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COMMUNICATIONS FROM THE OBSERVATORY AT LEIDEN.

Two new, peculiar and similar variable stars, found by P. Th. Oosterhoff and H. van Gent respectively, estimated and discussed by *Ejnar Hertzsprung*.

It is well known that the vast majority of variable stars of the δ Cephei type have periods between 2 and 40 days. Outside these limits of period very few stars of this kind are known.

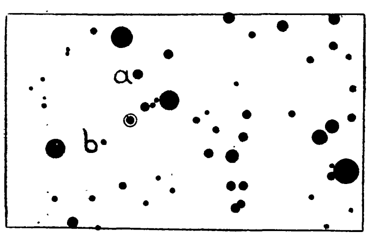
The question arises, whether the δ Cephei type disappears at a certain upper limit of period or there is a gradual transition to variables of other types. The two objects considered in the present note may or may not throw some light on this question. As far as the evidence went up till now there did not seem to be such a transition. The few variables known with periods between say one and three months seem to be either of the pure δ Cephei type or of another class.

The positions of the two new variables are:

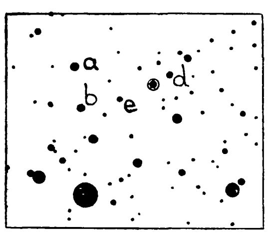
OOSTERHOFF's star $11^h\ 8^m33^s$, $-57°\ 2'.4$ (1875)
VAN GENT's star $11^h20^m10^s$, $-58°56'.7$ (1875).

The distance between the two objects is therefore only 2°·4, but I do not think that any significance should be attached to this fact.

Both stars are faint, in minimum about of the 14^{th} magnitude photographically.



VAN GENT's star
size of field 10′ × 6′



OOSTERHOFF's star
size of field 12′ × 10′

OOSTERHOFF's star was estimated on 690 and VAN GENT's on 828 plates taken with the Franklin-Adams instrument at Johannesburg, the latter star being present both on the plates of the η Carinae region and on those of the Crux region.

In both cases the maxima observed show a period of about 4 weeks. But it appeared that the intermediate minima were of unequal depth. In fact, minima of even and odd epoch are different. The preliminary periods of about 4 weeks were therefore doubled and the periods finally adopted are

OOSTERHOFF's star $55^d.6$
VAN GENT's star $51^d.0$

The resulting lightcurves are shown on the accompanying diagrams. The abscissae are fractions of the period and the ordinates the brightness in arbitrary steps. I estimate the range in the case of both stars to be about one magnitude and a half, but this is still rather uncertain.

Owing to the faintness of the stars the individual estimates are not very accurate, but the general character of the light variation is well established.

The peculiarity and great similarity of the two lightcurves in form and period is very striking. Superficially the lightcurves may be described as being intermediate between β Lyrae and δ Cephei, but it is hard to see, how this classification could have anything to do with the real cause of variation.

In this connection it is worth while to remember, that AC Herculis of period $75^d.4$ shows a lightcurve, which may be roughly described in the same way, the similarity with the β Lyrae type being, however, more pronounced, (G. ZACHAROV, *A. N.* **222**, 295 and W. F. H. WATERFIELD, *H. B.* 845).

The technical details concerning the two variables are as follows:

The comparison stars used are indicated on the accompanying diagrams. The adopted brightnesses in steps are for OOSTERHOFF's star *a* $^s.000$, *b* $^s.627$, *d* $1^s.012$, *e* $1^s.594$ and for VAN GENT's star *a* $^s.00$, *b* $^s.66$.

The phases have been computed according to the formulae

OOSTERHOFF's star:

phase $= \overset{d-1}{\cdot 018}$ (J. D. hel. M. astr. T. Grw. —2420000)

VAN GENT's star:

phase $= \overset{d-1}{\cdot 01965}$ (J. D. hel. M. astr. T. Grw. —2420000)

Table 1. Oosterhoff's star.

