

# Note concerning the Accuracy of Wave-Length Determinations in Nova (T) Aurigae's Spectrum.

By *W. W. Campbell.*

Professor *Vogel* concludes his extremely valuable paper »Ueber den neuen Stern im Fuhrmann«\*) with the statement, »...und bemerke noch, dass wohl der sicherste Beweis für die Richtigkeit der hier entwickelten Anschauungen gegeben wäre, wenn sich mit grösserer Sicherheit Veränderungen der Wellenlängen der hellen Linien in dem jetzt sichtbaren Spectrum, wie sie die Beobachtungen Campbell's andeuten, nachweisen liessen, die eine Bahnbewegung anzunehmen gestatteten...«.

As bearing upon this question, I have extracted from my observing book the original observations last made by me on the three nebular lines in the Nova spectrum, on 1893 September 1 15<sup>h</sup>–16<sup>h</sup> Pac. s. t. They are contained in the following table, the numbers in the vertical columns being the micrometer readings on the Nova lines and on the artificial comparison lines of lead, iron and hydrogen.

In order that the observations should be absolutely free from any possible bias on my part, they were made in this manner: I set the micrometer wire by estimation on the centre of the Nova line; Mr. Perrine, Secretary of

the Observatory, read the micrometer and recorded the reading in my note book; the micrometer wire was moved to one side or the other on indefinite distance; the comparison spectrum was thrown in, and the micrometer wire was set on the comparison line; Mr. Perrine read the micrometer and recorded the reading in my note book; the micrometer wire was moved to one side or the other on indefinite distance. Ten such comparisons were made on each of the three lines observed; and until the comparisons were completed I had no knowledge whatever of what the resulting wave lengths would be.

At the close of these observations, without making any changes in the apparatus, I measured the wave length of the chief nebular line of the Orion Nebula, in order to test the adjustments of the spectroscope. The observations are reproduced along with the others.

During the progress of the observations the micrometer readings decrease systematically, as will readily be seen. This is due to flexure in the spectroscope.

Nova 501	Lead 5005.63	Difference	Nova 496	Iron 4957.63	Difference	Nova 486	Hydrog. H $\beta$	Difference	Orion 501	Lead 5005.63	Difference
0.37	0.39	—0.02	1.26	1.25	+0.01	0.36	0.51	—0.15	4.31	4.21	+0.10
30	36	06	23	25	—0.02	35	47	12	30	19	11
34	36	02	19	24	05	30	46	16	28	19	09
29	36	07	20	23	03	16	46	30	28	18	10
29	35	06	15	21	06	34	46	12	27	17	10
30	32	02	09	17	08	26	43	17	28	18	10
30	33	03	14	18	04	24	43	19	27	19	08
26	32	06	15	16	01	17	42	25	28	19	09
31	31	00	13	15	02	31	42	11	27	17	10
0.25	0.30	—0.05	1.12	1.14	—0.02	0.23	0.40	—0.17	4.28	4.18	+0.10
		—0.039			—0.032			—0.17			+0.097
1 rev. in tenth-metres		13.84			13.37			12.41			13.84
$\Delta\lambda$		—0.54			—0.43			—2.1			+1.34
Comparison lines	5005.63			4957.63				4861.5		5005.63	
Observed $\lambda$	5005.09			4957.20				4859.4		5006.97	
Reduction to $\odot$	+0.48			+0.47				+0.5		+0.42	
$\lambda$	5005.57			4957.67				4859.9		5007.39	
Keeler's normal $\lambda$	5007.05			4959.02				4861.5		5007.05	
Displacement	—1.48			—1.35				—1.6		+0.34	
Velocity	—55 mi.			—51 mi.				—61 mi.		+12.7 mi.	

Professor Keeler's result for the wave length of the chief line of the Orion Nebula, the mean of seventeen determinations with the third and fourth orders of a grating, is 5007.34; corresponding to a velocity of +11.0 miles per second.

It will be seen that the three lines observed in the Nova are almost equally displaced from the normal positions

of the three lines in the nebulae. In fact, the results agree a little more perfectly than I had expected they would. But I would undertake at any time to repeat these observations, with perfect confidence that the displacements of the two principal lines would differ from each other considerably less than one tenth-metre.

The wave length of the brightest line was about

\*) Berlin, 1893, Königl. Akademie der Wissenschaften.

