

1969g. Tago-Sato-Kasaka.

$$\left. \begin{array}{l} T = 1969 \text{ Dec. } 21.2677 \\ q = 0.472638 \\ e = 0.999916 \\ p = 419,000 \\ \omega = 267.8274 \\ \Omega = 100.9628 \\ i = 75.8198 \end{array} \right\} \begin{array}{l} \text{Epoch } 1969 \text{ Dec. } 5.0 \\ \text{E.T.} \\ O = 1950 \end{array}$$

167 obs 1969 Oct 13 - 1970 Feb 18.

Marsden, B.G., I.A.U. Circ. No 2218
Perturbations Mercury-Pluto
Mean residual = 1".21.

Reports on Progress in Astronomy: Comets, 1969.
Q.J. R.A.S., II, No 3, 221, 1970

Adopted values:

$$(x - b)^2 = x^2 - 2bx + b^2$$

$$T = 1969 \text{ Dec } 21.268$$

$$q = 0.4726$$

$$e = 1.0$$

$$\omega = 267.827$$

$$\Omega = 100.963$$

$$i = 75.820$$

$$x^2 - 2b(x+b)$$

Twice ~~diff~~ $\times$ est
shareage

$$P.R. = \text{est } x - \text{est}$$

$$x^2 - P.R. = 2 \text{ est } \times \text{diff}$$

$$\text{diff} = \frac{x^2 - P.R.}{2 \text{ est}} \quad 2.9126$$

$$= \text{est} - P.R. \quad 0.9968$$

$$2.2202$$

$$+ 3164$$

$$1.9038$$

$$+ 31640$$

$$\text{diff} = \frac{x^2 - \text{est}^2}{2 \text{ est}}$$

$$2 \text{ est}$$

$$0.09936$$

$$2.12080$$

$$2.22016$$

$$= \frac{x^2 - \text{est}^2}{2}$$

$$2$$

$$3.11441$$

$$0.00317$$

$$3.11124$$

$$0.9936$$

$$2.1208$$

$$3.1144$$

$$\begin{array}{r} 202'' 11' \\ 180 \\ \hline 22'' 11' \end{array}$$

$$\begin{array}{r} 6 \overline{) 11} \\ 0.183 \end{array}$$

$$\begin{array}{r} 22.183 \\ 100.963 \\ \hline - 78.780 \\ 4.448 \\ \hline 83.428 \end{array}$$

$$2 \times 0.9 \times 2$$

$$2 \times 0.9 \times 1.4 \times 0.9 \times 0.1$$

$$\begin{array}{r} 09936 \\ 21208 \\ \hline 2.22016 \end{array}$$

$$\frac{t-T}{q^{\frac{3}{2}}} = M$$

$$\tan \frac{1}{2} v = \sigma$$

$$r = q (1 + \tan^2 \frac{1}{2} v) = q (1 + \sigma^2)$$

$$q = 0.4726 (4726)$$

$$T = \text{Dec } 21.268$$

$$t = \text{Oct } 16.0$$

$$t - T = 65.268$$

$$\log q^{\frac{3}{2}} = \bar{T}.51174$$

$$M = 200.90$$

$$\sigma = 1.4427$$

$$r = 1.4549$$

$$v = 110^{\circ}.6$$

$$\log q = \bar{T}.67449$$

$$\log q^{\frac{3}{2}} = \frac{3}{2}$$

$$2 \bar{T}.02347$$

$$\log q^{\frac{3}{2}} = \bar{T}.51174$$

$$\log t - T = 1.81470$$

$$u q^{\frac{3}{2}} = \bar{T}.51174$$

$$\log M = 2.30296$$

$$M = 200.90$$

$$\log \sigma = 20285$$

$$\log q = \bar{T}.67449$$

$$\begin{array}{r} 15 \\ 30 \\ 21.268 \\ \hline 6.268 \end{array}$$

$$55^{\circ}16'$$

$$110^{\circ}32'$$

$$132$$

$$53$$

$$44270$$

$$43881$$

$$389$$

$$\cos \psi = \frac{r \cos \Theta}{r \cos \phi}$$

$$\sin \psi = \frac{r \sin \Theta \cos i}{r \cos \phi}$$

$$\frac{\sin \psi}{\cos \psi} = \frac{r \sin \Theta \cos i}{r \cos \phi} \cdot \frac{r \cos \phi}{r \cos \Theta}$$

