the theory of their origin presented by van de Hulst, Spitzer, Frieman, Layzer, and others. The observational evidence suggests that in the final stages of development their tips become larger in diameter than their necks, and eventually break off, forming separate droplets. Several different observations show that the densities in the bright ionized rims of the comet-tail structures are considerably higher than the densities in the main bodies of the emission nebulae to which they belong. Finally, the application of these structures to the galactic structure problems of locating distant O stars and of determining the distances of *HII* regions is discussed.

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Parker, James M. Line contours and wave lengths in the flash spectrum without eclipse.

Flash spectra between 5000 and 6600 Å have been obtained without eclipse, with the 150-foot solar tower telescope on Mount Wilson. The observations were confined to vertical heights above the limb between 0 and 500 km, with the inherent integration along the line of sight over all the layers of the chromosphere.

A total of 1882 emission lines were observed with dispersions of 0.53 Å/mm in the second order or 0.35 Å/mm in the third. Of these, 1131 were identified with *H*, *He*, *C*₂, *O*, *Na*, *Mg*, *Si*, *Ca*, *Sc*, *Ti*, *V*, *Cr*, *Mn*, *Fe*, *Co*, *Ni*, *Y*, *Zr*, *Mo*, *Ba*, *La*, *Ce*, *Pr*, and *Nd*. For 1143 lines with wave lengths in the Rowland atlas, the mean difference (chromosphere minus Rowland) was $-0.0024 \text{ Å} \pm 0.0005 \text{ Å}$, the Rowland wave lengths referring to the overlying spectrum of the extreme limb of the sun. The relation of this observation to the limb shift is discussed.

Accurate line profiles were obtained for 135 lines from elements with atomic weights between 4 and 144. After correction for the overlying limb spectrum, some apparently doubly-reversed or otherwise altered emission lines were seen to be emission lines of normal appearance. No observational evidence for the existence of self-absorption was found in the profiles of the lines used.

Voigt functions were used to describe the observed and the instrumental profiles. After correction for instrumental distortion, the observed lines were found to be broad and non-Gaussian in shape. If, on the assumption that the profiles are actually Gaussian, the entire half-widths of the lines are assumed to arise from pure thermal

broadening, kinetic temperatures ranging from 11,000°K to 55,000°K are derived for the various elements. The inclusion of a maximum permissible turbulent velocity of 2 km/sec increases the wide discrepancy between the temperatures, while leaving the higher values essentially unaltered. Various sources of line broadening are considered, and reasons advanced for neglecting all of them, including self-absorption.

If the non-Gaussian character of the profiles is taken into account, and the lines are considered as having been formed by contributions from the various heights along the line of sight, the observed line profiles may be adequately explained, on the basis of van de Hulst's model chromosphere, by invoking a physically reasonable increase of turbulent velocities with height. The variation is from about 1.5 km/sec at zero height to about 19.5 km/sec at 5000 km. With van de Hulst's density gradient, the absence of turbulence at the various levels would require an extremely high temperature gradient in order to produce the observed profiles. The various hot- or cold-spicule models of the chromosphere suffer from similar difficulties in the absence of turbulence, unless the major mass of the chromosphere is at a very high temperature, about 40,000°K. The latter condition is considered as unlikely, for a variety of reasons.

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Popper, Daniel M. The giant eclipsing binary, RZ Cancr.

Although the available spectrographic and photometric observations of the 21-day eclipsing binary, RZ Cancr, are as yet inadequate for a definitive analysis of the system, preliminary results are of sufficient interest to justify a report. Approximate spectrographic elements, based on Mount Wilson coude spectrograms of the visual region of the spectrum, are

$$K_1 = 14 \text{ km/sec}, \quad K_2 = 96 \text{ km/sec}, \\ \gamma = +14 \text{ km/sec}.$$

The fractional radii and orbital inclination, estimated from an incomplete two-color photoelectric light curve obtained at the Lowell Observatory, are in reasonable agreement with those determined by Gaposchkin (1949) from Harvard patrol plates. Gaposchkin's values are

$$r_1 = 0.21, \quad r_2 = 0.25, \quad i = 87^\circ 5'.$$

The hotter star is the smaller, brighter, and more massive. Preliminary values of the color indices, $B-V$, are $+1.1$ mag. and $+1.4$ mag., which correspond to spectral types K1 III and K4 III, respectively. Hiltner's (1946) estimated spectral types are K2 III and K5 III.

