f DRAGONIS ($\alpha = 17^{\text{h}} 32^{\text{m}} 4^{\text{s}}$; $\delta = +68^{\circ} 12'$; Magn. = 5.2;
Type = K).

Gr. M.T.	Velocity	Measured by
1906 July 9.743	—76.3 km.	Newkirk and Miss Allen
Aug. 30.696	—75.6	Newkirk and Miss Allen
1907 June 26.748	—75.5	Miss Hobe
1909 May 6.995	—71.3	Miss Hobe
1910 March 7.048	—71.1	Lows
April 17.926	—71.5	Lows
" "	—71.7	Merrill

The variable velocity was discovered by Miss Hobe from the fourth plate.

A SAGITTARI ($\alpha = 19^{\text{h}} 52^{\text{m}} 8^{\text{s}}$; $\delta = -26^{\circ} 28'$; Magn. = 5.0;
Type = G5).

Gr. M.T.	Velocity	Measured by	Remarks
1908 July 15.873	—49.6 km.	Miss Allen	
July 23.839	—48.1	Miss Allen	
Sept. 4.623	—36.5	Curtis	2-prism
" "	—36.1	Olivier	" "
Sept. 8.617	—39.0	Curtis	2-prism
1909 June 22.840	—45.0	Mrs. Moore	
Aug. 9.730	—48.0	Mrs. Moore	

The variation in velocity was observed by Mr. Campbell, on comparing the third result, obtained by Curtis and Paddock in Chile, with the first and second, obtained at Mt. Hamilton. The last four plates were secured by the D. O. Mills Expedition.

α CYGNI ($\alpha = 20^{\text{h}} 38^{\text{m}} 0^{\text{s}}$; $\delta = +44^{\circ} 56'$; Magn. = 1.3;
Type = A2).

Gr. M.T.	Velocity	Measured by	Remarks
1896 Aug. 3.855	—2. km.	Campbell	Only H γ line
Aug. 9.871	—4.	Campbell	Only H γ line
Aug. 10.831	—0.	Campbell	Only H γ line
Sept. 8.165	—1.	Campbell	Only H γ line
1899 Aug. 14.887	—1.8	Burns	
Aug. 23.854	—1.4	Burns	
1902 Sept. 14.779	—4.8	Burns	
1904 Nov. 22.685	—4.7	Moore	
1905 July 2.977	—6.5	Burns	
" "	—7.9	Moore	
Aug. 3.939	—5.9	Moore	
Sept. 7.856	—2.4	Albrecht	
1907 June 2.974	—5.9	Merrill	
Aug. 5.979	—6.1	Young	
1909 Dec. 27.570	—4.9	Albrecht	

It is not intended to use the first four results in definitive computations. The variable velocity was determined by Campbell and Albrecht. Independent discovery was made by Lee, as published in the *Astrophysical Journal*, 31, 177, 1910.

W. W. CAMPBELL.

June 10, 1910.

THE SPECTRA OF SOME WOLF-RAYET STARS.

In the summer of 1908, during the course of some work on radial velocities with the 36-inch telescope and single-prism spectrograph of the Lick Observatory, it was found convenient to photograph the spectra of a few of the brighter stars of the Wolf-Rayet type. Ten measurable plates, including seven different stars, were secured. During my stay at Mount Hamilton time was found for the measurement of only three of these plates,—those of Campbell's "Hydrogen Envelope" star, B.D. +30:3639. The

others were measured during a visit at Flagstaff, Arizona, in August, 1909, with a measuring engine kindly made available by the Lowell Observatory.

The spectra of these and many other stars of the same type were investigated several years ago by Director Campbell,¹ but since then a photographic "correcting lens" has been placed in front of the slit, and a spectrograph greatly improved for photographic observation, particularly in regard to rigidity and temperature control, has been provided.

The photographs are as follows:

Plate	B.D.	P. S. T. of Mid-exp.	Duration of Exposure	Slit Width mm.	Comp'n Spec.	Kind of plate
12C	+30° 3639	1908 July 4d 15h 18m	90m	.063	Fe	Lumiere Σ
17B	30 3639	July 7 14 51	140	.058	H	Lumiere Σ
27C	30 3639	July 21 15 2	146	.063	H	Lumiere Σ
32A	35 3953	July 25 14 36	60	.038	Fe	Lumiere Σ
33A	36 5956	Aug. 1 13 32	95	.040	H	Cramer Iso Inst.
39H	36 3956	Aug. 8 14 14	120	.040	Fe	Seed 27
44B	35 4013	Aug. 11 13 24	140	.040	Fe	Seed 27
47C	37 3821	Aug. 15 11 43	74	.040	Fe	Lumiere Σ
48B	36 3987	Aug. 15 13 39	134	.040	Fe	Lumiere Σ
56A	+43 3571	Sept. 3 11 38	75	.038	Fe	Seed 27

¹ *Astronomy and Astrophysics*, 13, 448, 1894.