$$\begin{array}{r} 360 \\ 45.285 \\ 314.715 \end{array}$$

$$= \tan \Theta \cos i$$

$$47264$$

$$\begin{array}{r} 267.827 \\ -110.992 \\ \hline 156.835 \end{array}$$

$$\begin{array}{r} 267.827 \\ 106.008 \\ \hline 161.819 \end{array}$$

$$267.827$$

$$76.367$$

$$35.675$$

$$262.87$$

$$60.677$$

$$26.287$$

$$47.067$$

$$18.529$$

$$18.529$$

$$18.181$$

$$11.699$$

$$15.169$$

$$15.169$$

$$23.165$$

$$2.863$$

$$360$$

$$283.433$$

$$76.367$$

$$47.067$$

$$23.563$$

$$336.437$$

$$35.675$$

$$677$$

$$5.985$$

$$4.830$$

$$2.904$$

$$174.015$$

$$175.170$$

$$177.096$$

$$179.298$$

$$0.702$$

$$14.752$$

$$45.248$$

1970

Jan 22 1730-1900 S-W cloudless, thick mist - haze. Full Moon rising. Unable to locate comet.

Jan 25 1815-1835 Very misty, patchy sky, drifting clouds. Comet barely and only occasionally visible to naked eye. Mag. est. difficult, but certainly not brighter than 4. No tail visible - marked central condensation.

1915-2000 Sky cleared - quite good but misty towards horizon. Comet visible to naked eye, mag = ϵ Piscium (4.4) No definite tail; coma quite large ($\sim 8'$) quite impressive in $4\frac{1}{2}$ -in. scope. Strong central condensation.

Position from Atlas Bor: α $01^h 11^m 8^s + 20^\circ 15'$
(Telephoned Milbourne 21:50)

Jan 26 20:15 - 21:15 V. good sky, occasional drifting cloud. Rather misty towards horizon.

Comet visible naked eye. Mag. little brighter than μ Pisc. 4.8

Coma ~~5'~~^{8'-10'} diam. Tail glimpsed approx $1\frac{1}{2}^\circ$ long, P.A. 73°

$\alpha = 01^h 19^m 7^s$ $\delta = +5^\circ 48'$ at 21:00 U.T.

Feb 3. 1805-1835 Fair sky - improved later, then deteriorated.

Comet much fainter - mag = 6.7* Coma diffuse, small c.c.

Coma diameter $\sim 5'$.

$\alpha = 02^h 10^m 8^s$ $\delta = +24^\circ 50' 0''$ at 18:30

* Under-estimated $M = 6.5$

Feb 4 1830-1855 V. good sky. Comet seen better than previous night.

Mag. = 6.7* (Feb 3 may have been under-estimated) Coma diam $\sim 5'$

$\alpha = 02^h 15^m 5^s$ $\delta = +26^\circ 25'$ at 18:50

* Underestimated $M = 6.5$

Feb 5 1830-1845 V. good sky. Mag = 6.6 α $02^h 20^m 7^s$ $\delta +27^\circ 52'$
Coma diameter = 4'

Feb 6 Clear but some fog

7 " " telescope a.o.a.