P	s	P	s	P	s
·030	·760	·399	·681	·735	1·065
·066	·905	·441	·435	·766	·977
·116	1·000	·504	·591	·788	·970
·166	1·140	·558	·709	·816	·910
·192	1·334	·594	·764	·841	·840
·207	1·299	·639	·876	·874	·699
·232	1·424	·671	·925	·909	·449
·262	1·451	·688	·902	·928	·485
·297	1·534	·700	·940	·951	·514
·349	1·184	·714	1·000	·978	·585

Table 2. van Gent's star.

P	s	P	s	P	s
·029	·251	·334	·035	·671	·433
·082	·355	·348	·027	·698	·158
·118	·340	·366	·070	·718	·062
·162	·050	·382	·084	·730	·079
·191	— ·152	·414	·160	·754	— ·057
·211	— ·181	·439	·238	·774	— ·139
·227	— ·143	·470	·366	·791	— ·141
·238	— ·089	·498	·426	·825	— ·191
·254	— ·089	·530	·540	·880	— ·031
·272	— ·057	·572	·670	·931	·019
·292	— ·040	·615	·722	·944	— ·030
·319	— ·027	·645	·589	·976	·153

Table 3. Oosterhoff's star.

J.D. hel. M. astr. T. Grw. 2420000 +	number of plates	mean brightness	J.D. hel. M. astr. T. Grw. 2420000 +	number of plates	mean brightness	J.D. hel. M. astr. T. Grw. 2420000 +	number of plates	mean brightness	J.D. hel. M. astr. T. Grw. 2420000 +	number of plates	mean brightness
d		s	d		s	d		s	d		s
3786·53	3	1·03	3911·31	4	·25	3979·22	2	·92	4293·30	4	1·65
87·53	1	1·02	13·30	4	·27	85·20	1	·93	94·30	4	1.65
88·50	4	1·18	14·31	1	·27	86·20	1	·81	96·29	4	1·50
89·52	3	1·27	15·31	4	·50	87·20	1	·91	97·29	4	1·39
90 53	3	1·35	16·35	4	·57	88·20	1	·75	98·24	1	1·02
91·53	3	1·45	18·28	1	·43	89·20	1	·94	4537·40	2	·94
99·52	3	·93	19·32	4	·72	90·20	1	·80	38·48	3	.87
3813·46	12	·91	26·21	1	1·07	91·19	1	·72	43·43	3	·88
14·48	9	·97	27·23	2	1·18	92·19	1	·55	50·38	2	·84
15·46	3	1·01	28·26	4	1·16	4141·53	5	·86	53·46	3	·67
16·42	5	1·00	29·26	4	1·22	68·49	4	·95	58·38	1	·76
17·46	5	1.03	30·26	4	1·23	69·48	10	1·00	59·37	4	·85
18·56	3	1·19	31·29	4	1·20	71·45	4	1·07	60·48	2	·60
20·44	1	1·01	32·27	4	1·20	72·47	5	1·11	66·47	2	1·04
21·38	1	1·16	33·29	3	1·03	73·42	1	1·27	86·47	2	·58
28·45	10	·31	34·29	4	1·02	76·49	8	1·38	92·40	1	1·02
