TABLE 4.

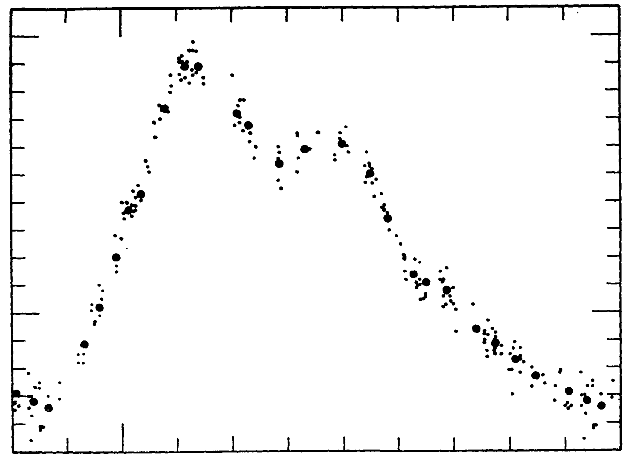
n	mean phase	mean brightness	relative weight	mean error
	p	m		m
10	·012	—·37	143	±·015
10	·034	—·43	136	·015
10	·078	—·74	139	·015
10	·116	—·89	110	·017
8	·139	—·89	116	·016
8	·208	—·72	122	·016
7	·230	—·68	90	·018
6	·287	—·54	78	·020
10	·331	—·59	154	·014
7	·399	—·61	106	·017
10	·449	—·50	139	·015
10	·481	—·34	151	·014
10	·526	—·14	118	·016
10	·550	—·11	155	·014
10	·586	—·08	144	·015
10	·639	·06	125	·016
10	·674	·11	143	·015
10	·709	·17	135	·015
10	·747	·23	138	·015
10	·807	·29	147	·014
10	·839	·32	141	·015
7	·866	·35	80	·019
6	·932	·11	86	·019
8	·959	—·02	114	·016
6	·990	—·20	93	·018

Hence the mean error of a single observation of reciprocal gradation ·87 is $\pm$ ^{m}·05 and the total weight of all observations is about 100000 m^{-2}.

We may conclude that the lightcurve of this variable is in full agreement with its period according to the scheme of HERTZSPRUNG. It is remarkable that the change of light on the descending branch at phase ·47 is nearly as rapid as on the ascending branch.

As the visual observations of WILLIAMS, which provide a fairly good lightcurve, are the oldest observations available, a determination of the period was made from his material and the Leiden observations. The reciprocal period found in this way is $^{d-1}$·127279, the mean error is estimated to be $\pm$ ·000003. This is in good accordance with the period derived from the Leiden observations.

FIGURE 2.



The best elements of the maximum are now:

$$\text{J. D. } 2425964{\cdot}24 + 7^{d}{\cdot}8567 \text{ E.}$$
$$\pm \;{\cdot}0002 \text{ (m. e.)}$$

During the preparation of this paper visual observations of V Y Cygni have been published by LASSOVSZKY [1]). The secondary maximum is clearly shown by his observations. The total range in brightness of the visual observations is about ^{m}·8, while the photographic amplitude amounts to 1^{m}·25.

1) *A.N.* **248**, 313.

Two new variable stars, which probably are physically connected with the galactic clusters N. G. C. 3532 and N. G. C. 4103 respectively, by *P. Th. Oosterhoff.*

It is a well known fact that only a very small number of variable stars occurs among the physical members of galactic clusters as contrasted with the globular clusters. Though some red stars belonging to galactic clusters may show an irregular light variation, they are of no special interest. From the periods and lightcurves of δ Cephei, RR Lyrae, and eclipsing type variables on the other hand it will be possible to estimate the star's parallax and therefore the distance of the cluster to which the variable belongs. As far as I know only two variables of the third type have been practically identified as members of open clusters, and attention may be drawn to these objects:

α Coronae borealis Ursa major group [1]) [2])
Σ 485 (north preceding component) *N.G.C.* 1502 [3])

There is an indication according to GUTHNICK and PRAGER that also the southern component of Σ 485 is a variable with only small range.

1) *Publ. Washburn Obs.* **15**, 1, 1928.
2) *Nachr. Kgl. Gesellschaft der Wissensch. Göttingen*, 1909.
3) *A.N.* **239**, 14, 1930.

A third example would be the eclipsing variable star β Aurigae, when its membership of the Ursa major group could be proved [1]).

