
ABSTRACTS***Bappu, M. K. Vainu. A spectroscopic study of Wolf-Rayet stars.**

A study has been made of the profiles and total intensities of the emission lines of seven bright Wolf-Rayet stars in Cygnus, three of which belong to the carbon sequence and the rest to the nitrogen sequence. The well known eclipsing binary CQ Cephei was also included on the program, and the variations in the profiles of the emission lines and their total intensities during a cycle investigated.

The broad emission band $\lambda 4058$, tentatively identified as due to *NIV*, has been found to be split into three components with wave lengths of 4044, 4057, and 4066 Å. The lines $\lambda 4044$ and $\lambda 4066$ have been tentatively identified as due to *NII* and *CIII*, respectively. The line $\lambda 4066$ *CIII* is moderately strong in carbon stars and as carbon lines have been found in nitrogen stars this identification is probably correct. The flat-topped nature of $\lambda 4058$, as shown by Beals to exist in BD 35°4001, can then be explained as due to the

* Of papers presented at the Eighty-fifth Meeting of the American Astronomical Society, Washington, D. C., June 20-23, 1951.

blending by physical causes of these components. The line $\lambda 5696$ in carbon stars, identified as due to CIII, has been observed to have a short wavelength component, $\lambda 5681$, which has been tentatively identified with the $3s^2P^0-3p^3D$ transition of NII. If such an identification is correct, one would expect the transition $3s^2P^0-3p^3P$, $\lambda 4630$, to be observable and of medium intensity. The observation of this line is difficult because of the violet-absorption edge of $\lambda 4650$ due to CIII. Nevertheless, the line has been detected in BD $35^\circ 4013$.

The occurrence of central reversals in Wolf-Rayet stars is a rare phenomenon. The spectrograms of BD $35^\circ 4001$ reveal a deep core for $\lambda 4686$ HeII, and a faint one for $\lambda 5411$ HeII. These might be central reversals or they may possibly be due to a non-uniform distribution of the emission on the stellar surface.

Intrinsic variations of the spectral lines, as has been shown by Struve¹ to exist in HD 151932, have been found in two stars of the nitrogen sequence, BD $37^\circ 3821$ and BD $35^\circ 4001$. The emission line $\lambda 4603$ Nv and its violet-edge experience changes in intensity. The line $\lambda 4640$ of NIII, and the NIII lines blended with $\lambda 4542$ HeII as well as $\lambda 4471$ HeI also show marked fluctuations.

In the case of the eclipsing variable CQ Cephei, the profile of $\lambda 4686$ HeII has been determined at different phases. While changes in form and intensity are immediately apparent, no marked asymmetry, as has been found by Beals² for $H\alpha$ in V444 Cygni, has been found here. The intensities of the band $\lambda 4640$ have a curve of variation with phase, similar to the $\lambda 4686$ light curve derived recently by Hiltner.³ The line $\lambda 4058$ NIV has marked violet absorption edges at both primary and secondary minima. The changes in intensity of $\lambda 4542$ and $\lambda 4471$ are similar to those found by Münch⁴ in V444 Cygni.

1. *A. J.* **100**, 198, 1944.

2. *M. N.* **104**, 205, 1944.

3. *A. J.* **112**, 477, 1950.

4. *A. J.* **112**, 266, 1950.