

THE SOLAR SYSTEM

8 I. OUR SOLAR SYSTEM

9 In the long perspective
11 of knowledge, which
begins with the close at
hand and stretches to the
infinitely remote, the solar system marks a
middle distance. Between the intimacy
possible with objects on this Earth and the
distant recognition of the universe of suns, it
furnishes an acquaintanceship combining
something of the interest of the one with the
grandeur of the other.

12 Its position in
space and in
knowledge.

Our knowledge about
the solar system has
greatly increased during
the last quarter of a
century; and first in the recognition of what
makes part of it. To our solar system we now
know belongs every heavenly body we see
except the fixed stars and the nebulae. Not only
are the Sun, Moon, and planets members of it,
but meteors, shooting-stars, and comets we
have found to be so, too. That all of these
bodies are part and parcel of what the Sun
controls, I shall first proceed to show you; for
it is proper that we should recognize the
members of the system before considering the
system's constitution and the several characters
of its constituents.

Path the
proof of one-
ness.

In many text-books you
shall find it still stated
that these flaming
portents, the cometæ or long-haired stars, —for
the ancients saw tresses where we prosaically
see tails, —one of which, on the average,
startles a generation into wonder, are visitors

Its constitu-
ents.

10 to us from other stars. So also we were taught
that the strange stones that fall to us from the
sky, and we call meteorites, were bits of some
body from far interstellar space. Such
knowledge belongs now to the history of
science, not to science itself; for these bodies
carry with them their badge of membership: it
shows in the orbits they describe. So, when we
pass through a comet's tail, or pick up a piece
of meteoric iron, we now recognize that we
have to do, not with a stranger, but with our
own kith and kin. Man may gaze at matter
beyond the solar system, but man has never yet
touched it.

Proof of community
lies in the character
of the paths. Planet and
particle alike turn out to travel in ellipses, and
ellipticity betrays association. How the orbit
labels the occupant we shall see, on finding the
paths the planets pursue and why they pursue
them. The orbits of the planets are then the first
point to consider.

Earth travels
in an ellipse.

To begin with the Sun.
Observation shows
not only that the Sun
changes its place in the heavens, but changes
its size as well. To measurement through a
smoked glass, it seems to contract in summer
and expand in winter. Plotting the directions it
successively takes in the form of a spider, and
taking the legs inversely proportionate to the
diameters at the times, we find an ellipse, in
one of whose foci lies the Sun. The Earth, then,
goes round the Sun in an ellipse.

Obsolete
views.

- 13 To find the path of a planet, we first get its synodic period, or period with regard to the Sun. Then, from a sufficient number of observations of synodic periods to give their mean, we obtain the sidereal period, or period with reference to the stars.

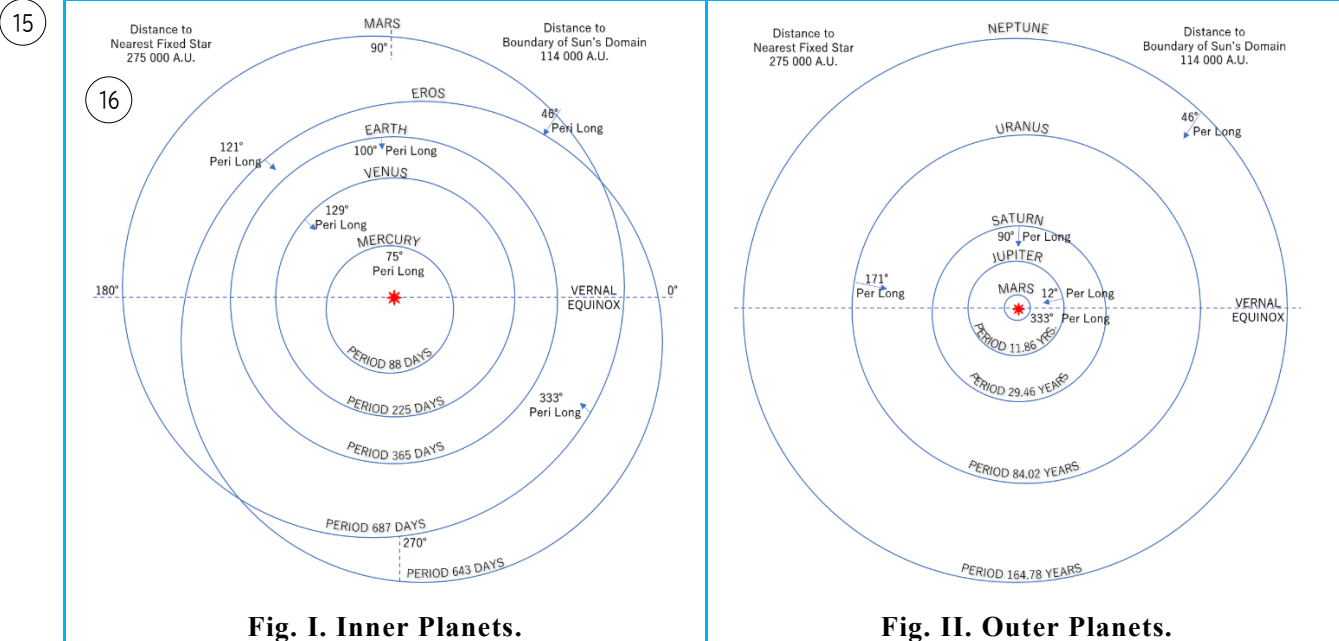
So do the
other planets.

By considering the angular motions, the two periods are easily seen to be connected by the following equation: —

$$\textcircled{14} \quad \frac{1}{S} = \frac{1}{P} - \frac{1}{E}$$

Where E = the Earth's period;
 S = the Planet's synodic period;
 P = the Planet's sidereal period.

From two bearings separated by a sidereal period, we get a quadrilateral, of which, knowing parts enough to solve, we derive the planet's distance from the Sun at the moment. We now have for the planet what we had for the Sun, —direction and distance at a given time. Dotting these data upon the apparent path, Kepler proved that the orbit of Mars was an ellipse. Mars was the first of the planets thus to have its orbit found; following it the others yielded similarly to the genius of the man. All the planets, then, move in ellipses about the Sun.



- 17 ⁱ Six lectures delivered at the Massachusetts Institute of Technology in December 1902 by Percival Lowell https://en.wikisource.org/wiki/The_Solar_System/Chapter_1