8 Clear

9 Clear - wkg on telescope

10 V. " " " (Moon near ϵ)

11 Thin cloud " "

12 Cloudy " "

13 " (Snow) " "

14 Fairly clear " "

15 Mainly cloudy - hazy Moon

16 Sky clear but hazy. Bright Moon

Sun 21 55⁴ -12° 50'
 Venus 22 27⁵ -12° 08'
 1970a 21 01 -15°
 1969g
 GST 0^h 09 42 20 α 08 00
 12 1 58 δ +32° 45'
 21 44 15 Mr p Per (sp. Algol)
 2 27
 21 41 48
 02 29 at 6 pm GST

Feb 16.5

Sun 21 58^{1/2} -12° 23'
 Venus 22 21^{1/2} -11° 48'
 1970a 22 01 -13° 30'
 GST 0^h 09 42 17
 12 1 58 1200-1300
 21 44 15 Searched for 1970a - No luck
 2 27 Venus easily seen
 21 41 48 1/2 sunspot groups.
 Good sky when clouds not in way
 Snow on ground NW wind.
 1500-1515 Good sky - No sign of 8
 15:45-15:55 No go - trees. Tried with 2 1/2" - No luck.
 16:20-25 Last attempt - Sun well down behind trees.
 1969g - Mr p Per.

Feb 20

1800 09 58 03 α 22° 41'
 10 03 00 δ -02 Mag 3
 20 01 03
 24 2 27
 03 58 36

Feb. 24

1800 10 13 50 1970a 22^h 51^m
 18 03 00 δ +05° 50' (5.0)
 28 16 50 Nov Serp α 18 28
 24 2 27 δ -02 40
 04 14 23 1969g α 03^h 28^m (7.5)
 δ +42° 28'

10 875
 11:00 Comet 1969g Mag ~ 9.0 diffuse.
 Orion Neb - splendid.
 Lining up telescope.

Mar 3
 0500 Nova Serpens - 5 mag.

Casting extra weight. Sky clear

Mar 5 Clear sky. Nova Serpens - 5 mag.

Mar 6.
 10 53 13
 18 2 57
 28 36 13
 24 2 27
 4 53 45 at 1800 UT

20:30 - Magnificent sky. Hard frost Snow on ground.
 22:30 Orion Neb splendid. Per. Double Cluster Praesepe
 Clust in Gem. R? Leonis.

Squinting on O.B.

Comet Kohoutek - Cepheus - too low.

1969g - 8 Per. 9-9½ mag.

18:45 Comet Daido - Mr & Peg - too low. Sky too bright

March 7
 0400 Arose to observe Nova Serpens - Sky too poor. Stars
 all over. Only brightest stars visible.
 Checking moonlight - casting extra one
 α UMi 03" 03" 19^{sec} 8+ 89 07 34

10	57	11	14	03	19
	2	27	10	54	44
10	54	44	03	08	35
08	05	19		00	34
02	51	23	03	09	06
21	02	35	04	07	06
	03	27			
21	06	02	UT		

11 moon cloud " BST "

12 Cloudy " "

13 " (Snow) " "

