

P/ Giclas 1978k

The following improved orbital elements, by S. Nakano, are from 43 observations 1978 September 3 to 1979 January 24.

Perturbations by all nine planets were taken into account. The mean residual is 1".50 and the mean error of period is  $\pm 0.001$  year ( $\pm 0.5$  day).

|                              |                           |
|------------------------------|---------------------------|
| T = 1978 Nov. 21.1876 ET     | Epoch = 1978 Nov. 28.0 ET |
| $\omega = 247.91992$         | e = 0.511655              |
| $\Omega = 141.5459$ } 1950.0 | a = 3.546405 AU           |
| i = 8.5458                   | $n^0 = 0.1475780$         |
| q = 1.731870 AU              | P = 6.679 years           |

The following residuals in seconds of arc are from the above elements:

| Date/               | $\Delta \sqrt{\cos \delta}$ | $\Delta \delta$ | Observer      |
|---------------------|-----------------------------|-----------------|---------------|
| 1978 Sept. 3.330 UT | - 0."1                      | - 4."2          | Giclas        |
| 8.302               | + 1.3                       | - 1.6           | "             |
| 10.338              | + 2.1                       | - 1.4           | "             |
| 11.347              | - 0.4                       | + 0.1           | "             |
| 12.367              | + 1.3                       | - 0.6           | "             |
| 13.722              | + 0.4                       | + 1.3           | Perth Obs.    |
| 13.737              | + 2.3                       | + 0.3           | "             |
| 14.324              | + 3.4                       | + 0.7           | Shao          |
| 16.767              | - 1.6                       | + 3.3           | Seki          |
| 16.779              | + 0.7                       | - 0.5           | Perth Obs.    |
| 16.801              | - 0.4                       | + 0.1           | "             |
| 21.717              | + 0.8                       | - 0.7           | "             |
| 22.621              | + 0.1                       | + 3.2           | "             |
| 23.231              | - 2.0                       | - 1.3           | Giclas        |
| 24.591              | - 0.1                       | + 0.2           | Perth Obs.    |
| 24.715              | - 2.1                       | + 1.8           | Alma-Ata Obs. |
| 24.735              | + 0.8                       | + 2.3           | "             |
| 24.868              | + 0.5                       | - 1.6           | Mrkos         |
| 24.883              | - 1.4                       | - 1.9           | "             |
| 25.557              | + 1.8                       | + 1.1           | Perth Obs.    |
| 25.872              | - 1.7                       | - 0.2           | Mrkos         |
| 25.887              | - 0.9                       | + 0.2           | "             |
| 26.157              | - 0.7                       | + 0.3           | H.C.O.        |
| 27.263              | - 0.1                       | - 1.8           | Giclas        |
| 30.293              | + 0.7                       | 0.0             | "             |

continued

| Date/                | $\Delta\alpha \cos\delta$ | $\Delta\delta$ | Observer     |
|----------------------|---------------------------|----------------|--------------|
| 1978 Sept. 30.599 UT | - 1.5                     | - 0.2          | Seki         |
| 30.616               | - 0.9                     | + 3.0          | "            |
| Oct. 2.521           | + 0.4                     | + 1.0          | Urata        |
| 3.705                | - 0.3                     | - 0.3          | Perth Obs.   |
| 7.308                | + 0.4                     | - 2.6          | Giclas       |
| 8.573                | - 1.1                     | + 1.2          | Urata        |
| 8.930                | - 1.2                     | + 0.7          | Mrkos        |
| 8.945                | - 0.7                     | + 0.5          | "            |
| 9.927                | - 2.7                     | - 0.2          | "            |
| 9.941                | - 2.4                     | - 0.1          | "            |
| 10.284               | - 0.2                     | + 2.0          | Palomar Obs. |
| 10.325               | + 1.3                     | - 2.9          | Giclas       |
| 23.473               | + 0.6                     | + 1.7          | Seki         |
| 23.551               | - 0.5                     | - 2.2          | "            |
| 28.185               | + 2.3                     | - 1.7          | Giclas       |
| Nov. 20.154          | + 2.4                     | + 0.9          | "            |
| Dec. 27.158          | + 1.3                     | 0.0            | "            |
| 1979 Jan. 24.117     | - 0.7                     | - 1.0          | "            |

1979 May 5

S. Nakano