A pair of faint stars, one of which is an eclipsing variable

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If we put

$$\psi(t) = \frac{1}{\sqrt{\pi}} \int_t^\infty e^{-t^2} dt,$$

we find

$$[\bar{\mu}]_{\mu > \mu_1} = \bar{\mu} . \psi(t_1 - \alpha/2\sqrt{\gamma}) \Big/ \psi(t_1), \qquad \frac{\alpha}{2\sqrt{\gamma}} = 1{\cdot}063$$

where t_1 must be determined from

$$[N_m]_{\mu > \mu_1} = N_m . \psi(t_1).$$

As an illustration of these formulas I have interpolated the observed numbers N_m for the magnitudes 4, 8 and 12 and for the three galactic zones, from the star counts given in *Groningen Publications* **27**, Table V, p. 63. The resulting mean proper motions are given below.

The agreement between the mean proper motions of KAPTEYN and VAN RHIJN and those derived in the present paper is, I think, all that could be expected. The aim of the present note is to call attention to a simple relation, which appears to be in better agreement with observation than would perhaps be anticipated.

m	KAPTEYN and VAN RHIJN			$\bar{\mu}$ calculated present paper
	$\log N_{m-\cdot55}^{m+\cdot45}$	$\bar{\mu}$ observed "/y	$\bar{\mu}$ true m. e. "/y	"/y
	Galactic latitude 0° to ± 20°			
4	— 1·775	·115	·115 ± ·0074	·098
8	·258	·038	·028 ± ·0027	·032
12	1·988	·017	·008 ± ·0065	·015
	Galactic latitude ± 20° to ± 40°			
4	— 1·906	·160	·160 ± ·0142	·130
8	·033	·048	·041 ± ·0022	·047
12	1·620	·032	·019 ± ·0052	·024
	Galactic latitude ± 40° to ± 90°			
4	— 2·019	·196	·196 ± ·016	·161
8	— ·083	·054	·046 ± ·0022	·057
12	1·356	·033	·026 ± ·003	·032

A pair of faint stars, one of which is an eclipsing variable, by *Ejnar Hertzsprung.*

The coordinates of this variable, found on plates taken of the η Carinae region with the Franklin-Adams instrument, are $10^h37^m53^s{\cdot}5$, $-61°18'{\cdot}5$ (1875). It is the north preceding component of a pair about 10″ apart in a position angle of approximately 45°. At the maximum brightness of the variable I estimate both components to be of about the 12th photographic magnitude. The duplicity is just evident on the Franklin-Adams plates (scale 1 mm = 183″·6), but the separation is so small, that it can only be ascertained when the variable is occasionally much fainter than normal. In Table I the epochs of minimum thus observed have been given stating the number of plates, on which the star was found distinctly faint on each of the 15 nights. These numbers have been taken as the relative weights of the observed minima in making the least square solution. The provisional ephemeris thus found is:

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$$2424078^d{\cdot}167 + 2^d{\cdot}111401 \times E$$
$$\pm \cdot008 \pm \quad \cdot000095 \text{ (m. e.)}$$

The star remains "distinctly faint" for about 3 hours and the whole duration of the minimum is probably about double this. As the star has been examined on about 600 plates, on 32 of which it was found distinctly faint, the period may, when the observations are considered as accidentally distributed, be expected to be of the order 600/32 times 3 hours or $2^d{\cdot}35 \pm {}^d{\cdot}42$ (m. e.) in agreement with the adopted period $2^d{\cdot}11$.

The range appears to be considerable, possibly 2 magnitudes or even more. The object should be observed with an instrument of longer focal length to get the components well separated.

This is the first new variable star found with the Leiden comparator for four plates. The intention of this instrument is that stars suspected of variability by blinking two plates can be immediately tested by the aid of the two other plates.

TABLE 1.

J. D. hel. M. astr. T. Grw.	number of plates	E	ΔE	$O-C$
d	n			d
2423799·509	1	0	8	+ ·047
3816·382	3	8	45	+ 27
3911·347	1	53	8	— 19
3928·245	3	61	8	— 12
3945·208	1	69	1	+ 59
3947·208	1	70	8	— 52
3964·203	1	78	1	+ 52
3966·231	3	79	9	— 32
3985·203	1	88	74	— 62
4141·515	4	162	17	+ 6
4177·430	3	179	9	+ 27
4196·377	1	188	1	— 28
4198·501	6	189	43	— 16
4289·284	1	232	118	— 23
4538·482	2	350		+ 30