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COMMUNICATIONS FROM THE OBSERVATORY AT LEIDEN

Photographic observations of two variables which appear to belong to the SS Cygni class,

by *W. H. Dirks.*

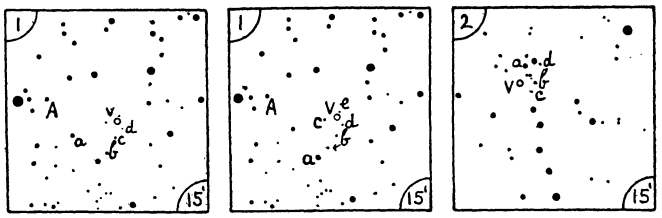
The variables were estimated by the writer on about 360 plates covering a field of 10° × 10° round 11 Puppis, which have been taken with the Johannesburg Franklin-Adams camera by Dr. H. VAN GENT, Dr. A. DE SITTER and Dr. W. CHR. MARTIN.

As the variation during one night was small, means over each night were formed. These means are given in the columns marked D in the table. Variable 1 was also estimated by the late W. E. KRUYTBOSCH. His estimates are given in the table, in the columns marked K.

The magnitudes of the comparison stars as found from star-counts by the aid of *Groningen Publications* **43**, are given in the following little table:

Variable 1 (D)			Variable 1 (K)			Variable 2		
	s	m		s	m		s	m
A	·0	13·0	A	·0	13·0	a	·0	13·8
a	3·8	13·4	a	4·1	13·5	b	4·4	14·4
b	7·0	14·0	b	6·4	14·0	c	7·6	14·7
c	9·5	14·3	c	8·6	14·3	d	11·4	15·3
d	12·0	14·6	d	10·3	14·6			
			e	12·0	14·8			

The surroundings of the variables are shown in the three diagrams below. In the second diagram the comparison stars used by KRUYTBOSCH are indicated. North is at the top.



Comparing two sets of red- and blue-sensitive plates, taken simultaneously with the Johannesburg Rockefeller twin telescopes by Dr. W. CHR. MARTIN, on which variable 1 is in minimum, while variable 2 is at an intermediate brightness of 10 steps, I found the stars to be white. This statement is to be regarded as a qualitative one.

The variables show the typical features of the SS Cygni class and may be of particular interest, because of their small ranges in light-variation, in a future discussion of a possible amplitude-cycle relation. They do not fit too well in the relation advocated by KUKARKIN and PARENAGO [1]), neither in the somewhat modified relation given by GAUZIT [2]).

The variables have very low galactic latitudes.

A more detailed description is given below.

Variable 1.

$\alpha = 7^h\ 43^m\ 45^s{\cdot}8$ $\quad \delta = -23°\ 15'{\cdot}3$ (1875)
$\lambda = 207°$ $\quad \beta = 0°$
Cycle $15^d - 23^d$
Brightness $13^m{\cdot}1 - 15^m{\cdot}1$

This variable was found independently by C. HOFFMEISTER [3]) and E. HERTZSPRUNG [4]). The identification was made possible by means of a sketch of the surroundings kindly provided by Dr. HOFFMEISTER.

The light-curve shows broad and narrow maxima; in the broad maxima the variable is brighter than 15 steps during about 15 days and in the narrow ones during about 9 days. These two kinds of maxima do not seem to interchange regularly. The length of the cycles ranges from 15 to 23 days.

The range in brightness is 14 steps or $2^m{\cdot}0$, from $13^m{\cdot}1 - 15^m{\cdot}1$. HOFFMEISTER gives $14^m{\cdot}5 - 16^m$.

Variable 2.

$\alpha = 7^h\ 48^m\ 58^s{\cdot}1$ $\quad \delta = -24°\ 00'{\cdot}1$ (1875)
$\lambda = 208°$ $\quad \beta = +1°$
Cycle $15^d - 20^d$
Brightness $13^m{\cdot}8 - 15^m{\cdot}8$

This variable was found by A. BLAAUW. Its light-

[1]) *N. N. V. S.*, **4**, 252, 1934.
[2]) *Revue Scientifique*, **77**, 465, 1939.
[3]) *A. N.*, **258**, 41, 1936 (661.1935 Pup).
[4]) *Unpublished.*

curve shows essentially the same features as that of variable 1. In the broad maxima the variable is brighter than 15 steps during about 15 days and in the narrow ones during about 6 days. The ascending branches of the narrow maxima are rather steep, much steeper than those of the broad maxima. In minimum the variable is near the limit of the plates and is sometimes invisible because of variations of this limit. The range in brightness is 15·4 steps or $2^m·0$, the broad maxima being brighter than the narrow ones. The length of the cycles varies from 15 to 20 days. Again there is no regular interchange of broad and narrow maxima.