14 Fairly clear " "

15 Mainly cloudy - hazy Moon

16 Sky clear but hazy. Bright Moon

$$r = 27.4(r + 2q)(r - q)^{\frac{1}{2}}$$

For $r = 1$

$$r = 27.4(1 + 0.9450)(0.5275)^{\frac{1}{2}}$$

$$= 27.4 \cdot 1.9450 \cdot \sqrt{0.5275}$$

$$= 27.4 \cdot 1.9450 \cdot 0.7211 = 38.44$$

53

38.44

9.64

9.64

28.80

21.26

59.7

48.64

19.66

36

17.18

17.82

9.64

31

38.44

21.26

17.18

Nov 12.8

Jan 28.8

37.3

2.9126

$v = 249.467$

1.7577

7652

925

267.827

517.294

360

157.294

1.6

9

2.1208

0.9

0.9936

0.9

3.1144

0.81

2.9126

2.9

2.7

0.29

13

13

39

13

169

2.9126

0.3164

2.5962

3.1144

3164

2.7980

9936

2.1208

3.1144

9880

1.2589

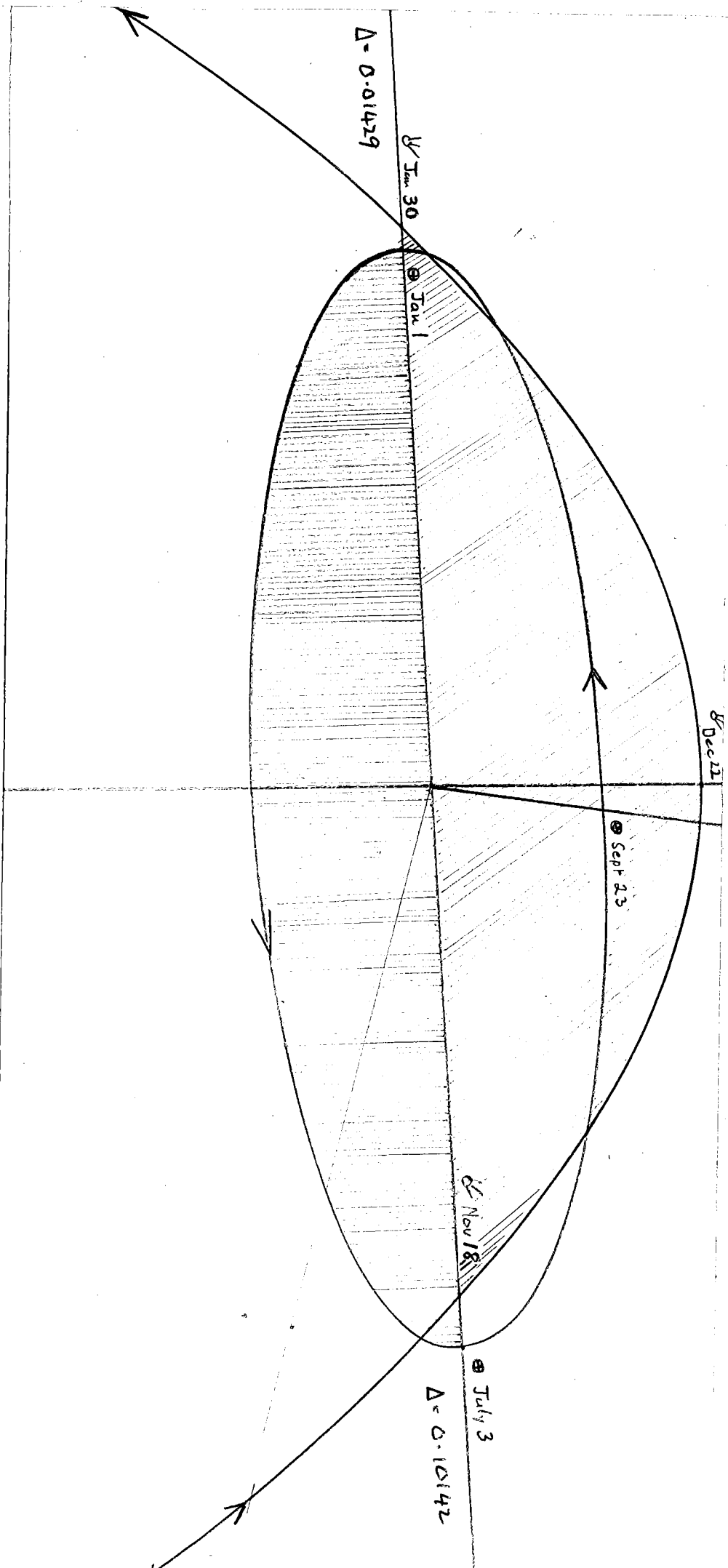
2.6469

0.7657

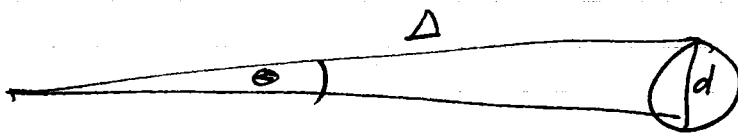
1.8811

2.9033

7 2.7645



Dec	16	Jan	10	20	31	7	0	5.5	7	0.43
Jan	20	-	31			10.0		27		0.42
Feb	1	-	7			8.0		39		
	8	-	14			7.5		29		
	15	-	28			6.0		12		
	22	-	28			5.0		21		
Mar	1	-	7			4.5		20		
Mar	8	-	27			4.0	3.5	9		
Apr	4					<1		1		