Combining spectrographic and photometric data yields the following properties of the individual stars, which appear to have somewhat smaller radii than do typical giants.

Type	Mass	Radius	M_{pv}
K1 III	2.6 $\odot$	10 $\odot$	+1.2
K4 III	0.4	12	+2.0

Further spectrographic observations will be obtained in order to determine K_1 , and hence the mass of the cooler star, reliably. Definitive two- or three-color light curves in the U, B, V system are also needed.

Gaposchkin, S. 1949, *Bull. Astr. Obs. Harv.*, No. 919.

Hiltner, W. A. 1946, *Pub. A. S. P.* 58, 166.

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Poveda, Arcadio. Studies of interstellar extinction at high galactic latitudes.

Investigations of the spatial distribution of galaxies by Neyman, Scott and Shane are based on the simplifying assumption that the regions in the sky covered by their work are free from irregular galactic absorption. This point may be investigated by comparing Shane's and Wirtanen's counts of images of galaxies with the counts of faint stars. If the region studied contains irregular interstellar clouds then these clouds will affect the apparent magnitudes of some stars and of all the galaxies and thus create a positive component in the covariance between the two counts.

Empirical material for the study is composed of Shane's and Wirtanen's counts in $10' \times 10'$ squares and of the author's counts of faint stars, of apparent magnitude roughly between 14.5 and 18.7, made in $4' \times 4'$ squares concentric with the $10' \times 10'$ cells used for counts of galaxies.

Unfortunately, in addition to the possible presence of interstellar clouds, there are several other possible sources of positive correlation between counts of galaxies and of faint stars. These include (1) errors in counting, for sometimes when counting stars we misidentify a nebula and call it a star, and vice versa; (2) plate effect, or irregularities of emulsion sensitivity and developing process; (3) telescopic effect, for at the

center of a plate the counts are higher than at the edges. In order to check the importance of (1) an experiment was performed with 16 standard nebulae supplied by Dr. Sandage with $17.6 \leq m_{pg} \leq 19.2$. The result gave us the probability, when counting stars, of classifying a nebula as a star approximately equal to 0.02, for counts on the 20-inch survey plates. This type of error is not considered important. In order to eliminate (2) and (3) eleven fields were selected for study for which there are available duplicate plates taken at the Lick Observatory either by Dr. C. D. Shane or by Mr. Wirtanen; for all of these plates there are available duplicate counts of stars, and for some of them duplicate counts of nebulae.

Let $X_{f,i,j,k}$ denote the number of stars obtained at the j th count ($j = 1, 2$) in the k th square ($k = 1, 2, \dots; K = 1296$) of the i th plate ($i = 1, 2$) taken over the f th field ($f = 1, 2, \dots; F = 11$), and a dot the average over the index it replaces. With this notation, the estimate of the covariance component between the counts of galaxies and the counts of stars due to irregular galactic absorption is given by either of the expressions (a) or (b):

$$(a) \quad \frac{1}{K} \left[\sum_{k=1}^K X_{f1 \cdot k} Y_{f2 \cdot k} - \frac{F}{F-1} \sum_{k=1}^K X_{\dots k} Y_{\dots k} + \frac{1}{F(F-1)} \sum_{f=1}^F \sum_{k=1}^K X_{f \dots k} Y_{f \dots k} \right],$$

$$(b) \quad \frac{1}{K} \left[\sum_{k=1}^K X_{f2 \cdot k} Y_{f1 \cdot k} - \frac{F}{F-1} \sum_{k=1}^K X_{\dots k} Y_{\dots k} + \frac{1}{F(F-1)} \sum_{f=1}^F \sum_{k=1}^K X_{f \dots k} Y_{f \dots k} \right],$$

where $Y_{f,i,j,k}$ is a similarly defined quantity for the number of nebulae.

Preliminary results indicate these covariances are very small or zero.

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Rense, Wm. A. Solar Lyman α radiation.

On May 8 several photographs of the sun's disk in Lyman α radiation, $1215.7 \text{ \AA}$, were obtained from an intermediate aerobee rocket at an altitude of about 150 km. Lithium fluoride optics were used. The photographs, though of low re-