what corrections to Hausen's elements are indicated by the recent observations of the moon made at Greenwich and Washington since 1862, a period during which both series of observations are carefully compared with Hausen's tables.

The general ideas on which the present investigation of these corrections is based are these: the errors of the moon's tabular longitude are of two classes,—a progressive correction, which apparently increases uniformly with the time; and errors of short period, the principal ones of which go through their period during one revolution of the moon or less. In determining the errors of the first class from observation, those of the second class may be regarded as accidental errors, the effect of which will be eliminated from the mean of a large number of observations. Since, in a series of observations extending through a number of years, the maxima and minima of each term of short period will fall indiscriminately into all parts of all the other periods, each periodic correction may be determined as if the effects of the others were purely accidental errors. At the same time, as the elimination of each periodic error from the maxima and minima of all the others cannot be complete in any finite time, it is desirable that each periodic correction of sensible magnitude which we can determine beforehand shall be applied to the residuals before the latter are used to determine the corrections to the elements.

The corrections of the elements of longitude have been made to depend principally upon the observed right ascensions, instead of reducing the observed errors of right uscension and polar distance to errors of longitude and latitude. The reason for this course is, that the apparent errors of polar distance, after correcting them approximately for errors of the elements easily determined, will arise principally from errors of observation, and not from errors of the tables. In fact, the observations of the moon's declination are sometimes affected with accidental errors of a magnitude which it is difficult to account for, especially in the case of Washington. Granting that the moon moves in a plane the position of which can be very accurately determined, we have afterward only to determine the moon's position in that plane, and this can be done from an observed right ascension almost as well as if we had a directly observed longitude. The longitude thus determined will be less likely to be affected with systematic errors than if we suppose the position entirely unknown, and change the errors of right ascension and declination to errors of longitude and latitude, without regard to the possible constant errors of the measured declinations.

Formulæ for expressing the longitude and latitude of the moon in terms of the lunar elements are given by Hansen in a posthumous memoir.* The following terms are sufficient for our present purpose:

Put

- 7, the moon's longitude in orbit;
- θ , the longitude of the ascending node;
- i, the inclination of the orbit to the ecliptic;
- α, δ , the moon's right ascension and declination;
- ω, the obliquity of the ecliptic.

 * Ueber die Darstellung der graden Aufsteigung und Abweichung des Mondes in Function der Länge in der Bahn und der Knotenläuge. Abhandlungen der Königlich-Sächsischen Gesellschaft der Wissenschaften, Bd. x, No. vüi.