From J. D. 2429369 to 2429407 the observations are all of brightness 10 steps and it seems unlikely that there has been any variation at all during this interval of 38 days.

Such a prolonged stay at an intermediate brightness would class the variable as a Z Camelopardalis star.

Mean J.D. — 2420000	1			2		Mean J.D. — 2420000	1			2		Mean J.D. — 2420000	1			2	
	K	D	n	D	n		K	D	n	D	n		K	D	n	D	n
	s	s		s			s	s		s			s	s		s	
5507·61	2·3	2·3	1	15·4	1	5915·47	11·6	14·0	2	14·5	2	6102·26	12·0	14·5	2	15·4	2
24·58	5·4	3·7	2	F	2	22·49		7·6	2	15·1	2	15·21	12·0	15·0	2	14·6	2
31·50		13·5	2			·50	6·0'		1			17·21	12·0	15·0	2	F	2
·51	11·7		1	11·4	1	23·45		11·4	2	6·2	2	6241·59	11·4	14·5	2	15·0	2
32·59	12·0	14·0	1	13·8	1	·46	9·7		1			48·56	2·6	2·7	2	11·6	2
61·52	11·4	13·0	2	13·7	2	43·45	10·0	13·0	2	2·4	2	49·56	2·1	2·2	2	13·9	2
62·52	11·5	14·5	2	15·0	2	50·40	1·0	2·3	2	14·9	2	64·50	2·1	3·4	2	13·4	2
64·52	12·0	14·0	2	15·4	2	68·34	3·0	2·0	2	14·2	2	65·54	3·2	3·9	2	13·0	2
68·51	11·5	13·5	2	15·4	2	69·37	5·2	5·6	2	4·4	2	66·54	3·2	5·4	2	8·8	2
70·46	3·0	2·8	2	6·0	2	71·40	6·6	7·1	4	9·2	4	68·52	4·9	7·9	4	9·2	4
5613·38	5·6	5·9	2	8·4	2	72·37	8·7	11·1	4	13·9	4	69·52	8·8	9·2	4	11·6	4
14·52	7·4	10·2	2	13·9	2	73·49	11·1	12·3	3	14·5	3	70·52	7·7	10·8	2	13·4	2
15·37	11·0	11·9	2	14·4	2	74·40	11·2	13·5	4	14·9	4	73·53	10·7	14·5	2	15·4	2
16·27				15·4	1	96·29	11·2	14·0	2	9·7	2	76·47	11·5	14·0	2	F	2
41·44	5·3	5·4	2	13·4:	2	97·35	11·0	13·7	4	11·6	4	77·50	12·0	15·0	2	F	2
43·48	2·0	1·8	2	14·9	2	98·38	11·6	15·0	2	13·6	2	94·41		10·8	1		
44·37	1·5	1·7	6	15·4	6	6000·39	12·0	14·5	2	15·0	2	99·43	11·4	13·5	2	10·8	2
45·27	— ·5	·0	2	F	2	02·48	10·3	10·8	1	15·4	1	6303·49	11·2	13·8	4	12·5	4
46·42	·9	·6	7	15·4	7	05·37	4·1	5·4	1	14·6	1	05·53	11·7	13·5	2	14·9	2
49·31	2·3	2·0	6	15·1	6	07·28	6·8	9·3	2	7·2	2	06·45		11·6	3	15·4	3
50·40		2·6	5			09·48	11·3	14·0	2	3·0	2	·48	10·0		2		
50·42	2·8		6	7·5	6	10·44	10·4	12·5	2	·1	2	09·52	3·8	4·4	2	14·7	2
51·35	4·3	3·0	4	5·9	4	12·43	11·8	14·5	2	2·2	2	10·43				15·4	3
52·39	5·5	5·8	13	7·0	13	13·42	11·8	14·7	3	3·4	3	·47	6·8	5·4	2		
