4993	1.988
.5618	1.986	.5014	1.966
.5676	1.981	.5036	1.966
.5700	2.008	.5060	1.982
.5787	2.016	.5104	1.997
.5828	2.025	.5165	2.000
.5856	2.005	.5237	1.951
.5877	2.021	.5263	2.014
.5900	2.014	.5292	1.979
.5923	2.023	.5380	1.983
.5992	2.005	.5408	1.955
.6023	2.021	.5436	1.985
.6051	2.012	.5467	1.971
.6075	2.018	.5505	1.970
.6163	2.004	.5529	1.979
3426.4495	2.019	.5628	1.979
.4516	1.980	.5654	1.923
.4534	2.019	.5696	1.980
.4551	2.012	.5732	1.998
.4572	1.999	.5765	1.989
.4592	1.991		
.4661	2.016		
.4685	2.016		
.4711	2.027		
.4732	2.011		
.4754	2.031		

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1395

Konkoly Observatory
Budapest
1978 March 21

OBSERVATIONS OF HDE 245770 DURING THE RECENT X-RAY FLARE-UP OF ITS COUNTERPART A0535+26

By a lucky chance the flare-up of the transient X-ray source A0535+26 in December 1977 (reported by M. Chartres and F. Li in IAUC 3154) could, for the first time, also be followed up its optical counterpart HDE 245770. There is no longer any doubt about a physical connection of these objects. Earlier flare-ups of the X-ray source took place at 1975 April 28 (IAUC 2774) and 1975 November 7 (IAUC 2863) (both were spells of maximal intensities).

In 1973 the author discovered the variability of the Bpe star HDE 245770 (Astron. Nachr. 295, 47). Since then it has continuously been observed by photoelectric UBV photometry at the Sonneberg 60 cm telescope II. From about the time of the recent X-ray flare-up we have measurements of 3 nights at our disposal. The object was compared with the star HDE 245906 with the following adopted magnitudes (see Mitt.Veränd. Sterne 7, 105): $V=10^{m}.54$, $B-V=+0^{m}.45$, $U-B=+0^{m}.22$. It should be noted that the magnitude of the object in V at 1977 Dec. 18.9 (UT) was the brightest one known to the author. In the other colours this maximum is less marked.

J.D.	1977/78 UT	V	B	U
244 3496.37	Dec. 18.87	$8^{m}.72$	$9^{m}.41$	$8^{m}.93$
498.59	21.09	8.87	9.45	8.93
524.46	Jan. 15.96	8.86	9.44	8.88

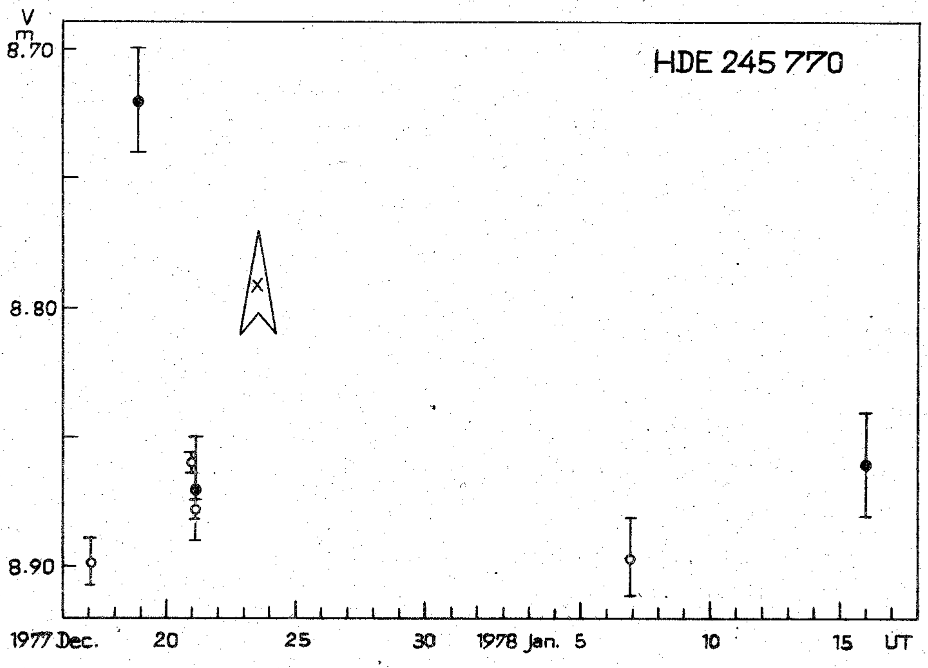
(standard deviations in V and B about ±0.02 mag, in U about ±0.05 mag.).