Inspection and measurement of the plates resulted in collecting the following data:

B.D. +30°3639.

Plate 12C.—Bright and narrow $H\beta$, $H\gamma$, $H\delta$, $H\epsilon$; bright and narrow line at $\lambda 4068.41$; bright band 7.3 A. U. wide at $\lambda 4651.80$; faint continuous spectrum on either side of band, brighter toward red.

Plate 17B.—Measurements on this plate give $\lambda 4651.5$ and $\lambda 4068.30$ for band and unknown line.

Plate 27C.—Line at $\lambda 4068.58$, band at $\lambda 4651.30$.

The definite character of the hydrogen lines and the stability of the spectrograph enabled the star's radial velocity to be determined with considerable accuracy. For this purpose the lines $H\gamma$, $H\delta$, and $H\epsilon$ were used. The results were:

Date	Velocity relative to Sun
1908 July 4	—25.4 km. per second
July 7	—32.3
July 21	—33.0
Mean	—30.2

These numbers represent the mean of velocities found from two sets of measures separated in time by about a year. The agreement between the two sets is good, the greatest discrepancy being 6 km. per sec., for the plate of July 4.

B.D. +35°3953.

Plate 32A.—In the photographic region no bright lines or bright bands were observed, but there are absorption lines at $\lambda 4340.40$ ($H\gamma$), 4471.43 and 4120.84 —all very faint but fairly definite. Several other dark lines suspected. Velocity relative to Sun, derived from displacement of $H\gamma$, —8 km. per sec.

B.D. +36°3956.

Plate 33A.—Plate underexposed. Very faint, fairly narrow band at $\lambda 4627.5$; bright band extending from $\lambda 4636.2$ to $\lambda 4670.0$.

Plate 39H.—Faint continuous spectrum to violet of $\lambda 4270$; faintly luminous band about 35 A. U. wide with maximum intensity at $\lambda 4441$; fairly narrow band at $\lambda 4632.4$; bright band $\lambda 4634.3$ to $\lambda 4704.3$ with sudden drop in intensity at $\lambda 4669.59$, the redward end being fainter. Maximum of a faintly luminous

band at $\lambda 4785.2$. Narrow maxima suspected in brightest band.

B.D. +35°4013.

Plate 44B.—Band with maxima at $\lambda 4217.6$ and $\lambda 4233.2$. Middle of fairly bright band $\frac{1}{4}$ A. U. wide at $\lambda 4440.9$; maximum of faint band at $\lambda 4544.7$; very bright bands $\lambda 4637.9$ to $\lambda 4668.6$ and $\lambda 4677.45$ to $\lambda 4700.7$; very faint bands still farther redward.

B.D. +36°3987.

Plate 48B.—Fairly bright bands $\lambda 4050.6$ to $\lambda 4065.4$ and $\lambda 4081.8$ to $\lambda 4116.3$; faint bands $\lambda 4537.6$ to $\lambda 4553.7$ and $\lambda 4601.6$ to $\lambda 4655.1$; bright band $\lambda 4671.4$ to $\lambda 4701.5$.

B.D. +43°3571.

Plate 56A.—Dark $H\gamma$; very bright band $\lambda 4617.2$ to $\lambda 4725.6$. This band shades gradually to red. Velocity relative to Sun, derived from displacement of $H\gamma$, —28 km. per sec.

B.D. +37°3821.

Plate 47C.—Faint band $\lambda 4042.6$ to $\lambda 4069.8$; brighter band $\lambda 4081.2$ to $\lambda 4118.0$; faint band $\lambda 4187.5$ to $\lambda 4213.8$; brighter band $\lambda 4321.8$ to $\lambda 4358.2$; very faint band $\lambda 4364.8$ to $\lambda 4388.9$; bright band $\lambda 4481.2$ to $\lambda 4582.9$, with maximum at $\lambda 4544.3$; bright band² $\lambda 4591.7$ to $\lambda 4660.1$, with minimum intensity at $\lambda 4607.9$; very bright band $\lambda 4660.0$ to $\lambda 4711.5$, being fainter from $\lambda 4843.8$ to $\lambda 4874.4$.

The wavelengths found above exhibit no notable departure from those of Dr. Campbell, given in the article referred to. The following lines and bands were found which are not mentioned in his article:

λ of center	B.D.	Description
4120.84	+35°3953	Narrow dark line
4068.40	30.3639	Narrow bright line
4630	36.3956	Narrow faint band
4058	36.3987	Fairly bright band 15 A. U. wide
4199	36.3987	Fairly bright band 34 A. U. wide
4628	36.3987	Faint band 54 A. U. wide
4056	+37.3821	Faint band

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February, 1910.

² This band has an appearance suggesting a number of dark lines crossing the band.