$$\frac{739}{5.5}$$

$$d = \theta(\text{rad}) \Delta$$

$$= \frac{\theta''}{206265} \cdot \Delta \cdot 1.496 \times 10^8 \text{ km}$$

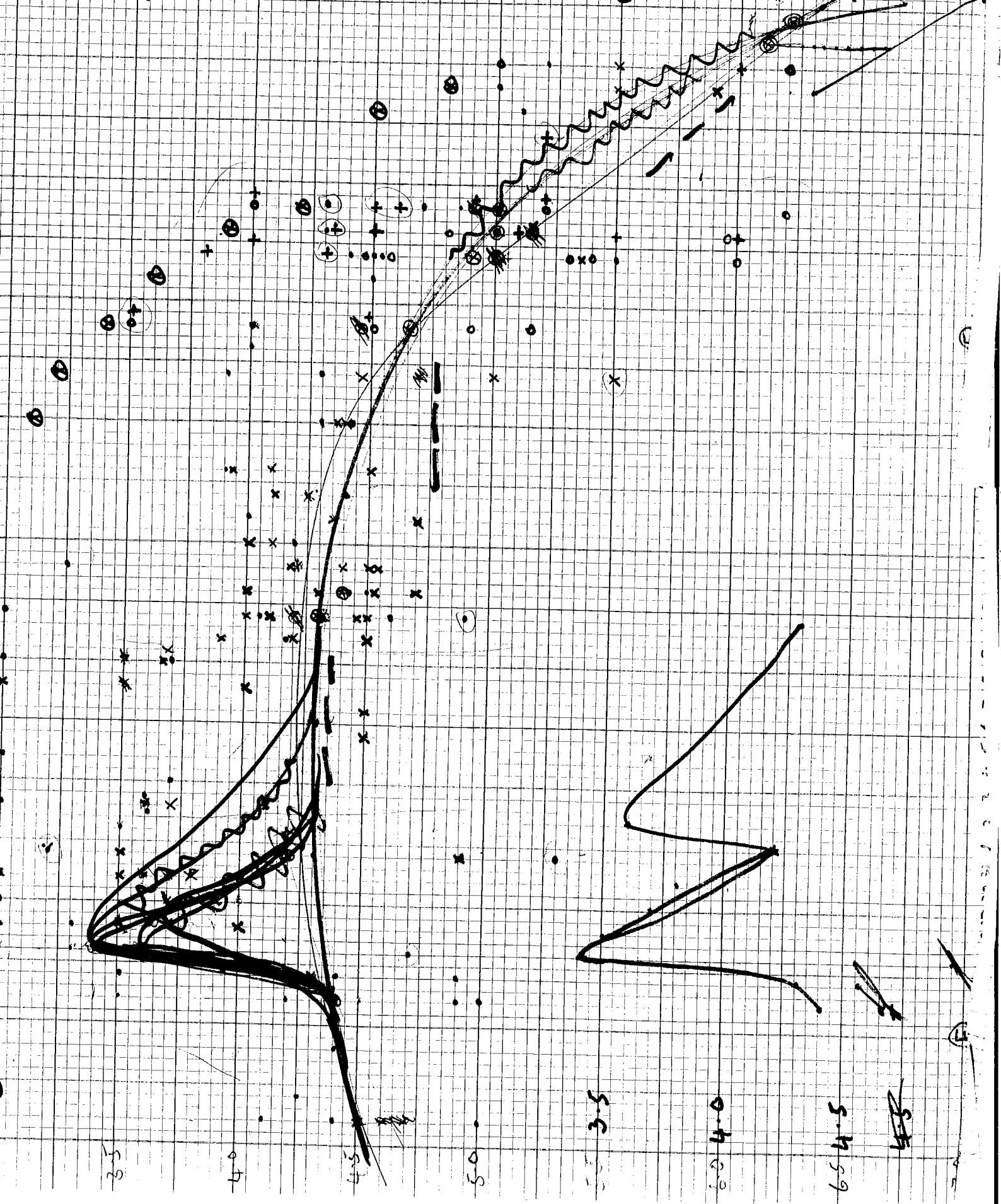
$$\log 206265 = 5.3144$$

$$\log 1.496 = 0.1750$$

$$\begin{array}{r} 8.1750 \\ 5.3144 \\ \hline 2.8606 \end{array}$$

$$\log d = \log \theta'' + 2.8606 + \log \Delta$$

SEM
 ULM
 MB
 HIE
 WHA
 X UMB
 X HCN
 X CR
 X MGT
 X HTB
 X PM
 JEB
 X ACLM
 RWD
 RWP
 GWM
 MJS
 OMB
 DTN
 HRR
 PTY
 + SEB
 + MTC
 + RP
 + JN
 [TAS]



3.5

4.0

4.5

5.0

5.5

6.0

6.5

7.0

1969/9

$$\begin{array}{r} 360.00 \\ 267.38 \\ \hline 92.62 \\ 1 \end{array}$$

$$r_{\phi} = \frac{29}{1 + \cos \theta} = \frac{2 \times 0.48116}{1 + \cos 92.62} = \frac{0.96232}{1 - \cos 87.38}$$

$$= \frac{0.96232}{1 - 0.04711} = \frac{0.96232}{0.95289} \quad \begin{array}{l} \log = 7.98333 \\ \log = 7.97904 \\ \hline 0.00429 \end{array}$$

Antilog 10100

$$r_{\phi} = 1.0100$$

$$T_{\phi} = 0.9833$$

$$A = \underline{\underline{0.0267}}$$

$$T_{\phi} = \frac{0.96232}{1 + \cos 272.62} = \frac{0.96232}{1 + \cos 87.38} = \frac{0.96232}{1.04711} \quad \begin{array}{l} \log = 7.98333 \\ \log = 0.02040 \\ \hline 7.96293 \end{array}$$