Independent of the author's observations, the star was also measured at that time by C. Bartolini et al. and A. Giangrande et al. Their differences to the comparison stars HD 35170 and HD 37438 are published in IAUC 3167. The values obtained on the basis of the magnitude $V=5^{m}.15$ for HD 37438 given by D.L.Crawford

(Astrophys.J. 137, 523) are plotted in the diagram (open circles) beside the values obtained by the author (filled circles). The vertical bars in the diagram give the range of the standard deviations; the arrow marks the spell of maximum X-ray intensity.

It is remarkable that the star enters maximum brightness about 5 days earlier than the X-ray source. This behaviour will be hard to explain if the small increase in optical brightness is understood as an effect of heating the optical component of a binary system by a compact X-ray component.

Besides, HDE 245770 is the brightest optical counterpart of a transient X-ray source that has ever been detected.



S. RÖSSIGER

Zentralinstitut für Astrophysik
Sternwarte Sonneberg
DDR-64 Sonneberg

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1396

Konkoly Observatory
Budapest
1978 March 22

KO Aur

KO Aur = Wr 122 = BD +48°1340 was discovered by Weber, R. in 1963. He classified this star as an eclipsing binary (1). Weber also gives the first elements obtaining a period of $0\overset{d}{.}428949$(2).

I observed the star on 117 plates of the Hartha sky-patrol (JD.2437300-38800) and searched on Sonneberg sky-patrol plates.

The obtained minima, listed below, show that the elements of Weber are not correct.

The following improved elements could be derived:

Min.(hel.) = JD.2436607.472 + $1\overset{d}{.}31793028 \cdot E$.

Observed minima:

JD.(hel.)	Epoch	O-C
2435762.655	- 641	$-0\overset{d}{.}024$
36607.450	0	- .022
37639.459	+ 783	+ .048
730.356	852	+ .007
940.545	1011.5	- .013
38406.478	1365	+ .031
495.380	1432.5	- .027
651.610	1551	+ .028
849.311	1701	+ .040
39070.627	1869	- .057
40205.425	2730	+ .003
41592.495	3782.5	- .048
689.379	3856	- .032
957.556	4059.5	- .054
42697.573	4621	- .055
866.368	4749	+ .045
870.323	4752	+ .046

Using the improved elements the observations of Weber, R. and Diethelm, R.(3) can be exhibited.

KO Aur is an eclipsing binary ($10\overset{m}{.}45$-$11\overset{m}{.}30$ph). Comparison stars are published in (1). The secondary minimum seems to be of the same depth as the primary minimum.

Further particulars will be published in "Mitteilungen der Bruno-H.-Bürgel-Sternwarte Hartha" Heft 12.

TH. BERTHOLD
Bruno-H.-Bürgel-Sternwarte
DDR-7302,Hartha

References:

(1) Weber, R. 1963 Inf.Bull.Var.Stars No.21
(2) Weber, R. 1964 Bulletin de la station astrophotographique de Mainterne No. 4 p. 15
(3) Diethelm, R. 1976 BBSAG Bull. 26

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1397

Konkoly Observatory
Budapest
1978 March 22

ELEMENTS OF CSV 260

CSV 260 = SVS 920 was discovered by Meshkova, T.S. (1) and classified as a short - periodic variable star ($12\overset{m}{.}1$-$12\overset{m}{.}9$ ph).

