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A LIST OF NINE STARS WHOSE VELOCITIES IN THE LINE OF SIGHT ARE VARIABLE.

By W. W. CAMPBELL and W. H. WRIGHT.

THE following nine spectroscopic binaries, discovered with the Mills spectrograph, are additional to the sixteen already announced.

The results expressed in integers are only approximate, and in most cases will be slightly changed by the final measures and reductions.

12 PERSEI ($\alpha = 2^h\ 36^m$; $\delta = +39^\circ\ 46'$).

The binary character of this star was discovered in January, from the second spectrogram. The spectra of both components are visible on the first three plates, and are not very unlike. On the last plate the two spectra appear to be coincident.

Date		Velocities
1899	Dec. 19	−42 km and ± 0 km
1900	Jan. 22	− 3 " − 54
	Jan. 26	−11 " − 43
	Aug. 7	−27

The velocity of the system is about −25 km per second.

ξ URSAE MAJORIS ($\alpha = 11^h\ 13^m$; $\delta = +32^\circ\ 06'$).

The principal component of this well-known double star has a variable velocity in the line of light. ξ *Ursae Majoris* is therefore a triple system. The visible system is interesting, historically, as having been the first one to show orbital motion, the two visible components forming a close and rapidly revolving system ($a = 2''.5, P = 60$ years). It has been observed with the micrometer very frequently since the beginning of the century, but no evidences of perturbative influences have been revealed by the measurements.

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1900ApJ....12..254C

	Date	Velocity
1897	Feb. 23	− 8.4 km
	April 8	−15
1899	Feb. 22	−11.5
	April 5	−14.1
1900	Feb. 26	−21.9
	Mar. 9	−18.4
	Mar. 12	−19
	Mar. 14	−21.6
	Mar. 20	−20
	May 8	−18

The variable velocity was discovered early in March, from the fifth plate.

The spectrograms obtained in 1897 are rather poor, and will probably not be needed in the final discussion of the motion.

93 LEONIS ($\alpha = 11^h\ 43^m$; $\delta = +20^\circ\ 46'$).

The first two plates of this star were underexposed, but the discordance of eight kilometers afforded strong suspicion of its variable velocity. Two late plates confirmed the fact of its variability.

	Date	Velocity
1900	Jan. 10	+22 km
	Jan. 16	+14 ±
	Apr. 9	−16
	May 14	+16

d BÖOTIS ($\alpha = 14^h\ 06^m$; $\delta = +25^\circ\ 34'$).

	Date	Velocity
1900	Mar. 27	+79 km
	April 4	+ 3
	April 9	+11
	April 17	+60 ±

The variable velocity was discovered from the second plate

β SCUTI ($\alpha = 18^h\ 42^m$; $\delta = -4^\circ\ 51'$).

	Date	Velocity
1899	May 15	−17 km
	June 11	−11
1900	April 17	−28
	April 23	−29
	May 14	−32
	July 18	−31

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1900ApJ....12..254C

The variable velocity was discovered from the third plate.

113 HERCULIS ($\alpha = 18^h\ 50^m$; $\delta = +22^\circ\ 32'$).

Date		Velocity
1900	June 5	−35 km
	July 9	−21
	July 17	−19
	July 31	−16

The variation was discovered from the second plate,

2 SCUTI ($\alpha = 18^h\ 37^m$; $\delta = -9^\circ\ 09'$).

Date		Velocity
1899	June 14	−49 km
	June 19	−50
	July 3	−45
1900	June 27	−40
	July 3	−38
	Aug. 1	−49
	Aug. 12	−38

The lines in this star's spectrum are rather broad, and cannot be measured very accurately. In addition, the third plate was underexposed; and the range of five kilometers in the approximate results for the first three plates afforded only a slight suspicion of vriability. Its reality was established from the fourth plate.

η ANDROMEDAE ($\alpha = 0^h\ 52^m$; $\delta = +22^\circ\ 52'$).

Two components seem to be visible in the spectrograms of this star. The results for the principal component are:

Date		Velocity
1899	Oct. 24	−25 km
	Oct. 31	−26
1900	July 24	−12
	Aug. 8	+ 2
	Sept. 9	− 2

The two component spectra appear to be practically coincident in the spectrogram of 1900, July 24.

κ PEGASI ($21^h\ 40^m$; $\delta = +25^\circ\ 11'$).

It will be recalled that this is the visual binary star having the shortest known period ($a = 0''.4$, $P = 11$ years). It was

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discovered by Burnham in 1880 with the 18½-inch telescope, and is one of the difficult stars on his list. The two components are described as yellowish, and of magnitudes about 4½ and 5. The present distance of the components is less than 0".2, in position angle 260° ±. It is not possible to photograph their spectra separately with the Mills spectrograph.

One of the components of this double star — probably the component whose spectrum is the stronger in the *Hγ* region — is a spectroscopic binary. *κ Pegasi* is therefore a triple system of great interest. The observations secured are as follows:

Date		Velocity
1896	Aug. 31	−43 km
1899	July 17	−41
1900	Aug. 6	+35
	Aug. 7	+27
	Aug. 8	−16
	Aug. 12	+35
	Aug. 21	−45
	Aug. 22	−34

The variable velocity was discovered from the third plate. The period seems to be about six days.

Changes in the appearance of the spectrum occur, but their source has not yet been traced.

[NOTE BY W. W. C.—Mr. Wright was in charge of the work with the Mills spectrograph during my connection with the Crocker Eclipse Expedition to Georgia, from March to late in July. While following the regular program of observation, he detected the variable velocities of the stars *ξ Ursae Majoris*, *d Böotis*, *β Scuti*, *113 Herculis*, and *2 Scuti*, as described above; and the credit for these five discoveries belongs to him.]

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