This cylinder has the same axis A as T_1 and is of the same size; the axis is situated 8 cm below the upper iron frame. The paper for the contracted curve, rolled upon a lower cylinder, is slowly unwound by the common rotation of T_1 and T_2. Two other fountainpens rigidly connected to the blocks K_1 and K_3 by means of long rods H_1, H_3 and short tubes R_1 and R_3, gliding along C_1 and C_3, draw the original intensity curve in another colour upon the same paper, one with the same zero, the other somewhat displaced vertically. In this way the contracted curve can directly be confronted with the original curve; and at the same time there is a control afterwards that the mechanism has worked without any faltering. In the picture Figure 5 of the instrument we see at the left hand side three curves, two of the intensity curves (blue) as weak lines, exactly equal to the cut-out figure at the right hand side, and the contracted curve (red) as a strong line.

The three contact wheels are kept in a constant rotation in one direction, off the paper at the tangent point, so that there is no fear of pulling up and tearing the paper at steep places of the border curve, and at the same time they rub themselves clean from oxyd particles and dust. This motion is transferred by chains, Ch in the figure, from a small cogwheel Cw, fastened to the iron plate B_2 and driven by the motor of the cylinders T. Moreover, because narrow tops of the cut-out paper figure have a tendency to curl up, two thin cylindrical rods (knitting pens) were pressed, at the outer sides next to each wheel, against the cylinder T_1, rotating with the slow motion of the paper. This proved to be sufficient to have always the paper lying flatly on the cylinder surface.

When the machine is set in motion and the cylinders are rotating, the three contact wheels immediately take their place upon the curve and follow it in a rapid succession of small oscillations about the true line.

Note on the limb darkening of YZ 21 Cassiopeiae, by *A. Pannekoek* and *Elsa van Dien*.

In the *Bulletin of the Engelhardt Observatory, Kazan* No. 14 (1938) an extensive and valuable series of spectrophotometric measures of 21 Cas has been published by S. V. NEKRASSOVA. It consists of 989 spectra, taken during 30 nights in the years 1935–37; each spectrum was measured at 4 points, with wave lengths 4830, 4315, 3952 and 3862 A., near to the hydrogenlines $H\beta$, $H\gamma$, $H\varepsilon$, $H\zeta$; the comparison star, as usual, was 23 Cas. The author in her paper derives for each wave length the elements of the eclipse, including the coefficient of limb darkening. From our computations published in *B.A.N.* No. 297 it follows that in consequence of the coupling of the geometrical elements with limb darkening it is not possible to derive the latter, even within wide limits, from even much more accurate data. Hence her results for this quantity cannot give real values.

The problem has changed, however, since the researches of G. KRON (*Lick Bulletin* No. 499) have provided a very accurate determination of the geometrical elements of the eclipse. Now less accurate spectrophotometric measures cannot contribute anything more to our knowledge of these elements. But the conditions for finding the amount of limb darkening have considerably improved thereby, since now this coefficient is the only unknown quantity to be determined from the spectrophotometric data. By means of the geometrical elements the loss of light (in fraction of the primary) can be computed for uniform disc (α_0 for $x = 0$) and for totally darkened limb (α_1 for $x = 1$). Then with a coefficient of limb darkening x we have $\alpha\,(1 - {}^1/_3\,x) = (1 - x)\,\alpha_0 + {}^2/_3\,x\,\alpha_1$; or, putting ${}^2/_3\,x$: $(1 - {}^1/_3\,x) = X$, $\alpha - \alpha_0 = X\,(\alpha_1 - \alpha_0)$. The amount of x or X determines how the light curve of α runs between the curves for the uniform and the darkened case.

The computations have been made for the means given by NEKRASSOVA in her Table 4 (p. 21), using the elements $r_1 = 0{\cdot}1439$, $k = 0{\cdot}538$, $\cos i = 0{\cdot}0353$, $P = 4{\cdot}4672$. In Table 1 the values of $\alpha_1 - \alpha_0$ and of $\alpha - \alpha_0$ for the 4 wave lengths are given[1]).