On 363 plates taken with the 40 cm - astrograph of Sonneberg Observatory and 272 observations on sky-patrol-plates I examined this algol-type star and found 17 times of minima.

The following improved elements were obtained:

Min.I(hel.) = JD.2437345.343 + 2.810055·E (EA)

($11\overset{m}{.}56$-$12\overset{m}{.}11$ ph; D = $0\overset{p}{.}07$)

Observed minima:

JD. (hel.)	Epoch	O - C
2429516.522	-2786	$-0\overset{d}{.}008$
37286.373	- 21	+ .041
345.319	0	- .024
376.306	+ 11	+ .052
578.549	83	- .029
38272.576	330	- .085
289.523	336	+ .002
331.672	351	.000
348.547	357	+ .014
410.349	379	- .005
39028.564	599	- .002
250.546	678	- .014
385.493	726	+ .057
413.563	736	+ .020
40152.597	999	+ .009
478.533	1115	- .021
509.463	1126	- .002

Further particulars will be published in "Mitteilungen der Bruno-H.-Bürgel-Sternwarte Hartha" Heft 12.

H. BUSCH

Bruno-H.-Bürgel-Sternwarte
DDR-7302,Hartha

Reference:
(1) Meshkova, T.S. 1940 Perem.Zvezdy, Tom.V.255

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1398

Konkoly Observatory
Budapest
1978 March 23

PHOTOELECTRIC PHOTOMETRY OF THE MULTIPLE STAR SYSTEM ETA ORIONIS

The star Eta Orionis has proven to be at least a quadruple system. Visually it consists of a bright pair (Eta Ori A and B) separated by about $1''.6$. In addition Aitken's Catalogue lists a faint third component separated by about 100" from the bright pair. This component may not be physically associated with Eta Ori A and B. Kunz and Stebbins (1916) found that Eta Ori A is an eclipsing binary of the Beta Lyrae type. The total amplitude (including the contribution to the light made by Eta Ori B) was about $0^{m}.15$. The period of variation was given as about 8 days, but Pogo (1928) found that Eta Ori A also displayed a long-term radial velocity variation with a period of about 9 years. Thus Eta Ori A is a triple system.

Recently Zizka and Beardsley (1976) have re-determined the spectroscopic orbital elements of Eta Ori A. For the eclipsing pair, Eta Ori Aab, they find a period of 7.989229 days, and for the period of the third component, Eta Ori Ac, about this pair, they find a period of 9.174 years. McAlister (1976) has examined this system by speckle interferometry. For the visual pair Eta Ori Aabc,B he finds a separation of $1''.599$, and for the separation between Eta Ori Aab and Eta Ori Ac he finds $0''.044$.

No photometric observations of Eta Orionis appear to have been published since the early work by Kunz and Stebbins. During December, 1977 and January, 1978 this investigator made the following observations of Eta Ori in the intermediate yellow (y) and blue (b) wavebands of the uvby system. Both Eta Ori A and Eta Ori B were included in the diaphragm. The comparison star used was HD 35777, whose spectral type is B2V and whose UBV magnitudes and colors are V = 6.61, B-V = -0.18, and U-B = -0.75. The four components of Eta Ori AB have spectral types ranging from B0 to B3. At maximum light the UBV magnitudes and colors of this system have been determined by this investigator to be V = 3.33, B-V = -0.19, and U-B = -0.95. The observations in y and b obtained are as follows:

Hel. JD	Phase	$\Delta m(y)$	$\Delta m(b)$
2443508.627	0.0219	-3.106	-3.093
10.804	0.2944	-3.278	-3.258
11.752	0.4130	-3.292	-3.285
12.825	0.5473	-3.238	-3.232
15.723	0.9101	-3.282	-3.254
16.816	0.0469	-3.261	-3.251
17.595	0.1444	-3.256	-3.252
21.593	0.6447	-3.286	-3.272
22.694	0.7826	-3.295	-3.284