29·47	2	·30	35·29	4	·91	77·50	9	1·50	95·30	1	1·02
30·52	4	·42	36·27	4	·90	87·57	1	1·25	4627·24	1	1·89
31·54	3	·39	37·28	4	·73	90·42	2	·62	42·36	2	·64
33·59	2	·44	38·24	3	·51	96·35	3	·57	48·24	1	·53
40·31	1	·88	39·26	5	·45	98·44	13	·63	49·24	1	·60
41·33	3	1·01	40·26	5	·42	4200·38	6	·72	50·32	1	·79
42·32	4	1·02	41·27	4	·44	01·39	5	·75	51·24	1	·88
44·32	3	1·15	42·26	5	·43	02·42	2	·94	4915·41	2	·60
45·30	2	1·30	43·26	5	·52	04·47	11	·84	18·45	2	·76
57·31	4	·44	44·25	5	·55	05·46	12	·87	76·37	1	·80
58·37	4	·40	45·26	5	·58	06·39	8	·97	5025·40	1	·56
68·24	1	·93	46·26	4	·68	07·43	2	·98	38·25	2	·92
71.30	6	·94	47·21	1	·63	26·28	1	·92	39·20	2	1·04
72·33	7	·96	48·25	4	·83	28·29	1	·89	43·24	1	1·32
74·29	4	·97	49·20	2	·74	38·30	2	1·76	67·26	6	1.40
76·35	9	1·02	55·20	1	1·32	40·42	1	1·60	68·25	4	1·47
77·36	9	·89	56·21	2	1·38	45·35	3	·71	78·24	3	·99
78·37	9	.92	57·24	3	1·45	54·43	2	·90	5319·33	1	·61
79·34	9	·79	58·23	3	1·39	57·29	2	·78	20·31	2	·61
80·35	8	·79	59·23	3	1·40	58·26	1	·79	27·31	3	·78
81·40	6	·64	60·25	2	1·34	61·25	2	·90	28·36	2	·60
82·27	1	·46	62·24	2	1·30	62·29	4	·92	29·29	2	·54
83·48	2	·63	63·22	3	1·19	63·31	5	·90	30·27	1	·65
84·33	5	·47	64·23	3	·95	64·37	3	·95	77·31	2	·79
85·37	8	·47	65·23	3	·72	66·24	1	·89	79·36	2	1·04
86·37	4	·64	66·23	3	·59	77·27	1	1·00	80·26	2	·94
87·38	5	·72	67·23	3	·64	80·19	1	·98	81·35	2	·90
89·47	1	·90	68·23	2	·50	81·20	1	·98	82·35	2	·85
97·24	1	1·19	69·23	2	·46	82·21	2	·93	83·40	2	.73
99·29	1	1·02	70·22	2	·47	84·24	2	·94	84·40	1	·88
3900·28	5	1·18	71·21	2	·45	85·25	4	·97	85·38	2	·62
01·24	1	1·19	72·22	2	·67	86·30	5	1·06	86·33	2	·62
02·38	4	1·41	73·22	1	·63	87·31	4	1·12	91·39	2	·86
03·32	7	1·43	74·22	2	·80	88·30	4	1·30	5403·18	1	1·46
04·33	7	1·38	75·22	2	·75	89·32	4	1·38	06·22	2	1·59
07·34	4	1·28	76·22	2	·81	90·28	2	1·59	42·22	2	·63
08·29	3	1·11	77·21	2	·87	91·26	2	1·46			
10·27	4	·64	78·22	2	·88	92·31	4	1·67			

