

RADIAL VELOCITIES OF Z SCULPTORIS,  $\xi$  PHOENICIS, AND  $\beta$  CRUCIS

The present note reports on the results of the spectrographic observations of Z Sculptoris,  $\xi$  Phoenicis, and  $\beta$  Crucis with the Bosque Alegre reflector. All the spectrograms—except one of the  $\xi$  Phe, which was kindly secured by Dr. J. Landi Dessy—were obtained by Sahade with the Wood-grating spectrograph, which gives a dispersion of about 42 Å/mm. All the plates—36 for Z Scl, 31 for  $\xi$  Phe, and 21 for  $\beta$  Cru—were measured by Albarracín. As a check, Sahade has remeasured 7 plates of Z Scl, 3 of  $\xi$  Phe, and 9 of  $\beta$  Cru. The star lines used for Z Scl and  $\xi$  Phe are listed in Table 1; for  $\beta$  Cru we have

TABLE 1  
STELLAR LINES USED FOR THE RADIAL-VELOCITY DETERMINATIONS

| Z SCULPTORIS    |         | $\xi$ PHOENICIS |         | Z SCULPTORIS     |         | $\xi$ PHOENICIS  |         |
|-----------------|---------|-----------------|---------|------------------|---------|------------------|---------|
| Element         |         | Element         |         | Element          |         | Element          |         |
| H $\zeta$ ..... | 3889.05 | H15.....        | 3711.97 | H $\delta$ ..... | 4101.74 | Ca II.....       | 3933.66 |
| Ca II.....      | 3933.66 | H14.....        | 3721.94 | Ca I.....        | 4226.73 | Sr II.....       | 4077.71 |
| Ca II.....      | 3968.47 | H13.....        | 3734.37 | Fe I.....        | 4250.46 | H $\delta$ ..... | 4101.74 |
| Fe I.....       | 4005.25 | H12.....        | 3750.15 | Fe I.....        | 4260.48 | Sr II.....       | 4215.52 |
| Fe I.....       | 4045.82 | H11.....        | 3770.63 | H $\gamma$ ..... | 4340.47 | H $\gamma$ ..... | 4340.47 |
| Fe I.....       | 4063.60 | H10.....        | 3797.90 | Fe II.....       | 4351.76 | Mg II.....       | 4481.23 |
| Fe I.....       | 4071.74 | H9.....         | 3835.39 | Fe I+Ti I...     | 4404.75 | H $\beta$ .....  | 4861.33 |
| Sr II.....      | 4077.71 | H $\zeta$ ..... | 3889.05 | Mg II.....       | 4481.23 | .....            | .....   |

used the wave lengths given by Kühlbörn<sup>1</sup> in his study on early B-type stars. It has not been possible, of course, to measure all the lines on each of the corresponding plates, but the minimum of lines measured were 6 for Z Scl, 6 for  $\xi$  Phe, and 9 for  $\beta$  Cru.

Z SCULPTORIS<sup>2</sup>

This star was observed in 1946, 1947, 1948, and 1950, and it was included on the program because Schneller's *Katalog* for 1939 indicated that a variation in brightness from 6.3 to 7.6 mag. had been detected and that the type of variation was *unbekannt*. Quoting S. Gaposchkin,<sup>3</sup> "This star was suspected of variability by Thome (*Córdoba Results*, 17, XII, 1894) and Pickering at first concluded that there was a photographic variation; later, however, he stated that there was no variation (*Harvard Ann.*, 46, 232, 1903). The star is too bright for successful study on the patrol plates but a discussion of over five hundred estimates leads to the conclusion that the variation, if any, is inappreciable with the accuracy that we can attain, the probable error of the median magnitude being 0.05 magnitude." Gaposchkin's value for the photographic magnitude of Z Scl is  $7.60 \pm 0.05$  mag.

The spectral type of Z Scl (Fig. 1) is around F8V, and the radial velocity obtained from our material is  $-13.8 \pm 0.6$  (p.e.) km/sec; the scatter of our results is probably not significant.

 $\xi$  PHOENICIS<sup>4</sup>

$\xi$  Phe was included on the program because it had been announced as an eclipsing variable; after our observations were made, it turned out that there had been a mistake in the greek letter and that the announcement did not actually mean to refer to  $\xi$  Phe.

<sup>1</sup> *Veröff. U.-sternw. Berlin-Babelsberg*, Vol. 12, Part I, 1938.

<sup>2</sup>  $\alpha = 0^{\text{h}}37^{\text{m}}5$ ;  $\delta = -34^{\circ}14'$  (1950.0). GC 789 = CD-34°224 = CPD-34°56 = HD 3735 (Sp. F8).

<sup>3</sup> *Harvard Ann.*, 115, 225, 1950.