The phases have been calculated using the ephemeris determined by Zizka and Beardsley shifted by 90°, so that primary minimum will fall at 0.00 phase. This ephemeris is:

$$\text{Pri. Min.} = \text{JD } 2415761.860 + 7\overset{d}{.}989229 \text{ E.}$$

If the spectroscopic orbital elements obtained by Zizka and Beardsley are assumed, and if the eclipsing system is assumed to be edge-on, then the separation between the components is 48 $R_{\odot}$. It appears that all four components have masses normal for early B-type stars, and thus we can assume that their radii are also normal. If we estimate the radii of the components of the eclipsing binary to be 5.5 $R_{\odot}$ each, then the phase angle of external tangency will be about 13°.2. This implies a total duration of about 14 hours for each eclipse. This is an upper limit to the duration of the eclipses, since it has been assumed that the system is inclined 90° to the plane of the sky.

Kunz and Stebbins describe Eta Orionis as a system of the Beta Lyrae type. But the system described above would be a detached system, in which the interactions arising from the ellipticity and mutual reflection of the components would be very small. If we assume values, typical for early B-type stars, of $x = 0.30$ and $y = 0.50$ for the limb-darkening and gravity-brightening coefficients, then the coefficients due for light outside eclipses due to the ellipticity and reflection effects can be calculated using expressions such as those cited by this investigator (Chambliss, 1976). When the effects due to ellipticity and to reflection are combined, the value of the A_2 coefficient is only about -0.001. Thus for such a system there should be virtually no variation of light outside eclipses. The only observation of this investigator which shows a large deviation from the mean is the first one, and this is the only observation which does not occur outside eclipses according to the ephemeris used and the assumptions made about this system.

Kunz and Stebbins reported a total amplitude in the light curve of about $0^{m}.15$, and this appears to be similar to that found by this investigator. Since the eclipsing pair, Eta Ori Aab, contributes only about 20% of the total light of the system, it appears that the eclipses are deep and total or nearly so. Thus the inclination of this system must be very near 90°. More extensive photoelectric observations are urgently needed for this system.

All observations of this investigator were made with the 40-cm telescope no. 4 of Kitt Peak National Observatory, which is operated by the Association of Universities for Research in Astronomy, Inc., under contract with the National Science Foundation.

CARLSON R. CHAMBLISS
Kutztown State College
Kutztown, Penna.
USA 19530

References:

Chambliss, C. R., 1976, Pub. A. S. P. 88, p. 762
Kunz, J. and Stebbins, J., 1916, Pub. A. A. S. 3, p. 272
McAlister, H. A., 1976, Pub. A. S. P. 88, p. 957
Pogo, A., 1928, Astrophys. J. 68, p. 309
Zizka, E. R. and Beardsley, W. R., 1976, B. A. A. S. 8, p. 362

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1399

Konkoly Observatory
Budapest
1978 March 28

AS 239: THE DECLINING PHASE OF A SLOW NOVA?

AS 239 was discovered during the Mount Wilson objective-prism survey for Be stars, undertaken in the 1940's. It was designated and classified by Merrill and Burwell (Ap.J., 112, 72, 1950) in their list of "Additional Stars" with Hα emission. They rated AS 239 as 12th magnitude, and tersely described the spectrum as containing "lines of highly ionized iron atoms". In a similar survey, made about 1950, Henize (Ap.J.Suppl.,30,491,1976) also recorded AS 239 (=Hen 1465) as 12th magnitude, but rated the Hα emission less strong than had Merrill and Burwell. Experience with magnitude estimates in the AS and Hen catalogues suggests that V ~ 13-14 is more appropriate at that epoch.

Searches over the last decade by this and other observers had failed to rediscover any suitable 13th magnitude star near the Merrill and Burwell position. This dilemma was finally resolved when N. Sanduleak (private communication) provided a finding chart for AS 239 based on his own objective prism survey made about 1968. Sanduleak described AS 239 as much fainter than 12th magnitude; indeed it was too faint to have been noted on his original search of the prism plates.