Antilog 91810

$$T_{\phi} = 1.0167$$

$$r_{\phi} = 0.9182$$

$$A = \underline{\underline{0.0985}}$$

$$t = 27.4(r + 2q)(r - q)^{\frac{1}{2}}$$

$$r = 0.9182 \quad q = 0.4812 \quad 2q = 0.9623$$

$$r + 2q = \begin{array}{r} 0.9182 \\ 0.9623 \\ \hline 1.8805 \end{array}$$

$$r - q = \begin{array}{r} 0.9182 \\ 0.4812 \\ \hline 0.4370 \end{array} \quad \sqrt{0.4370} = 0.6611$$

$$t = 27.4 \cdot 1.8805 \cdot 0.6611$$

$$t = 34.07 \text{ days.}$$

$$\begin{array}{r} 1.4378 \\ 0.2743 \\ \hline 1.8203 \\ 1.5324 \\ \hline 3407 \end{array}$$

$$\begin{array}{r} \text{Dec. } 21.875 \\ \text{Nov. } 30.000 \\ \hline 51.875 \\ 34.07 \\ \hline \text{Nov. } 17.805 \end{array}$$

$$r = 1.01 \quad q = 0.4812 \quad 2q = 0.9623$$

$$r + 2q = \begin{array}{r} 1.0100 \\ 0.9623 \\ \hline 1.9723 \end{array}$$

$$r - q = \begin{array}{r} 1.0100 \\ 0.4812 \\ \hline 0.5288 \end{array}$$

$$\sqrt{0.5288} = 0.7272$$

$$t = 1.9723 \cdot 0.7272 \cdot 27.4 = 39.29$$

$$\begin{array}{r} 9.125 \\ \hline \text{Jan. } 30.165 \end{array}$$

$$\begin{array}{r} 1.4378 \\ 0.2949 \\ \hline 1.8616 \\ 1.5943 \end{array}$$

$$39.29$$