II. THE COMPUTED EPHEMERIDES.

The following tables give geocentric positions (tropical celestial longitudes and latitudes) of the sun, moon, and naked-eye planets to an accuracy and spacing suitable for historical purposes, and dates of new and full moons (conjunction and opposition in longitude) for the period A.D. 1650 through 1805. The planetary positions are computed for 12 hours U.T. (noon) Julian calendar. As in the Tuckerman tables, positions are given at five-day intervals for Mercury, Venus and the moon, and ten-day intervals for the sun, Mars, Jupiter, and Saturn. The central column gives a pair of Julian calendar dates, the one on the left corresponding to tabulated positions of Mars, Jupiter, and Saturn and to the ancillary column of Gregorian calendar dates shown at the far left of each page.

In the tables of new and full moons, we have used the Gregorian calendar with U.T.—in contradistinction to the Goldstine tables, which use the Julian calendar and local time in a location near Babylon (arbitrarily defined as 3 hours east of Greenwich). Instead of the arbitrary lunation count used by Goldstine, we give the Julian day number for each event.

As in the Tuckerman and Goldstine tables, the ephemerides are based upon the theories of Leverrier for the sun and inner planets, Gaillot for Jupiter and Saturn, and Hansen for the moon. Although better tables are available in some instances, these were originally chosen to match the *Tafeln zur astronomischen Chronologie* of P. V. Neugebauer. Because the computer coding originally written at IBM was unavailable, a new program was prepared by Professor Peter Huber at the Eidgenössische Technische Hochschule in Zurich. Professor Huber graciously placed his program at our disposal; we made certain modifications to increase its efficiency without fundamentally altering its accuracy, and we wrote a new control program to calculate the times of new and full moons. Professor Huber's program differs from Tuckerman's by including: 1. for the sun the largest perturbation in longitude by the moon, 2. for the moon, Hansen's perturbations in longitude and latitude with amplitudes greater than 10 seconds of arc, and 3. for Jupiter and Saturn, perturbations from Uranus. As a consequence, our lunar phenomena differ slightly from Goldstine's; for 1650 the difference is 2 or 3 minutes of time, but we are confident that the present scheme is the more accurate one. For 1950 our dates for full moon agree on the average with the *American Ephemeris*, with a maximum deviation in one case of 2 minutes of time.

In tests against 37 equi-spaced dates from the *Connaissance des temps* for 1958, Professor Huber found the following maximal differences:

	Δ Long.	Δ Lat.
Moon	0°.0244	0°.0103
Sun	0.0005	0.0002
Mercury	0.0042	0.0003
Venus	0.0053	0.0005
Mars	0.0037	0.0003
Jupiter	0.0020	0.0012
Saturn	0.0081	0.0015

Recently, F. R. Stephenson and M. A. Houlden ["The accuracy of Tuckerman's solar and planetary tables," *Journal for the History of Astronomy*, vol. 12, pp. 133–138, 1981] have examined the Tuckerman tables in light of the Integrated Ephemeris of the Jet Propulsion Laboratory using 200 randomly selected dates over the interval from −600 to +1649. For all of the objects they found the latitudes almost invariably accurate to the precision quoted, and for all except Mars the agreement in longitude was satisfactory. For Mars the principal discrepancy arose at perihelic oppositions, and after about 1200 A.D. the agreement was satisfactory. Hence, we expect the accuracy of our ephemeris longitudes to be as good or better than the error limits quoted by Tuckerman:

	Long.
Sun	$0°.00_3$
Mercury	0.01_0
Venus	0.01_5
Mars	0.01_5
Jupiter	0.01_2
Saturn	0.08_4
Moon	0.2_1

Their error limits in latitude are bounded "by $0°.00_5$ for the Sun and planets, and $0°.0_7$ for the Moon."

We give, finally, the longitudes for other meridians, particularly for the ephemerides and tables cited in the first part of our paper.

City	Long.	Time Correction	Local Mean Time
Philadelphia	75°10′W	−5^{h}01^m	6:59 a.m.
Cambridge	71 05 W	−4 44	7:16 a.m.
Toledo	4 02 W	−0 16	11:44 a.m.
Oxford	1 15 W	−0 05	11:55 a.m.
London	0 10 W	−0 01	11:59 a.m.
Paris	2 20 E	+0 09	12:09 p.m.
Lyons	4 50 E	+0 19	12.19 p.m.
Bologna	11 20 E	+0 45	12:45 p.m.
Padua	11 53 E	+0 48	12:48 p.m.
Leipzig	12 20 E	+0 49	12:49 p.m.
Venice	12 20 E	+0 49	12:49 p.m.
Rome	12 30 E	+0 50	12:50 p.m.
Copenhagen	12 34 E	+0 50	12:50 p.m.
Hven	12 45 E	+0 51	12:51 p.m.
Berlin	13 25 E	+0 54	12:54 p.m.
Gdansk	18 41 E	+1 15	1:15 p.m.
Frombork	19 40 E	+1 19	1:19 p.m.
Cracow	19 55 E	+1 20	1:20 p.m.

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