On the Palomar Sky Survey plates, taken in 1950, AS 239 is a slightly red star of about 15th magnitude. On the U.K. Schmidt Sky Survey IIIaJ plate J2351, taken in 1976 May, it is about 18-19th magnitude. In 1978 February the star was observed spectroscopically with the 3.9 m Anglo-Australian Telescope (AAT); the magnitude was then estimated at 19-20 on a television viewing system which responds well at Hα.

Despite the strong emission lines in the spectrum of this star, and the nonhomogeneous nature of the magnitude estimates, these data indicate that a decline of more than 7 magnitudes has occurred in the last 30 years.

Spectra of AS 239 were taken by Minkowski (see Merrill and Burwell) in 1943 and 1945, but no publication ensued. These plates were kindly made available to the author by the Director of the Hale Observatories. The plate numbers and dates are listed below. All appear to have been taken at low dispersion with a prism spectrograph on the Mount Wilson 100-inch telescope.

Plate	Date	Spectral region (A)
JS 540	31.5.43	3850 - 5000
E 872	29.6.43	3950 - 7000
E 895	29.7.43	3950 - 7000
E 932	1.9.43	3850 - 5050
E 1442	3.7.45	4000 - 7000

The four plates taken in 1943 show a very-high-excitation spectrum with the following salient features. There is a weak continuum, rather red. The Balmer series is strong.[O III] λ5007 is weaker than Hβ but λ4363 is almost as strong as Hγ.[S III] and [Ne III] are fairly strong. [N II] λ5755 is strong; the red lines, if present, are blended with Hα. He II λ4686 is of comparable intensity to Hβ, and He I is quite strong. The N III blend at λ4640 is weak. Lines of [Fe VI], [Fe VII] and [Ca V] are strong, and [Ca VI] and [Ne IV] are weak.

Minkowski's 1945 plate revealed spectral changes towards higher excitation. He II, [Fe VII] and [Ca VI] had strengthened; He I, [O III], [S III] and [Fe VI] had weakened. The continuum had also weakened on the 1945 plate, and the unidentified band at λ6830 had appeared.

These spectra suggest that AS 239 is a symbiotic star or slow nova. The high-excitation lines are certainly typical of those found in symbiotic stars, but Minkowski's plates are unsuited to a search for TiO absorption. Slow novae tend not to show TiO absorption in their early stages. In 1943, AS 239 resembled the slow nova RR Tel in the early 1960's, whilst its 1945 spectrum is more closely matched by that of RR Tel in 1973 (Thackeray, Mem,R.A.S., 83, 1, 1977).

Whether AS 239 be classified as a symbiotic star or a slow nova, its > 7 magnitude decline is extreme. Thus the AAT spectrum of 1978 Feb. 15 is of particular interest. It was taken with the image-photon counting system and covered the wavelength range 3400-7500 A with a resolution of 5A. Because the star was so faint, the spectrum shows few features. However, a change has probably occurred in the last 35 years. The emission lines now recorded appear to be of lower excitation. Hα is prominent and flanked by weak [N II]. The [O III] lines are seen with λ5007 ~ Hβ. λ6300 of [O I] may be present. No continuum is detected throughout most of the spectrum, and no lines to the blue of Hβ. The V magnitude, strictly defined by the V filter, is about 22. Longwards of 6900 A a weak continuum rises from the noise, dissected by TiO absorption and demonstrating the presence of a star later than about M3 in the system. The R magnitude is about 19. The Balmer decrement is steep and indicates reddening as high as A_V=11 magnitudes if case B applies. The dereddened R magnitude is about 11.

An infrared measurement of AS 239 was also made with the AAT in 1977 April, using an InSb photometer kindly made available by P.M. Williams. The star was not visible at the telescope owing to strong moonlight, so the measured magnitudes may be slightly affected by centering and guiding errors. Data were taken at 1.6 μm (H) and 2.2 μm (K), yielding:

$$K = 8.2 \quad H-K = 1.0$$

Correction for $A_V \sim 11$ yields $K_o = 7.2$ $(H-K)_o = 0.3$, and this is consistent with the continuum of the star seen in the far red of the optical spectrum if its spectral type is mid M. Thus there is no evidence for any infrared excess at these wavelengths.

