Two lines on the sky: the celestial equator and the ecliptic

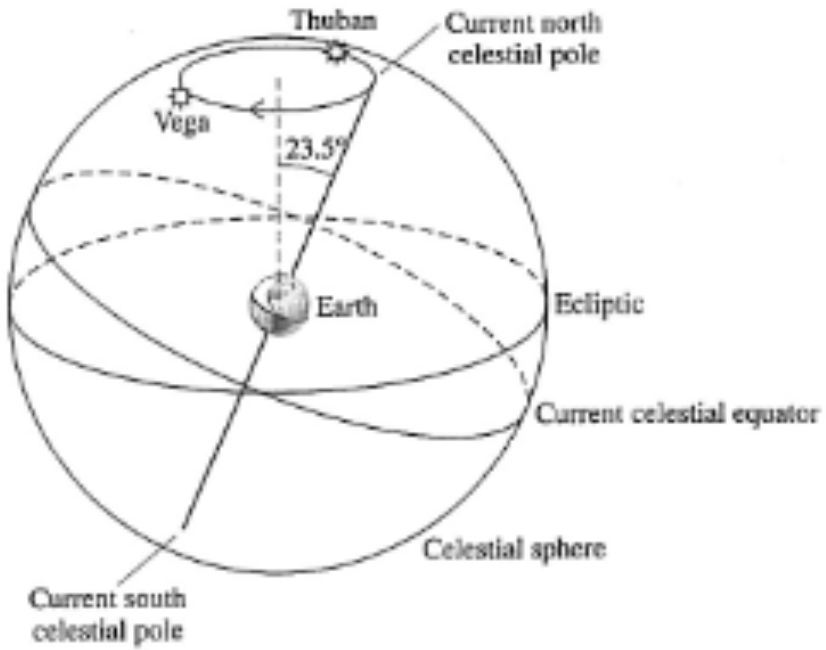


FIGURE 1.10 Precession of the Earth's rotation axis, with the resulting motion of the north celestial pole on the celestial sphere.

Revolution of the Earth about the Sun: an explanation for many astronomical phenomena

The seasonal changes in the night sky…
The difference between sidereal and solar time

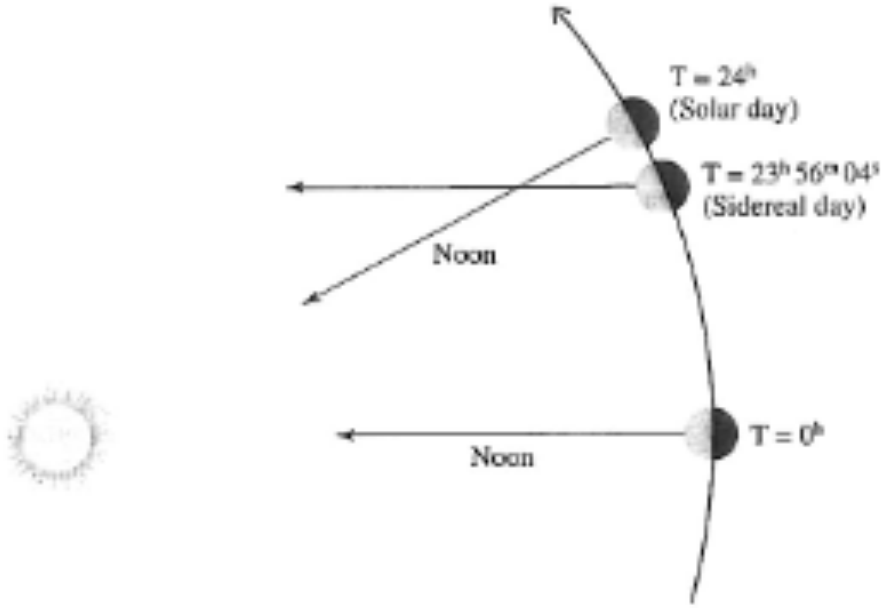
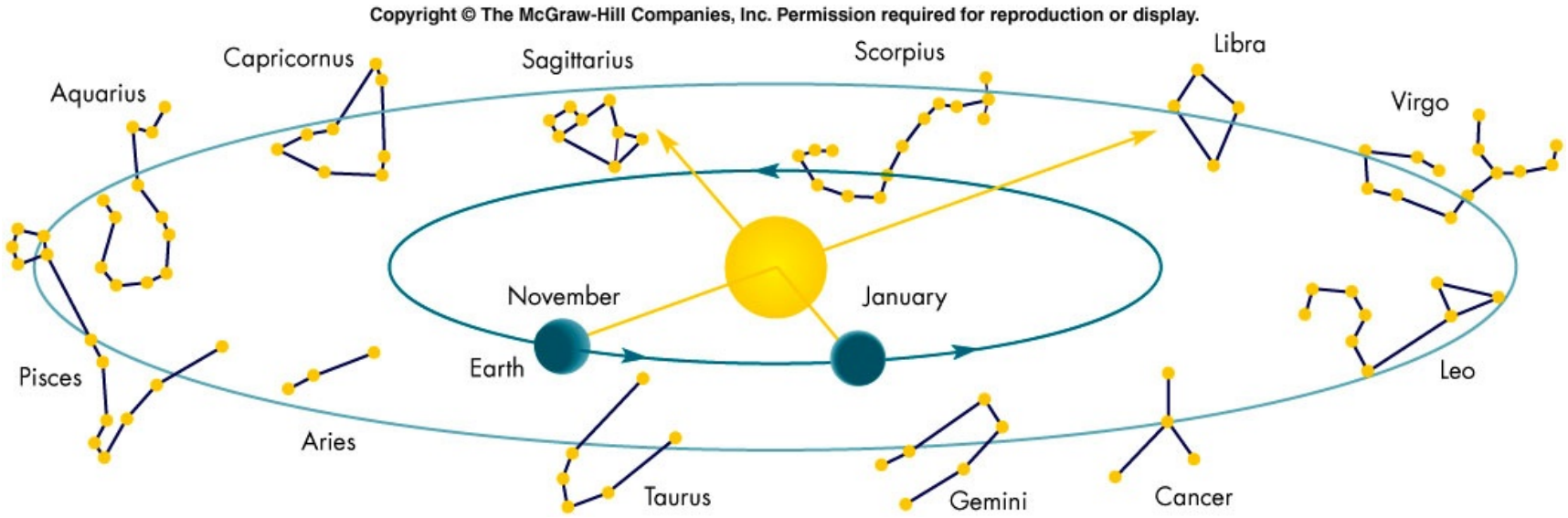