A systematic search for variables was performed by MILLER in twelve galactic clusters, but without positive results. [2])

The number of known variables in galactic clusters being so small, two new variable stars, found by the writer, seem to be of special interest, since they are probably physically related to the clusters *N. G. C.* 3532 and *N. G. C.* 4103 respectively. The variability of these stars was discovered in the blinkmicroscope on plates of the Carina and Crux regions, which were taken with the Franklin-Adams refractor of the Union Observatory.

Variable in N. G. C. 3532.

This variable is identical with *C. P. D.* — 58° 3066, $8^{m}\cdot 7$ and *H. D.* 96368, $8^{m}\cdot 9$, spectrum A0. Its position is:

$$\left.\begin{array}{llll} \alpha: & 11^{h} & 0^{m} & 15^{s}\cdot 5 \\ \delta: & -58^{\circ} & & 3'\cdot 4 \end{array}\right\} (1875)$$

As the star is situated near the centre of the cluster, and as its spectrum and magnitude are in full agreement with the spectrum-magnitude relation of the cluster, it seems very propable that this star is a physical member. In this connection the measurement of the radial velocity would be of much value.

The star was estimated, about three years ago, on 613 Johannesburg plates of the Carina region. From these estimates the period was determined and a mean lightcurve formed. The following comparison stars have been used:

a .... *C. P. D.* — 58° 3073 , $8^{m}\cdot 8$ =
H. D. 96387 , spectrum A0
b .... *C. P. D.* — 58° 3081 , $8^{m}\cdot 6$

The photographic magnitudes and the spectra according to WALLENQUIST [3]) are:

	m_{pg}		m_{pv}
var....	9·1	A0	8·89
a....	8·8	A0	8·68
b....	9·4	A2	9·30

In the last column the photovisual magnitudes of MARTIN [4]) are given. The magnitude of the variable refers to maximum brightness.

The variable appeared to be of the eclipsing type, the period being $4^{d}\cdot 2948$. Phases were calculated by the formula:

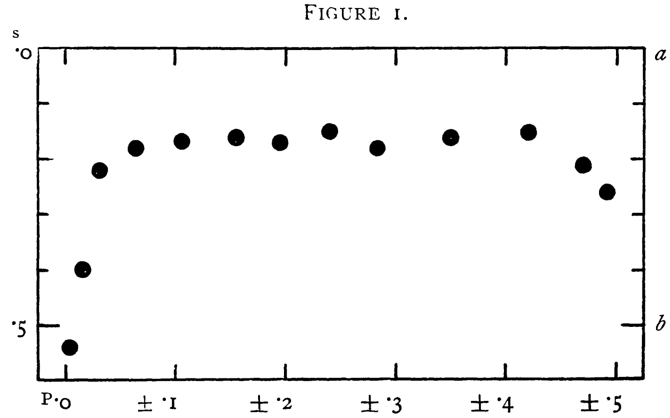
$$\text{phase} = \overset{d^{-1}}{\cdot 23284}\ (\text{J. D.} - 2420000)$$

and then a mean lightcurve was formed. There is an indication of a secondary minimum and, as the lightcurve seems to be symmetrical, the phase of the primary minimum was determined and a mean lightcurve was deduced by arranging the observations according to phase counted from minimum. This mean lightcurve is shown in figure 1 and the number of observations, the mean phase and the mean brightness in steps of each point of the lightcurve are given in Table 1.

TABLE 1.

n	*P*	*s*
20	± ·004	·54
20	·015	·40
30	·032	·22
40	·064	·18
50	·106	·17
(o	·154	·16
60	·196	·17
70	·241	·15
60	·283	·18
70	·350	·16
63	·420	·15
40	·468	·21
30	·491	·26

FIGURE 1.



The difference in brightness between the comparison stars is found to be $^{s}\cdot 50$. In figure 1 the brightness of these stars is indicated. The agreement between the estimated brightness of the comparison stars and of the variable at maximum and the magnitudes of MARTIN is complete One step corresponds to $1^{m}\cdot 24$ and the total range of the primary minimum is about $^{m}\cdot 50$. The range of the secondary minimum may be estimated to be about $^{m}\cdot 15$.

Though during the last years 265 new plates of this region have been taken at Johannesburg, I did

1) *Ap. J.* **34**, 112, 1911.
2) *Harv. Bull.* **883**, 30, 1931.
3) *Annalen v. d. Bosscha-sterrenwacht, Lembang*, Vol. 3, 3e ged. 1931.
4) *B. A. N.* **244**.

not think it worth while to derive a new mean lightcurve, as photovisual observations on a larger scale are being taken with the 26-inch refractor of the Union Observatory with the special purpose of deriving an accurate lightcurve. Yet the star has been estimated on the new plates and from this material three additional epochs of minimum were derived, with the aid of which the elements could be improved. The best elements, computed by least squares, are now:

$$\text{J. D. } 2424292^{d}\cdot255 + 4^{d}\cdot294580\,(\text{E} - 108)$$
$$\pm\ \cdot007 \qquad \pm\ \cdot000035\ (\text{m. e.})$$

In Table 2 the epochs of minimum, the number of periods elapsed and the residuals $(O-C)$ are given.

