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RADIAL VELOCITIES OF α PERSEI AND ζ PERSEI

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During the winter season 1948-1949 spectra were obtained for α Persei and ζ Persei for measuring radial velocities. The elements of JORDAN for α Persei are largely confirmed. The spectrum of the secondary of α Persei was not observable on our plates. For ζ Persei a possible duplicity could not be confirmed with any certainty.

During the winter season 1948-1949 the first two authors obtained 27 spectra for the spectroscopic double star α Persei and 17 spectra for ζ Persei with a one-prism spectrograph attached to the 13" photographic refractor of the Leiden Observatory, with the aim of measuring radial velocities. The dispersion was 25 Å/mm at H_γ . They also performed part of the reductions and preliminary measurements of some plates. After their departure for South Africa the last author made the definitive measurements of all plates

and took care of the preparation of this paper, for which he thus has the full responsibility.

On the spectra the lines from the list by PETRIE¹⁾ for early-type B stars were measured. On some plates it was not possible to measure all these lines. Weights were determined for these lines for the two stars. Systematic corrections were necessary for three lines. These corrections were about equal for α Persei and ζ Persei, so we used the average for both stars. The lines used and their weights and corrections are given in Table 1. The Ca^+ line, which may have an interstellar origin, was treated separately.

For every spectrum we determined the average velocity and its weight from all measured lines. The results are given in Table 2.

TABLE I

The lines measured in the spectra of α Persei and ζ Persei

λ	elements	weight α Per	weight ζ Per	correction
4861.33	H_β	1.5	1	-14.4 km/sec
4567.84	Sc^{++}	1	2	
4552.62	Sc^{++}	3	13	
4471.40	He, He	5	6	-2.6 km/sec
4387.93	He	2	3	
4340.47	H_γ	3	2	
4267.17	C^+ , C^+	4	3	-7.7 km/sec
4120.84	He, He	1	7	
4101.74	H_δ	4	8	
4069.77	O^+ , O^+	3	11	
4026.14	He, He, N^+ , F^+ , Fe^{++}	4	8	
3995.00	N^+	5	3	
3970.07	H_ϵ	2	1.5	
3964.73	He	4	1.5	
3933.66	Ca^+			

α Persei

JORDAN²⁾ in his study of α Persei found also the spectrum of the second component, not discovered by previous investigators. It is remarkable that we were not able to find the spectrum of the second component with any certainty although we especially searched for it. From the work of JORDAN, who used many more spectra than we did, it appears that the orbital eccentricity in α Persei, if present, must be

¹⁾ R. M. PETRIE, *Publ. Dom. Ap. Obs.* 9, 297, 1953.

²⁾ F. C. JORDAN, *Allegheny Publ.* II, 63, 1910.

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small. We therefore fitted our observations by least squares to the formula

$$v = v_0 + A \cos 2\pi(\varphi - \varphi_0),$$

where the phases φ were computed using JORDAN's elements. These phases are also given in Table 2. Our results compare to those of JORDAN as follows:

	present investigation	JORDAN
v_0	$+ 22.6 \pm 2.5$ km/sec	$+ 18.5 \pm 0.7$ km/sec
A	$+ 112.3 \pm 3.3$ km/sec	$+ 111.9 \pm 1.0$ km/sec
φ_0	$+ 0.012 \pm 0.009$	

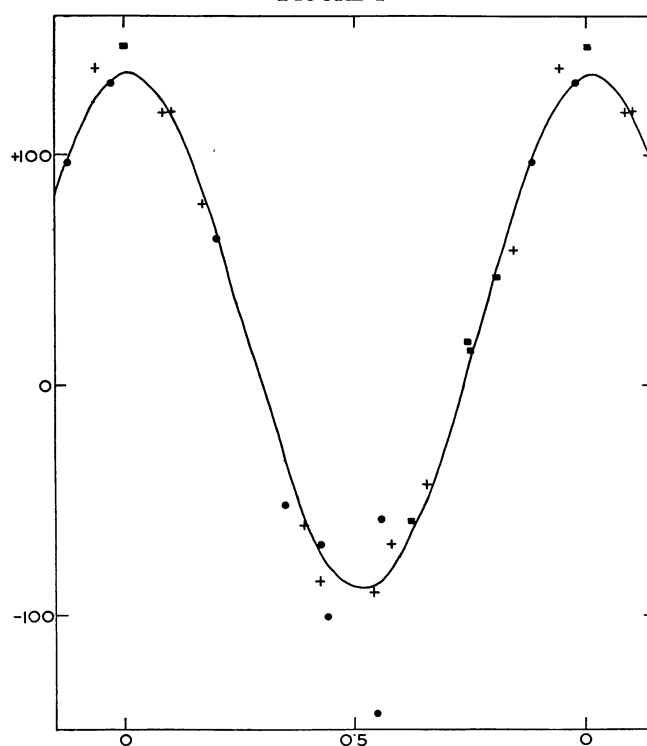
TABLE 2
Radial velocities of α Persei and ζ Persei