FIGURE 1.11 The relation between the solar and sidereal day; the solar day is slightly longer than the sidereal day because of the Earth's orbital motion around the Sun.

The "parade of the constellations"



Demo

Also look at online animation with the book web site

Why the solar day varies, Part 1…variable angle between celestial equator and ecliptic

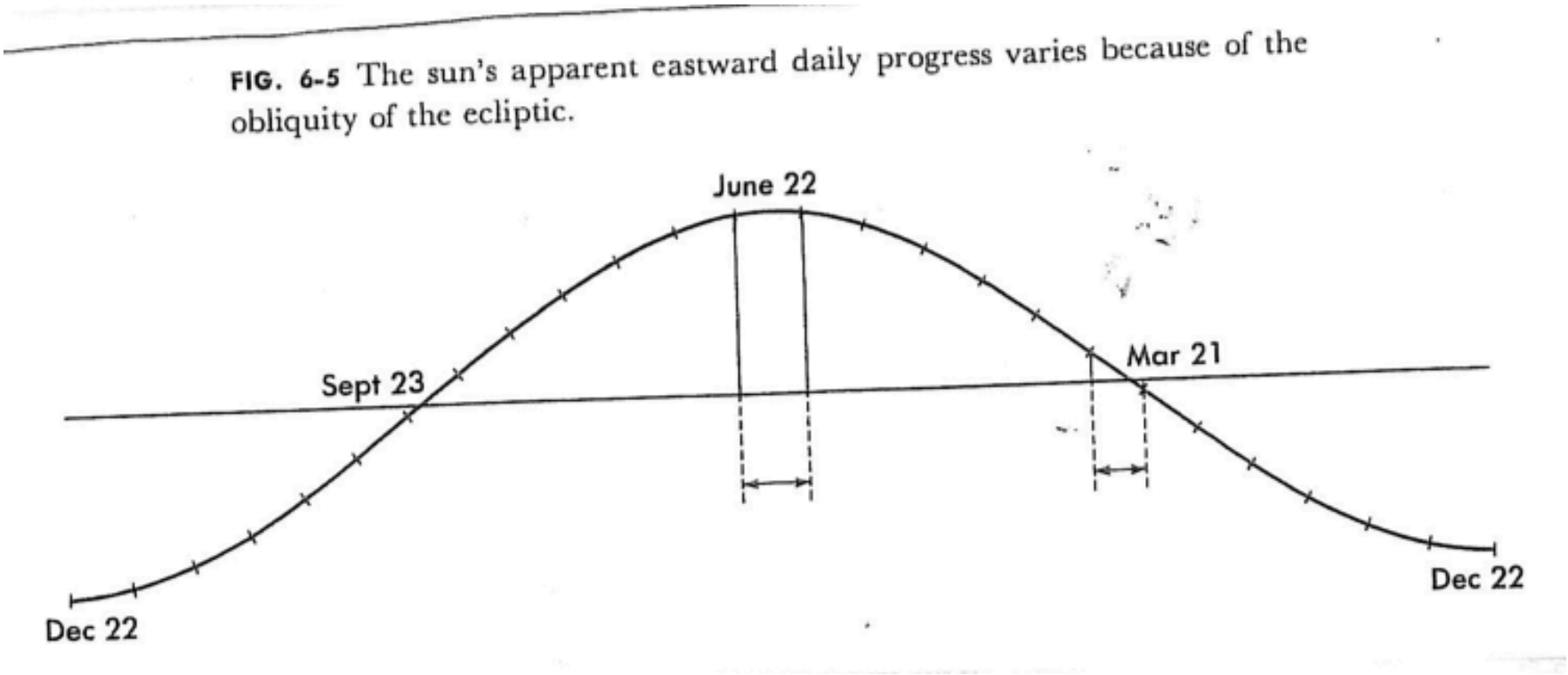


FIG. 6-5 The sun's apparent eastward daily progress varies because of the obliquity of the ecliptic.

Why the solar day varies, part 2…the ellipticity of the Earth's orbit + Kepler's 2nd Law

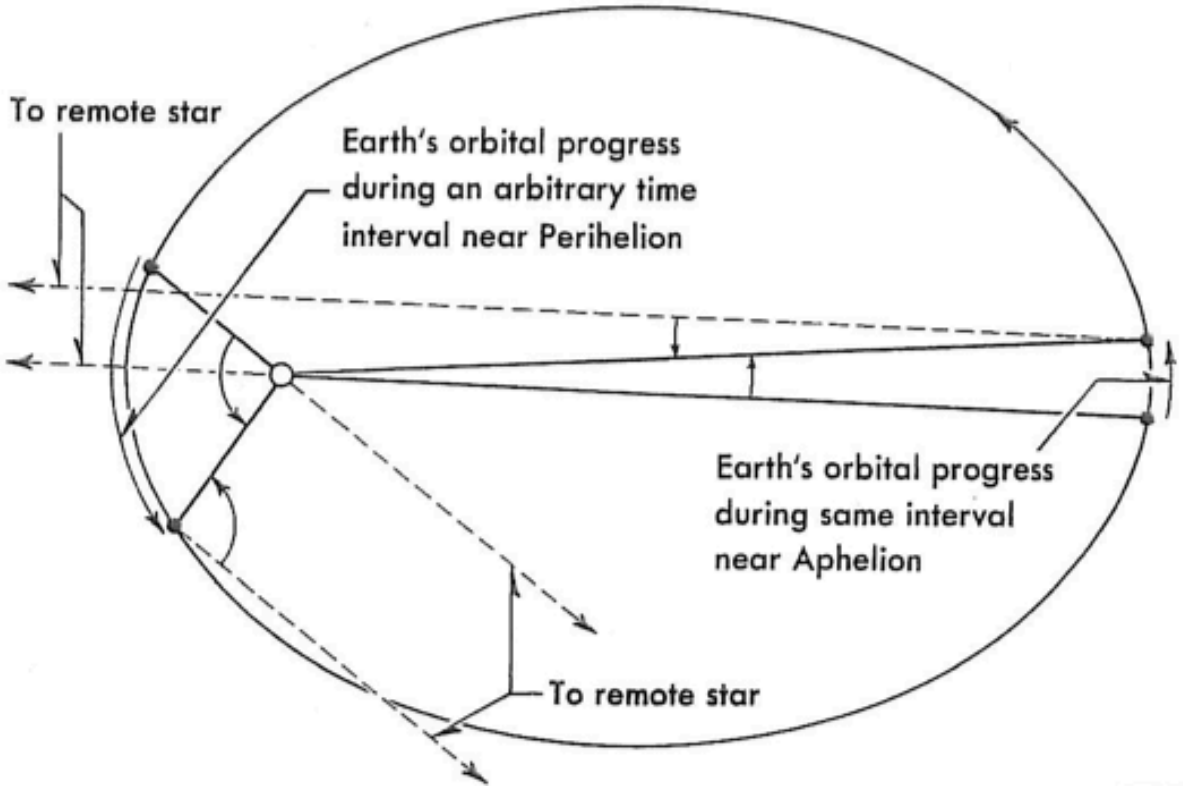


FIG. 6-4 The variation in the length of an apparent solar day because of the earth's variable orbital speed.