TABLE 4.

VAN GENT's star.

J. D. hel. M. astr. T. Grw. 2420000 +	number of plates	mean brightness	J. D. hel. M. astr. T. Grw. 2420000 +	number of plates	mean brightness	J. D. hel. M. astr. T. Grw. 2420000 +	number of plates	mean brightness	J. D. hel. M. astr. T. Grw. 2420000 +	number of plates	mean brightness
d		s	d		s	d		s	d		s
3786·53	3	·02	3910·27	4	—·25	4172·47	5	·29	4586·50	4	·27
87·53	1	·00	11·31	4	—·04	73·42	1	·51	95·30	1	—·08
88·52	4	·16	13·30	4	—·01	76·48	7	·30	4642·36	2	—·10
89·51	2	·26	15·31	4	·05	77·50	9	·31	48·24	1	·00
90·52	4	·46	16·33	5	·13	87·57	1	·00	49·24	1	·08
91·53	4	·39	18·28	1	·41	90·42	2	·02	50·32	1	·37
99·52	4	·57	19·32	3	·14	96·35	3	·36	51·24	1	·01
3801·51	1	·30	26·21	1	·00	98·44	12	·50	4915·41	2	·64
13·46	12	—·04	27·23	2	·01	4200·37	5	·61	18·48	3	·52
14·48	8	·00	28·26	4	—·05	01·39	5	·65	76·37	1	—·22
15·46	3	·04	29·26	4	—·20	02·41	1	·66	5025·42	2	—·02
16·42	4	·07	30·29	4	—·02	04·46	10	·76	38·25	2	·40
17·46	5	·13	31·28	5	—·16	05·46	12	·68	39·20	2	·38
18·56	3	·05	32·27	4	—·02	06·39	8	·58	67·26	6	·66
20·44	1	·00	33·30	3	—·04	07·43	2	·30	68·24	2	·60
21·38	1	·32	34·29	4	—·08	26·28	1	·39	78·22	1	—·32
28·33	7	—·00	35·29	4	·01	28·29	1	·58	5319·33	1	·25
29·47	2	—·10	36·25	2	·04	38·30	2	—·05	20·31	2	·56
30·52	4	—·00	37·28	3	·19	40·42	1	·00	27·31	3	·53
31·54	3	—·00	38·21	1	·00	57·29	2	·37	28·38	3	·37
33·59	2	·01	39·20	1	·10	58·30	3	·18	29·40	10	·15
40·31	1	·21	40·29	5	·02	59·32	9	·03	30·37	5	—·02
41·33	3	·27	41·26	5	·39	60·32	8	·01	31·41	12	—·18
42·33	3	·22	42·28	3	·22	61·28	4	—·03	32·40	4	—·20
44·32	3	·58	43·28	4	·54	62·29	7	—·09	37·58	1	—·02
45·28	1	·64	44·28	4	·44	63·36	9	—·08	48·28	2	·41
57·31	4	—·06	45·28	5	·50	64·40	7	—·14	50·41	2	·28
58·37	4	—·15	46·32	3	·54	66·24	1	·00	51·42	6	·20
68·24	1	·36	47·21	1	·66	80·19	1	·25 :	53·33	2	—·10
71·30	6	·44	55·20	1	·00	81·21	2	·38	54·42	8	—·11
72·33	7	·44	56·23	1	·00	82·24	4	·13	55·26	2	—·04
74·29	4	·44	57·24	1	—·26	84·24	2	—·10	56·40	2	—·12
76·35	9	—·06	58·25	3	—·06	85·29	5	—·27	57·36	2	·00
77·36	9	—·15	59·25	2	—·20	86·30	9	—·14	60·46	2	·14
78·37	9	—.21	63·25	2	·02	87·31	10	—·11	61·36	2	·10
79·34	9	—·28	64·28	1	·08	88·31	10	·00	62·36	6	·12
80·35	8	—·14	65·24	4	·07	89·32	10	—·05	77·31	2	·85
81·40	6	—·15	66·24	3	·15	90·29	6	—·06	78·42	3	·53
82·27	1	·00	67·27	2	·20	91·31	11	—·02	79·36	2	·34
83·49	3	—·04	74·21	1	·53	92·31	10	·04	80·30	6	·27
84·33	7	—·03	76·24	2	·23	93·30	10	·04	81·32	4	·13
85·36	9	—·01	85·22	2	·08	94·30	10	·11	82·35	2	—·08
86·34	5	—·02	86·21	2	·04	96·30	9	·20	83·42	4	—·11
87.38	5	·03	87·22	3	·10	97·30	9	·27	84·39	2	—·22
89·47	1	·03	88·22	3	·16	98·34	3	·41	85·33	4	—·19
99·29	1	·66	89·22	3	—·03	4537·40	2	·00	86·33	10	—·21
3900·28	5	·59	90·23	2	·23	38·48	3	—·25	88·36	2	—·08
01·24	1	·61	91·22	2	·40	50·38	2	·26	91·35	5	—·16
02·38	4	·16	97·21	1	·66 :	53·46	3	·45	5406·22	2	·04
03·32	7	·05	4141·49	2	·06	58·38	1	·84	42·23	1	—·18
04·34	8	·01	68·48	3	·00	59·43	8	·68			
07·34	4	—·20	69·48	10	·04	60·49	3	·70			
08·29	3	—·07	71·45	4	·08	66·49	3	—·01			

The observations were then arranged according to phase and divided into groups of 23 estimates each. Mean values for each of these groups are given in Tables 1 and 2 and graphically represented on the Figures.

The mean error of the estimate on a single plate is found to be $\pm$ s·133 in the case of OOSTERHOFF's and $\pm$ s·135 in the case of VAN GENT's star, assuming that the form of the lightcurve remains constant.

As these variables are of particular interest, mean values of the estimated brightnesses have been given for each night in the Tables 3 and 4.

Finally, in view of these facts one is liable to ask, if the small asymmetry shown by the maxima of the