The table shows that the values of α are situated only partly between α_0 and α_1. In the vicinity of minimum this is only the case for λ 4830 and 4315; for the former the other phases would give a negative x; and the ultraviolet wave lengths deviate to the other side, giving $x > 1$. These results indicate that there must be considerable systematic deviations, either in the observations or in the behaviour of the star, and that a trustworthy coefficient of limb darkening cannot be derived. The ultraviolet measures, especially those at 3862, cannot be reconciled

[1]). The m.e. of one observation being $0^{m}{\cdot}057$ the m.e. of one α (from the mean of 12 observations) is $0{\cdot}017$ at full light, $0{\cdot}011$ at minimum.

TABLE 1.

Phase	α_0	α_1	$\alpha_1-\alpha_0$	4830 $\alpha-\alpha_0$	4315 $\alpha-\alpha_0$	3952 $\alpha-\alpha_0$	3862 $\alpha-\alpha_0$
d — 0·123	0·061	0·042	— 0·019	+ 0·008	+ 0·013	+ 0·010	+ 0·011
+ ·118	·075	·054	— ·021	+ ·030	+ ·023	+ ·043	+ ·058
— ·108	·103	·083	— ·020	+ ·002	·000	+ ·006	+ ·017
+ ·106	·109	·089	— ·020	+ ·026	+ ·038	+ ·069	— ·009
+ ·101	·124	·105	— ·019	+ ·026	+ ·036	+ ·059	+ ·069
+ ·093	·147	·135	— ·012	+ ·015	+ ·017	+ ·077	+ ·072
— ·089	·165	·155	— ·010	— ·013	— ·001	+ ·023	+ ·026
+ ·075	·207	·206	— ·001	+ ·002	+ ·031	+ ·094	+ ·099
+ ·071	·219	·224	+ ·005	·000	+ ·022	+ ·089	+ ·090
— ·070	·222	·227	+ ·005	— ·025	— ·023	+ ·054	+ ·050
— ·055	·264	·288	+ ·024	— ·034	+ ·003	+ ·045	+ ·046
+ ·046	·286	·321	+ ·035	— ·024	+ ·008	+ ·076	+ ·096
— ·036	·290	·348	+ ·058	— ·013	+ ·018	+ ·085	+ ·108
+ ·032	,,	·356	+ ·066	+ ·002	+ ·015	+ ·102	+ ·121
— ·020	,,	·374	+ ·084	+ ·011	+ ·020	+ ·091	+ ·117
+ ·018	,,	·376	+ ·086	+ ·008	+ ·034	+ ·107	+ ·132
— ·014	,,	·379	+ ·089	+ ·021	+ ·041	+ ·102	+ ·135
+ ·007	,,	·383	+ ·093	+ ·029	+ ·042	+ ·105	+ ·136

with KRON's geometrical elements (a much too large ratio of the radii was derived here by NEKRASSOVA) if we assume the normal conditions of limb darkening. An explanation may possibly be found in the fact that at this wave length between Hζ and Hη the intensity of the spectrum is considerably depressed by the wings of the Balmer lines. At the limb of an A type star the emitted light, coming from less deep layers, must show narrower Balmer lines. Hence the distribution of intensity over the stellar disc cannot be expected to show, for such a wave length, the regular law adopted in our formulas for limb darkening.

An analogous influence could be supposed, qualitatively, to explain the series of opposite signs in the case of λ 4830 during the partial phase, though, quantitatively, the distance from Hβ seems to be just sufficient to account for only a few percents. It will be interesting to measure the variations at other wave lengths entirely free from any suspicion of influence of hydrogen wings. If these should show normal results measurements in and in the vicinity of Balmer lines are valuable to give information on the behaviour of these lines at the limb of A type stars.

Next to U Cephei and U Sagittae, investigated by REDMAN, 21 Cas seems, by its greater brightness, to be an object appropriate to this purpose.