If the ~11 magnitudes of extinction were present in the 1940's, it is unlikely that Minkowski could have secured spectra in the blue. Whilst the characteristics of the spectrograph are not known, the appearance of Minkowski's plates suggests that A_V did not exceed 5 magnitudes, and may have been much less. Moreover, had AS 239 been reddened by 11 magnitudes in 1950, the Palomar Sky Survey plates would have shown the object to be much redder than is the case.

We are forced to accept that the reddening has increased. Condensation of dust grains in the circumstellar nebula provides the obvious mechanism for this, and the phenomenon is well-established in conventional novae (e.g. Hyland and Neugebauer, Ap.J. 160, L77, 1970). Since the reddened M star alone can adequately account for the H and K fluxes, whatever dust exists must be cooler than ~1000 K, or must have low emissivity at 1.6 and 2.2 μm. A detectable excess at longer infrared wavelengths might be expected. If the star is intrinsically as luminous now as in the 1940's ($m_{bol} \sim 13-14$), the 10 μm magnitude could be as bright as 3-4.

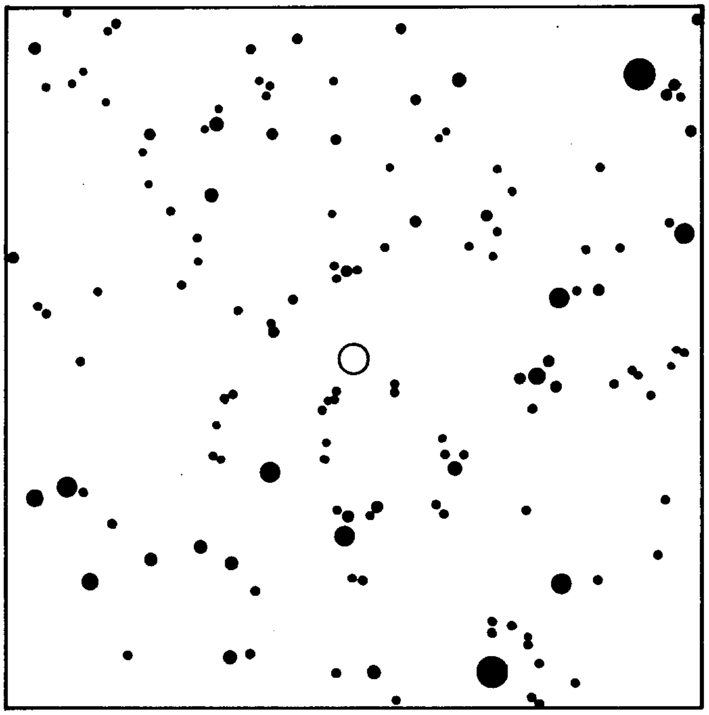
Apart from the high reddening, and the likelihood that this has increased during the decline, AS 239 resembles the recurrent nova T CrB in both its amplitude and its high-excitation spectrum. If its maximum occurred shortly before Minkowski's spectra were secured, around 1940, the similarity would be greater. T CrB has no significant infrared excess (Geisel, Kleinmann and Low, Ap.J. 161, L101,1970).

The optical continuum of AS 239 is now too faint for useful photometry. The star should, however, be more fully observed at infrared wavelengths in order to ascertain whether circumstellar dust does exist. A light curve showing the variations of AS 239 during this century, and based on an uniform set of plate material, would also be of value. To this end, a finding chart is provided below. The chart is based on the recent U.K. Schmidt plate of the region and shows stars to about 21st magnitude near AS 239. The 1950 coordinates of AS 239, read off the AAT encoders and corrected for pointing errors, are:

$17^{\mathrm{h}}40^{\mathrm{m}}30\overset{\mathrm{s}}{.}8 \quad -22^{\circ}44'16''$.

I thank M. Barlow for his detailed comments on this paper.

