

REDUCTION OF STAR PLACES.

(The following is largely adapted from Hayford's *Geodetic Astronomy*).

The *mean place* of a star is its position referred to the mean equator and mean ecliptic, as distinguished from its position as referred to the actual or true equator and ecliptic. The equator and ecliptic as they would be if unaffected by periodic variations, in other words by nutation, are called the *mean equator* and *mean ecliptic*.

The *mean place* of a star, then, at a given instant, differs from the true place by the effect of nutation at that instant, and from the *apparent place* by the effects of both nutation and annual aberration.

To avoid inconveniences arising in the course of computations of star places, if any other form of year is employed in reckoning time, the astronomer uses what is called the *Besselian fictitious year*. The beginning of the fictitious year differs from the beginning of the ordinary year by a fraction of a day, which varies for different years.

The reduction from the mean place given in the catalogue to the apparent place for any given date is made in two steps.

Firstly, the mean place of the star is reduced from 1910.0 to the beginning of the fictitious year at some part of which its apparent place is desired.

If α_0 and δ_0 are the mean right ascension and declination as given in the catalogue, the mean right ascension and declination α and δ for the beginning of some year t are

$$\alpha = \alpha_0 + (t - 1910.0) \left[\frac{d\alpha}{dt} \right] + \dots\dots$$

$$\delta = \delta_0 + (t - 1910.0) \left[\frac{d\delta}{dt} \right] + \frac{1}{2} (t - 1910.0)^2 \left[\frac{d^2\delta}{dt^2} \right] + \dots\dots$$

where $\left[\frac{d\alpha}{dt} \right]$, $\left[\frac{d\delta}{dt} \right]$ are the annual precession and proper motion in right ascension and declination, respectively, as given in the catalogue, and $\left[\frac{d^2\delta}{dt^2} \right]$ is the change per year in annual precession.

In the formula for declination given above only the first two terms of the expression are given. This is sufficiently accurate for all but the close circumpolar stars. With these stars the change in the change per year in annual precession is very often sufficient to make the application of the third term necessary. To avoid this and shorten the labour of reduction, the positions of all stars in the main catalogue whose declinations are between $+83^\circ$ and $+90^\circ$ are given separately in a subsidiary catalogue for every 5 years from 1910 to 1925. The reduction of declination to mean place at the beginning of the desired year is then made as above, taking for δ_0 , $\left[\frac{d\delta}{dt} \right]$ and $\left[\frac{d^2\delta}{dt^2} \right]$ the data given for the epoch immediately previous to the year for which the declination is required.