TABLE 2.

J. D. Hel. M. T. Gr. — 2420000	Epoch	$(O-C)$
d		d
3828·40	0	— ·04
3841·33	3	+ ·01
3858·51	7	+ ·01
3871·36	10	— ·03
3884·27	13	·00
3914·31	20	— ·02
3927·23	23	+ ·01
3957·24	30	— ·04
3970·21	33	+ ·05
4206·37	88	+ ·01
4262·23	101	+ ·04
4292·25	108	·00
4627·24	186	+ ·01
5327·27	349	+ ·02
6422·33	604	— ·04
6478·21	617	+ ·01

Variable in N. G. C. 4103.

This variable is identical with *C. P. D.* — 60° 3723, $9^{m}\cdot2$, its position being:

$$\alpha : 11^{h}\ 59^{m}\ 40^{s}\cdot5 \quad \delta : -60^{\circ}\ 33'\cdot6 \quad (1875)$$

The variable is one of the brightest stars of the cluster and is situated at its western side. Though no spectra of cluster stars and variable are known to me, it seems to be rather probable that the variable is a physical member of this cluster. Determinations of spectra and radial velocities will be necessary to throw light on this question.

The star has been estimated on 388 plates of the Crux region. The following comparison stars were used:

a	*C. P. D.*	— 60°	3746	, $9^{m}\cdot0$	$^{s}\cdot00$
b	„	— 60	3760	, 9·1	·32
c	„	— 60	3717	, 9·5	·60
d	„	— 60	3749	, 9·3	·85

In the last column the estimated brightness in steps is given.

The variable is of the eclipsing type and from six minima a provisional period of $1^{d}\cdot41768$ could be derived. From plates taken in the same night it is evident, that the minimum is of constant brightness during about two hours. Therefore sharper epochs can be obtained by using the observations on the descending or ascending branch of the minimum. As a provisional period was already found, 15 observations on the ascending branch between the limits of brightness $^{s}\cdot25$ and $^{s}\cdot70$, counted from the comparison star *a*, could be selected. The J. D. of these observations was then reduced to a point on the ascending branch of brightness $^{s}\cdot50$. By means of least squares elements have been computed from these epochs. The details of this computation are given in Table 3.

TABLE 3.

J. D. Hel. M. T. Gr. — 2420000	brightness	J. D. reduced to brightness + $^{s}\cdot50$	Epoch	$(O-C)$
d	s			d
3959·281	+ ·32	3959·266	0	+ ·015
3976·254	+ ·41	3976·247	12	— ·017
4285·338	+ ·60	4285·345	230	+ ·018
4292·413	+ ·51	4292·414	235	— ·002
5351·468	+ ·32	5351·453	982	— ·001
5354·290	+ ·32	5354·275	984	— ·015
5354·313	+ ·39	5354·305	984	+ ·015
5361·352	+ ·65	5361·363	989	— ·015
5361·375	+ ·41	5361·368	989	— ·010
5378·401	+ ·32	5378·386	1001	— ·005
5378·423	+ ·32	5378·408	1001	+ ·017
5714·373	+ ·41	5714·366	1238	— ·025
6114·199	+ ·32	6114·184	1520	— ·005
6471·472	+ ·32	6471·457	1772	+ ·002
6471·494	+ ·27	6471·477	1772	+ ·022

The elements (for a point on the ascending branch of brightness $^{s}\cdot50$) are:

$$\text{J.D. } 2425351^{d}\cdot454 + 1^{d}\cdot417722\ (\text{E} - 982)$$
$$\pm\ \cdot004 \quad \pm\ \cdot000007 \quad (\text{m. e.})$$

Then phases were calculated by the formula:

$$\text{phase} = \cdot705357^{d^{-1}}\ (\text{J.D.} - 2420000)$$

and a mean lightcurve was formed. The existence of a secondary minimum is obvious and as the lightcurve is symmetrical, another mean lightcurve was deduced, arranging the observations according to phase counted from minimum. This lightcurve is shown in figure 2 and the number of observations, the mean phase and the mean brightness of each point, are given in Table 4.

As the difference in phase between the point on the ascending branch mentioned above and the middle