DAVID A. ALLEN
Anglo-Australian Observatory
P.O. Box 296, Epping, NSW 2121
Australia



Finding chart for AS 239. North is at the top and east to the left. The box is 5′arc across.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1400

Konkoly Observatory
Budapest
1978 March 28

HD 11285 AND HD 14940: TWO NEW PULSATING VARIABLES

During the reduction of an observing run (Weiss, 1978) at the 50cm ESO photometric telescope at La Silla (Chile), two further candidates for pulsation variability have been found among the comparison stars. The equipment was the same as described in Weiss (1977).

HD 11285 (6.8^V) is classified as FO in the HD-catalogue. Figure 1 shows that this star is a short periodic variable with a period of approximately 1^h50^m and an amplitude of about 0.02 mag (increasing brightness in V and magnitude in (B-V) are plotted in positive direction). To demonstrate the photometric accuracy, V magnitudes of the comparison star HD 11636 are also plotted in this figure. The phase of (B-V) is similar to that published by Struve (1953). Photometric indices in the Strömgren system should be available for this star to allow for discussion of its absolute magnitude (Breger and Bregman, 1975).

HD 14940 (6.6^V) is also classified as FO in the HD-catalogue and shows an extremely small amplitude. Additional observations of this star should be made to confirm its variability. The present observations were made during a night of good photometric stability, however, with a constant decrease of transparency. HD 14940 was observed together with HD 15144 and HD 15798. When the V - magnitudes for the last two stars were plotted, a systematic trend of 0.009 mag/hr and 0.011 mag/hr, respectively, became evident. In contrast, the corresponding slope for HD 14940 was 0.0026 mag/hr. Therefore the V - magnitudes were rectified by subtracting a slope of 0.001 mag/hr and the result is given in Figure 2.

The standard deviation for both light curves relative to the dotted line is 0.0016 mag in both cases. The amplitude of the V - magnitudes for HD 14940 is about 0.005 mag and the period could be between 5 and 6 hours. For this star there are no Strömgren indices available either.

Acknowledgements: The author thanks the Gen. Director of ESO, Dr. Woltjer, for making telescope time available for him as well as Dr. Muller for his continuous support at La Silla.

Note to I.B.V.S. No. 1364: In Figure 1, increasing magnitudes in V were plotted in positive direction.

WERNER W. WEISS
University Observatory and
Figl-Observatory f.Astrophys.
Vienna

References:
Breger, M., Bregman, J.N. 1975, ApJ 200, 343
Struve, O. 1953, PASP 65, 252
Weiss, W.W. 1977, IBVS No. 1364
Weiss, W.W. 1978, Pulsational Stability of Ap-Stars, Observational Evidences, in preparation

