

FILAR-MICROMETER OBSERVATIONS OF COMET *e* 1890 (*ZONA*, Nov. 15),

MADE WITH THE 12-INCH EQUATORIAL OF THE LICK OBSERVATORY,

By E. E. BARNARD.

1890 Mt. Hamilton M.T.	No. Comp.	$\Delta\alpha$	$\Delta\delta$	$\alpha$	$\delta$	$\log p\Delta$ for $a$   for $\epsilon$
Nov. 30	8 <sup>h</sup> 53 <sup>m</sup> 50 <sup>s</sup> 18, 6	+0 <sup>m</sup> 22.40	-4 <sup>'</sup> 23.3	4 <sup>h</sup> 6 <sup>m</sup> 39.23	+35 <sup>o</sup> 7 <sup>'</sup> 28.0	n9.539 0.076

Mean Place for 1890.0 of Comparison-Star.

$\alpha$	Red. to app. place	$\delta$	Red. to app. place	Authority
4 <sup>h</sup> 6 <sup>m</sup> 13.01	+3 <sup>s</sup> .82	+35 <sup>o</sup> 11 <sup>'</sup> 39.8	+11.5	W.B. IV 48

ELLIPTIC ELEMENTS OF COMET 1890 *f* (*SPITALER*),

By Rev. G. M. SEARLE.

The observations of Nov. 16 and Dec. 4, made in Europe, together with those at Mt. Hamilton Dec. 6 and 7, seeming to furnish sufficient material for an approximate orbit of this comet, a parabola was computed from those of Nov. 16 and Dec. 7, using a ratio of the geocentric distances obtained as usual from the middle place and time of Dec. 4. The following elements resulted from the observations corrected approximately for parallax and aberration :

$$\begin{aligned}
 T &= 1891 \text{ Jan. } 5.6724 \text{ Gr. M.T.} \\
 \Omega &= 62^{\circ} 59' 17'' \\
 \omega &= 26 \ 19 \ 13 \\
 i &= 33 \ 16 \ 37 \\
 \log q &= 0.488416
 \end{aligned}
 \left. \vphantom{\begin{aligned} T \\ \Omega \\ \omega \\ i \end{aligned}} \right\} 1890.0$$

On comparing these, however, with the places of Dec. 4 and 7, the following somewhat startling discordances were found; (O—C) :

	$\Delta\lambda$	$\Delta\beta$
Dec. 4	+1 <sup>'</sup> 35 <sup>"</sup>	+0 <sup>'</sup> 54 <sup>"</sup>
6	+4 <sup>'</sup> 43 <sup>"</sup>	+2 <sup>'</sup> 36 <sup>"</sup>

and indeed, on determining the points of intersection of the lines of observation with the plane of the supposed orbit, it appeared that these points actually lay in a curve *convex* towards the sun.

It appeared certain that this could only be remedied by assuming shorter geocentric distances; but as distances materially shorter were quite irreconcilable with parabolic motion, the calculation was made from Nov. 16, Dec. 4 and 7, without any assumption as to eccentricity. The following decidedly different orbit resulted :

$$\begin{aligned}
 T &= 1890 \text{ Sept. } 30.3947 \text{ Gr. M.T.} \\
 \Omega &= 49^{\circ} 22' 56'' \\
 \omega &= 359 \ 5 \ 44 \\
 i &= 15 \ 53 \ 58 \\
 \log q &= 0.287878 \\
 \varphi &= 40^{\circ} 4' 7'' \\
 \log a &= 0.736067 \\
 \log u &= 2.445907 \\
 \text{Period} &= 4642 \text{ days, or } 12^y.71.
 \end{aligned}
 \left. \vphantom{\begin{aligned} T \\ \Omega \\ \omega \\ i \end{aligned}} \right\} 1890.0$$

The residuals for the middle place, Dec. 4, were now, (O—C)  $\Delta\lambda = +1''$ ,  $\Delta\beta = 0''$ ; for that of Dec. 6,  $+23''$  and  $+9''$ .

These elements are still of course necessarily quite rough, as the intervals of time are not favorable for accuracy; but it would seem probable that the period is such as to place this comet among those subject to special perturbation by *Saturn*, and possibly brought into our system by that planet. The aphelion distance of the comet from these elements is 8.9514, and it occurs near the descending node; the mean distance of *Saturn* is about 0.6 greater.

The following are the coordinate equations, for mean equator and equinox, for 1890.0 :

$$\begin{aligned}
 x &= [9.990401] r \sin(v+137^{\circ} 22' 12'') \\
 y &= [9.923001] r \sin(v+ 55 20 32) \\
 z &= [9.766876] r \sin(v+ 30 12 40)
 \end{aligned}$$

For 1891.0 we have

$$\begin{aligned}
 x &= [9.990397] r \sin(v+137^{\circ} 23' 4'') \\
 y &= [9.923018] r \sin(v+ 55 21 26) \\
 z &= [9.766853] r \sin(v+ 30 13 12)
 \end{aligned}$$

EPHEMERIS FOR GREENWICH MIDNIGHT.

Gr. M.T.	App. $\alpha$ h m s	App. $\delta$ ° ' "	$\log \Delta$	Br.
1890 Dec. 24.5	4 58 42	+39 57.6	0.0686	0.76
	28.5	56 19	40 14.0	0.0794
1891 Jan. 1.5	54 30	40 26.6	0.0911	0.66
	5.5	53 10	40 35.6	0.1037
	9.5	52 26	40 41.6	0.1170
	13.5	52 18	40 45.0	0.1308
	17.5	4 52 48	+40 46.4	0.1451