α Persei					
No plate	J. D. hel 243	Phase	Velocity	Weight	Vel.-Ca ⁺ 3933
30	2803.5961	0.5530	- 58.4	2.5	+31.4
32	805.5592	.9972	+147.1	8	+ 2.3
34	812.5459	.5783	- 69.3	5	+29.4
36	813.5387	.8030	+ 46.3	8	+15.1
37	881.4338	.1668	+ 78.5	5	- 1.4
40	882.5698	.4239	- 85.6	4.5	+19.2
41	883.4317	.6189	- 59.0	8	+ 9.4
44	886.6403	.3448	- 52.1	1	
45	887.5295	.5462	-143.6	1.5	
51	972.3613	.7424	+ 18.5	12	+10.0
52	975.4406	.4394	-101.1	2	
53	978.2882	.0836	+118.0	4	+22.5
54	978.3665	.1013	+118.7	3.5	+24.2
55	980.3052	.5401	- 90.3	4.5	- 0.8
59	995.3203	.9378	+137.2	5	+27.6
60	997.3116	.3885	- 60.7	4.5	+14.6
61	999.3068	.8400	+ 58.5	6.5	+17.7
63	3003.3222	.7485	+ 14.3	11	+21.7
64	004.3115	.9725	+131.0	2.5	+28.3
65	005.3080	.1979	+ 63.9	2.5	+17.7
66	006.3132	.4253	- 69.5	2	
67	007.3170	.6525	- 43.5	4	(-15.9)
68	008.3124	.8777	+ 96.8	1.5	+19.7
ζ Persei					
32	2805.5832		+27.3	1	+26.9::
34	812.5720		+24.9	2	
36	813.5682		+30.0	1	
38	881.6202		+22.3	1.5	+30.2
51	972.3933		+34.8	2	+32.8
53	978.3237		+29.1	5	+18.9
55	980.3437		+24.7	2	+24.7
59	995.3535		+32.4	4.5	+11.6
60	997.3454		+33.8	3.5	+12.6
61	999.3385		+28.4	3	+18.2
64	3004.3447		+19.8	2.5	+32.2
65	005.3488		+32.3	1.5	+35.3
66	006.3488		+22.9	1	+16.7
67	007.3530		+34.9	1.5	
68	008.3487		+31.9	2	

The computed sine curve and the individual observations are shown in Figure 1.

It is seen that the amplitudes in the two investi-

FIGURE 1



Radial-velocity observations of α Persei

weight	symbol
1 - 3	•
3.5 - 7	+
7.5 - 12	■

The curve is given by $v = 22.6 + 112.3 \cos 2\pi(\varphi - 0.012)$

gations are essentially equal. This demonstrates that our results are not influenced by the spectrum of the second component. This is a very curious fact and suggests that the spectrum of the secondary was decidedly fainter in 1948-1949 than at the time of JORDAN's observations. The cause of this phenomenon might be variability of the secondary, but nothing is known with certainty. Further investigation of this point might prove of interest. It is seen that JORDAN's period fits the observations still quite well after a lapse of forty years.

The K line of Ca⁺ does not partake in the motion of the system and thus is interstellar. The velocity of this line derived from 18 spectra is $+17.1 \pm 2.4$ km/sec.

As is shown below, a correction of -8.6 km/sec to our velocities is necessary to bring them in the system of WILSON's 'General catalogue of stellar radial velocities'¹⁾.

Deriving a new period from JORDAN's and our own observations and averaging the amplitudes of both investigations, but using only our own corrected values for the mean velocity of the system and the

¹⁾ R. E. WILSON, 'General catalogue of stellar radial velocities', *Carnegie Inst. Publ.* No. 601, 1953.