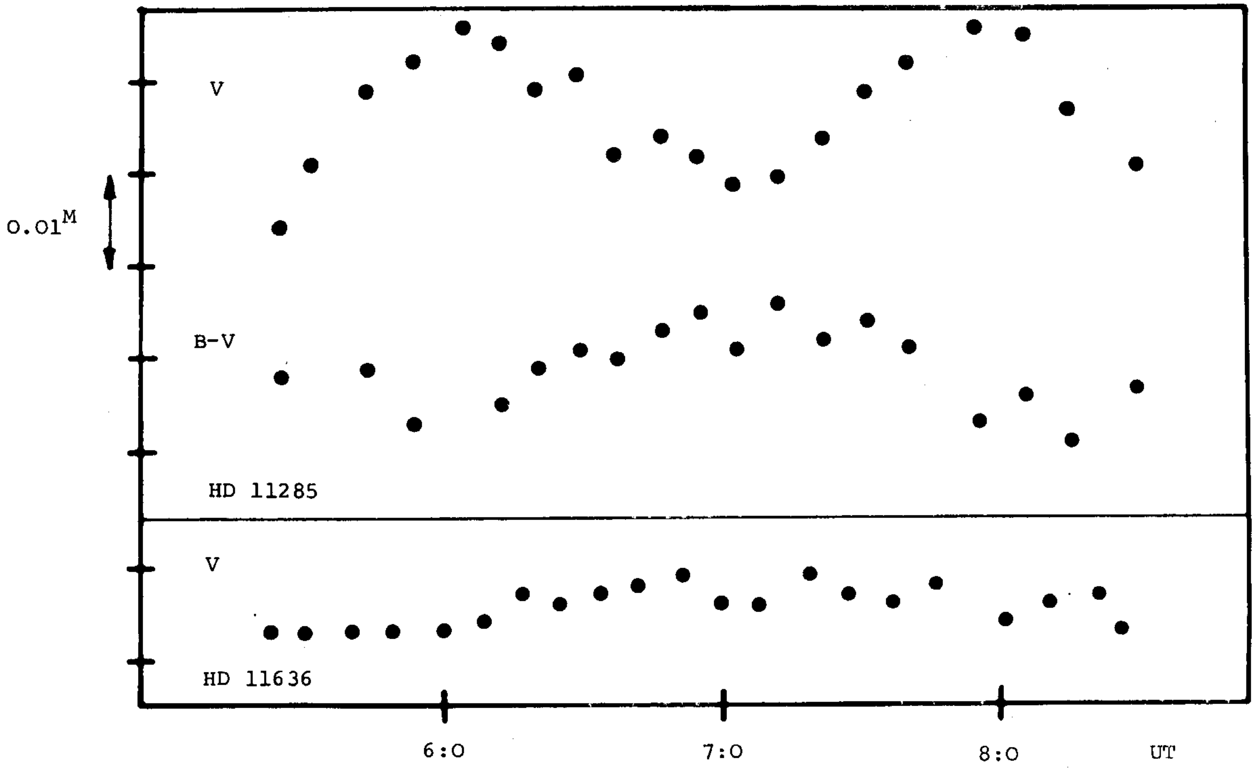


Figure 1: Variations in V and (B-V) during the night of 25 to 26 Sept. 1977.

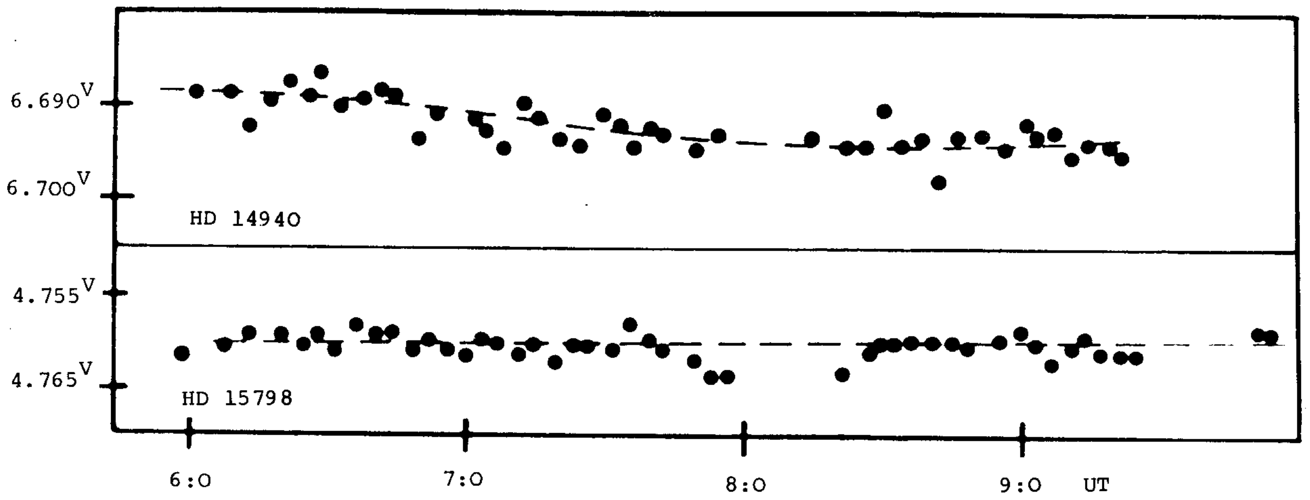


Figure 2: V measurements of HD 14940 and HD 15798 during the night of 10 to 11 Sept. 1977.