merely by a change of scale. In the case of the δ -function distribution the calculation can be simplified and the series expansion is not required. The use of these two distributing functions has advantages in addition to their mathematical simplicity. As the big eddies with their relatively higher velocities carry the smaller ones with them, they are most important as far as the Doppler effect is concerned. The velocities of the smaller eddies appear only as fluctuations about the mean value for the big eddies. Unfortunately we have no information about the behavior of big eddies. The statistical theory of turbulence¹ which is so successfully worked out for the equilibrium region in the turbulent spectrum fails to treat the big eddies. In fact the big eddy depends so much on the boundary condition and the manner in which the energy is supplied that a general theory of big eddies cannot be given. The δ -function and the Gaussian function thus become physically most plausible and at the same time represent two examples among all simple distributions, because one distribution is cut off abruptly at a certain point, while the other extends to infinity. The actual distribution is likely to be an intermediate case between these two. A comparison of our results with the observed data would therefore give some general information about the turbulence in stellar atmospheres.

The result of the numerical computation shows that a weak line after being broadened by turbulence looks much shallower than strong lines. This phenomenon was in fact observed by O. Struve in the spectrum of δ Canis Majoris,² a star which is known to have a turbulent atmosphere. It was also found that the flat portion of the curve of growth derived from the δ -function distribution, the δ -curve, is much below that derived from the Gaussian one, the g-curve, with the same mean eddy velocity. In

practice, the mean turbulent velocity is usually evaluated from the flat portion of the curve of growth; if the observed curve of growth is compared with the δ -curve then the mean turbulent velocity would be much greater than if the observed curve had been compared with the g-curve. This might be a reason why all weak lines are much broader than might be expected from the value obtained from the strong lines (i.e., values determined from comparison with the g-curves) as was pointed out by O. Struve.²

Another application of this investigation is to the theory of interstellar lines. If there are a number of interstellar clouds between the star and the observer, the final line profile and curves of growth of interstellar lines can be given directly by the present method. For example we can derive the formula for the equivalent widths of interstellar lines which L. Spitzer³ first obtained by a different method of approach. We believe that by considering the mean line-absorption coefficient the problem of the formation of an interstellar line due to several clouds can be solved a little more easily than by other methods.

1. For a review of statistical theory of turbulence see, e.g., S. Chandrasekhar, *Ap. J.* **110**, 329, 1949.
2. *Ap. J.* **104**, 138, 1946; **110**, 455, 1949.
3. *Ap. J.* **108**, 276, 1948.

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Huffer, C. M. and Zdeněk Kopal. Photoelectric studies of VV Ori, RZ Cas, WW Aur, TV Cas and U Oph.

Light curves of five eclipsing binary stars have been completed at the Washburn Observatory. These photoelectric measures were made mostly during the last two years using the 1P21 photomultiplier, which has its maximum sensitivity in the blue region of the spectrum. The computations were made at the Massachusetts Institute

Period	VV Ori 1 ^d 4853799	RZ Cas 1 ^d 1952519 variable	WW Aur 2 ^d 52501906	U Oph 1 ^d 6773522	TV Cas 1 ^d 8126098
I— λ_a	.110 $\pm$ 3	.755 $\pm$ 2	.398 $\pm$ 3	.405 $\pm$ 6	.050 $\pm$ 6
I— λ_b	.245 $\pm$ 4	.046 $\pm$ 2	.475 $\pm$ 3	.464 $\pm$ 5	.593 $\pm$ 7
Radius r_a	.2094 $\pm$ 19	.241 $\pm$ 2	.1605 $\pm$ 11	.247 $\pm$ 2	.283 $\pm$ 14
Radius r_b	.4145 $\pm$ 36	.284 $\pm$ 2	.1612 $\pm$ 11	.263 $\pm$ 2	.307 $\pm$ 15
Ratio k	.505 $\pm$ 8	.848 $\pm$ 18	.997 $\pm$ 9	.939 $\pm$ 13	.92 $\pm$ 4
Incl. i	80 ^o .9 $\pm$ 2	82 ^o .14 $\pm$ 6	87 ^o .65	86 ^o .57 $\pm$ 7	80 ^o .8 $\pm$ 3
Duration of eclipse	2 ^m 09 $\pm$ 3	1 ^m 171 $\pm$ 2	1 ^m 036 $\pm$ 4	1 ^m 69 $\pm$ 1	1 ^m 95 $\pm$ 4
Duration of totality	1 ^m 042 $\pm$ 3				
Primary minimum	transit	occultation	ambiguous	transit	transit