<sup>4</sup>  $\alpha = 0^{\text{h}}39^{\text{m}}5$ ;  $\delta = -56^{\circ}47'$  (1950.0). GC 830 = BS 183 (5.83 mag.) = CD-57°137 = CPD-57°143 = HD 3980 (Sp. F0p).



FIG. 1.—Positive enlargements of spectra of Z Scl,  $\xi$  Phe, and  $\beta$  Cru

The spectrographic material was obtained in the interval July-September, 1949, and there is an additional plate secured in 1946 for surveying purposes. The *Henry Draper Catalogue* remarks that "the spectrum is very peculiar, and resembles the composite type in combining strong *H* lines with several intense solar lines. The strontium lines 4077.9 and 4215.7, and the double silicon line 4128.1, 4131.1 are specially well marked." Actually,  $\xi$  Phe is a peculiar star of around A8 spectral type (Fig. 1), which belongs to the "strontium-europium" group. Outstanding absorption lines, besides those of *H* and *Ca*  $\Pi$ , are the *Sr*  $\Pi$  4077 and 4215 lines,  $\lambda$  4290, and *Mg*  $\Pi$  4481. High-contrast plates of  $\xi$  Phe will be obtained in order to publish a list of wave lengths and identifications.

The radial velocity of  $\xi$  Phe, as derived from our material, is  $+7.1 \pm 0.6$  (p.e.) km/sec, a value which agrees, within expected limits from the probable errors, with the one quoted in Moore's *General Catalogue of Radial Velocities*,<sup>5</sup> namely,  $+9.8 \pm 0.8$  (p.e.) km/sec. The latter value was determined as a mean from several measures of four plates taken in Chile with a linear dispersion of about 20 A/mm.

The scatter of our velocities is probably not significant; furthermore, the mean values for *H* and for the other elements are practically the same. However, it seems in order to mention that, on one plate which yields a mean radial velocity as high as  $+20$  km/sec, three *H* lines give  $+36 \pm 2.2$  (p.e.) km/sec and the rest of the elements (four lines),  $+9 \pm 2.2$  (p.e.) km/sec, while from a plate taken immediately after, under the same conditions, we have  $+4$  km/sec for the mean value,  $0 \pm 2.8$  (p.e.) km/sec for five *H* lines, and  $+9 \pm 2.4$  (p.e.) km/sec for the rest of the elements (three lines).

The plates were examined for variation in line intensities, and no strong evidence for the existence of such a phenomenon was found.

#### $\beta$ CRUCIS<sup>6</sup>

The second brightest star of the Southern Cross was spectrographically observed at Bosque Alegre in 1946, 1947, and 1950, because of the remark in the *Henry Draper Catalogue* that on one plate "4387.8 and 4471.8 appear to be slightly bright on the edge of the greater wave length" and because it had been announced by W. H. Wright<sup>7</sup> as having variable radial velocity with a range of 19 km/sec. The plates on which Wright's report was based—10 in number—had been taken in the years 1904, 1905, 1907, and 1909. The results from them are listed in the *Lick Catalogue of Stellar Radial Velocities*,<sup>8</sup> together with those from 46 later spectrograms; the mean value from all this material, namely,  $+20.0 \pm 0.5$  (p.e.) km/sec, was adopted in Moore's *General Catalogue of Radial Velocities*<sup>9</sup> only as a provisional radial velocity of  $\beta$  Cru.

The radial velocities obtained from our material are listed in Table 2; their mean value is  $+10 \pm 1.0$  (p.e.) km/sec. The probable error of the individual radial velocities is of the order of  $\pm 2.0$  km/sec, and therefore the scatter shown by our measures is somewhat large, the range being of the order of the one previously announced. However, all the available values for the radial velocities of  $\beta$  Cru (those appearing in Moore's *Catalogue* and ours) do not suggest any period for representing them. The fact that the mean values from the material considered by Moore and from our material differ by an amount larger than is consistent with the probable errors affecting them would seem to support the hypothesis that  $\beta$  Cru actually shows variation in velocity. The possibility that the difference may arise from the different values in the wave lengths adopted by the Lick

<sup>5</sup> *Lick Obs. Pub.*, 18, 5, 1932.

<sup>6</sup>  $\alpha = 12^{\text{h}}44^{\text{m}}8$ ;  $\delta = -59^{\circ}25'$  (1950.0). GC 17374 = BS 4853 (1.50 mag.) = HD 111123 (Sp. B1).

<sup>7</sup> *Lick Obs. Bull.*, 5, 176, 1909. The reference is quoted in Moore's *Third Catalogue of Spectroscopic Binary Stars* (*Lick Obs. Bull.*, No. 355, 1924).

<sup>8</sup> *Lick Obs. Bull.*, 16, 188, 1928. The linear dispersion of the spectrograms was either 10 or 20 A/mm.

<sup>9</sup> *Op. cit.*, p. 103. The revised spectral type quoted is B1s.