The Equation of Time

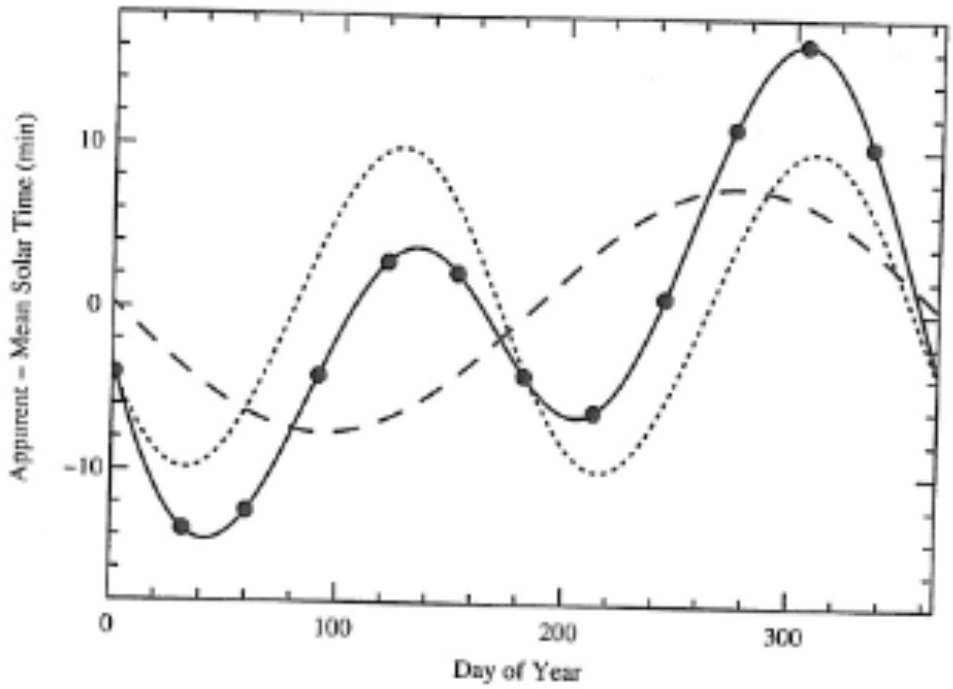


FIGURE 1.12 The solid line is the empirically determined equation of time; dots represent the first day of each calendar month. The dotted line is the contribution to the equation of time from the obliquity of the ecliptic; the dashed line is the contribution from the Earth's changing orbital speed.

The Analemma

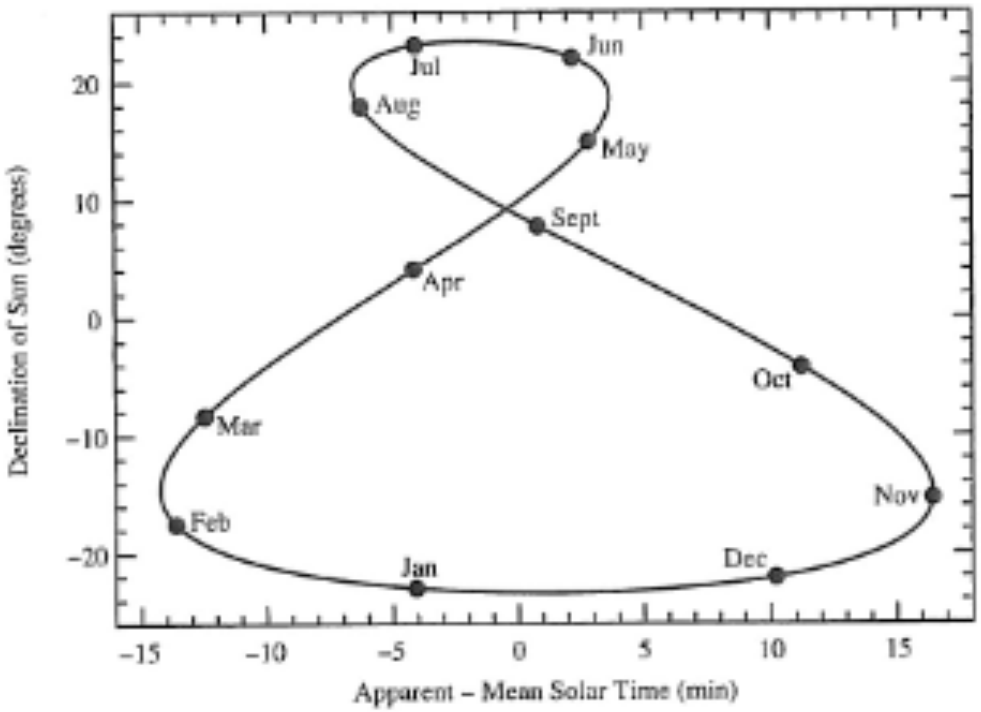


FIGURE 1.13 The analemma; that is, a plot of the Sun's declination as a function of the equation of time. The dots represent the Sun's position on the first day of each calendar month.

The analemma in the sky