53·36	6·4	7·6	11	10·0	11	14·42	11·6		11	4·7	11	23·46	2·6	2·3	3	15·4	3
54·36	7·9	10·7	5	11·9	5	·43		14·5	10			24·47	3·2	3·9	2	14·3	2
55·42				14·7	7	15·44				10·6	1	25·44	5·2	5·9	2	10·0	2
·44		12·1	6			·45	11·2	14·5	2			33·30	11·6	13·0	1		
·45	11·2		4			28·32	11·8	14·0	2	13·4	2	37·36		13·3	3	7·4:	3
73·28	6·0	6·9	2	15·4	2	29·42	11·5	14·5	2	14·8	2	·42	12·0		1		
78·27	12·0	14·5	2	F	2	30·31	11·4	14·0	2	15·1	2	38·51	4·0	5·9	2	9·8	2
83·28	11·4	14·0	2	4·2	2	36·27	7·6	10·2	2	8·8	2	62·41	12·0	14·0	1		
84·25	5·4	5·4	2	3·9	2	38·41	11·5	14·0	2	12·7	2	·43				8·3	2
85·34	2·9	2·3	2	5·0:	2	39·30	11·7	14·0	2	14·5	2	63·41	11·6	14·0	2	12·1:	2
87·31	4·4	4·9	2	·8	2	40·46	11·8	14·0	2	14·4	2	6476·25	12·0	15·0	2	14·8	2
5704·30	11·5	14·0	3	15·4	3	42·40	11·6	15·0	2	15·0	2	7365·50		4·4	2	15·0	2
05·30	11·4	13·5	2	F	2	63·29	3·0	2·3	2	11·4	2	7717·51		9·6	2	13·4	2
06·31	2·2	2·2	3	F	3	64·36	4·4	2·8	2	13·8	2	48·49		5·9	2	15·0	2
07·29	·4	·8	2	F	2	65·32	2·9	5·9	1	14·4	1	7802·45		6·2	2	13·2	2
09·26	3·0	2·5	2	F	2	67·32	4·9	8·3	1	14·7	1	03·36		6·1	2	14·4	2
13·25	5·0	5·7	2	F	2	83·24	1·0	·8	1	15·4	1	07·33		14·0	2	14·7	2
14·22	5·9	7·4	2	5·7	2	84·23	1·2	1·8	1	F	1	8219·32		15·0	2	14·2	2
15·30	7·7	8·3	1	3·3:	1	85·22	1·8	1·8	2	15·0	2	8656·24		11·9	2	14·4	2
17·26	9·8	11·9	2	10·8	2	86·22	2·1	1·9	2	15·0	2	8965·34		14·5	4	15·0	4
19·26	10·6	13·5	2	15·4	2	87·24	2·6	1·9	2	9·5	2	85·28				15·4:	1
34·28	11·3		1			89·28	4·1	5·4	2	2·6	2	9369·25		14·5	1	9·9	1
·29		13·0	2	15·4	2	91·27		10·8	2	·0	2	80·22		10·6	2	10·1	2
39·26	12·0	14·0	2	11·4	2	·28	6·4		1			82·20		12·8	1	10·1	1
41·24	12·0	14·0	2	9·2	2	92·27	11·3	14·0	2	2·2	2	94·26		14·5	1	9·5	1
58·20		14·0	2	15·4	2	93·27	11·2	13·5	2	3·0	2	99·24				9·9	4
·21	12·0		1			94·26	11·8	15·0	2	5·2	2	·25		3·3	3		
5854·61	11·6	14·5	2	9·8	2	97·26	11·6	14·5	2	13·9	2	9400·21		5·6	2	9·8	2
87·52		13·0	1	5·5	1	99·26	12·0	15·0	1	14·4	1	02·23		9·6	2	10·5	3
93·52	2·2	1·8	2	F	2	6101·28	11·4	14·0	1	15·4	1	07·22		14·5	3	10·6	3

n = number of plates. F = invisible. : = uncertain.