5002 in September 1892, and about 5007 in February 1893. The wave length of the lead comparison line is 5005.6. In February, and also in August 1893, I set the micrometer wire on the lead line, read the micrometer and changed the reading so as to bring the wire into the position  $\lambda = 5002$ . Turning out the lead spectrum, the micrometer wire was found on both occasions (using the first order grating and the compound prism) to cover the more

refrangible edge of the Nova line: the line did not show at all on the more refrangible side of the wire, while about four-fifths or nine-tenths of the line was on the less refrangible side of the wire. These comparisons leave no basis for the suspicion that the observed changes of wave length might be due to variations in the distribution of the light within the broad line.

Mount Hamilton, 1893 Sept. 5.

W. W. Campbell.

### Sur l'emploi de la règle-à-calcul à la solution d'un système d'équations.

A propos des remarques de M. Hammer dans les A. N. 3190 sur ma notice dans le No. 3145, j'admets que l'abrègement du calcul se fonde principalement sur l'emploi de la règle-à-calcul au lieu des logarithmes; mais il me paraît que la comparaison des deux procédés d'élimination (et de calcul des poids s'il s'agit des équations normales) ne soit pas complètement épuisée par les remarques de M. Hammer. Ainsi on peut faire l'observation que la multiplication, par un seul pointement, avec une expression de la forme  $\frac{m}{n}$  ne peut en général se faire avec la même

précision qu'une simple division, parcequ'on sera souvent dans la nécessité de faire coïncider deux points non-marqués. Je parle ici, comme auparavant, de l'instrument de la forme la plus simple, consistant seulement de deux règles. Il pourrait aussi être lieu de comparer la multiplication et la division au point de vue de la facilité avec laquelle on peut pousser plus loin la précision; mais je n'y insisterai pas, tout ce qui concerne le mode d'un calcul numérique étant à un certain degré une question de goût et d'habitude.

Christiania le 26 septembre 1893.

H. Geelmuyden.

### Pianeta (287) Nephthys.

Dalle 4 opposizioni 1889, 90, 91 e 92.

Epoca 1892 Giugno 9.5 t. m. Berlino.

$$\left. \begin{array}{l} M = 349^{\circ} 50' 39''.7 \\ \omega = 115 \ 37 \ 14.3 \\ \Omega = 142 \ 3 \ 54.0 \\ i = 10 \ 1 \ 25.5 \end{array} \right\} 1890.0 \quad \begin{array}{l} \varphi = 1^{\circ} 18' 27''.0 \\ \mu = 982''.890 \\ \log a = 0.371668 \end{array}$$

Effemeride per 12<sup>h</sup> Berlino.

1893	$\alpha$ app.	$\delta$ app.	$\log A$	t. d. ab.	1893	$\alpha$ app.	$\delta$ app.	$\log A$	t. d. ab.
Ott. 3	2 <sup>h</sup> 3 <sup>m</sup> 41 <sup>s</sup> .42	-2° 48' 38".1	0.1540	11 <sup>m</sup> 51 <sup>s</sup>	Ott. 17	1 <sup>h</sup> 51 <sup>m</sup> 54 <sup>s</sup> .24	-4° 43' 48".0	0.1491	11 <sup>m</sup> 43 <sup>s</sup>
4	2 56.33	2 57 28.6	1532	49	18	50 59.94	4 50 58.4	1494	43
5	2 10.13	3 6 16.0	1523	48	19	50 55.54	4 57 57.6	1497	44
6	1 22.91	3 14 59.5	1517	47	20	49 11.12	5 4 44.7	1501	44
7	2 0 34.71	3 23 38.6	1510	46	21	48 16.73	5 11 19.7	1506	45
8	1 59 45.60	3 32 12.4	1505	45	22	47 22.45	5 17 42.3	1512	46
9	58 55.65	3 40 40.5	1500	44	23	46 28.35	5 23 51.9	1518	47
10	58 4.93	3 49 2.3	1496	44	24	45 34.52	5 29 47.9	1526	48
11	57 13.51	3 57 17.2	1492	43	25	44 41.01	5 35 30.4	1534	50
12	56 21.44	4 5 24.4	1490	43	26	43 47.89	5 40 58.9	1543	51
13	55 28.81	4 13 23.6	1489	42	27	42 55.22	5 46 13.3	1552	53
14	54 35.70	4 21 14.1	1488	42	28	42 3.10	5 51 12.9	1563	54
15	53 42.19	4 28 55.5	1488	42	29	41 11.55	5 55 57.7	1574	56
16	52 48.35	4 36 26.8	1489	42	30	40 20.65	6 0 27.5	1586	11 58
17	1 51 54.24	-4 43 48.0	0.1491	11 43	31	1 39 30.45	-6 4 42.3	0.1598	12 0

Grandezza di opposizione = 10<sup>m</sup>.8. Variazioni corrispondenti  $\pm 1^m \pm 5''.2$ .

Teramo 1893 Settembre.

V. Cerulli.