which gives, for various instants, the geographical points where the satellite is in the zenith, and the heights of the satellite above these points. From such heights and the dip of the horizon the terrestrial area of its visibility is defined; and its apparent altitude and azimuth from any station within this area may be derived.

Although observing coordinates are thus essentially geographical, they must be transformed to the usual astronomical ones, having vernal equinox and north pole as points of reference, for all theoretical developments of the orbit and ephemeris on the principles of celestial mechanics. However, even on this ground more generally familiar to astronomers, there are special considerations for a very close satellite. For instance, it must be borne in mind that the satellite's orbital period is the time interval for return to a given sidereal longitude—not for return to perigee or any other given anomaly in the orbit. For finding ephemerides of other celestial bodies this distinction is negligible, but for such a close satellite it might lead to an error of a degree, 70 geographical miles, in two or three hours—so enormous is the perturbational advance of perigee. The classical approach to this question (Herget 1948) derives the resultant decrease in an orbital anomaly to be used in Kepler's equation for computation of an ephemeris position. However, if the ephemeris is computed by the vectorial equation $\mathbf{r} = a(\mathbf{P}X + \mathbf{Q}Y)$ (Wilson 1955), one may get directly the resulting variations in the rectangular orbital coordinates.

$$\Delta X = + \Delta \pi \left(Y - \frac{eXY}{1 - e^2} \right)$$

$$\Delta Y = - \Delta \pi \left(X + \frac{eY^2}{1 - e^2} \right)$$

Here $\Delta \pi$ is the corresponding variation in the longitude of perigee. The X and Y for the corresponding mean anomaly and eccentricity e may be read directly from tables in the *Union Observatory Circular* No. 71, Appendix.

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Naval Research Laboratory,
Washington, D. C.

Wlérick, Gérard. Solar granulation. The frequency spectrum of photospheric brightness at long spatial wave lengths.

A very good photograph of solar granulation taken by Dr. W. A. Miller at Rocky Point, Long

Island, N. Y., has been analyzed. The aperture of the telescope was 4.5 inches and the plate Kodak 548 GH. As no colored filter was used, the plate was impressed by radiations from the interval 3600–5650 Å.

With the microphotometer of the High Altitude Observatory tracings were made along two linear paths whose total length corresponds to 1,140,000 km on the sun. The statistical analysis was similar to that made by Frenkiel and Schwarzschild (1955) and by Uberoi (1955) for solar granulation photographs taken at Mount Wilson with a 4-inch aperture in a narrow wavelength interval centered around 5800 Å. It consisted of the computation of the autocorrelation function of brightness, of the one-dimensional frequency spectrum and of the two-dimensional frequency spectrum. A correction was applied for the finite resolution of the telescope due to diffraction and chromatic aberration.

The results indicate that in the range of spatial wave lengths from 87,000 km to 3140 km, wave numbers from $7.2 \times 10^{-5} \text{ km}^{-1}$ to $2 \times 10^{-3} \text{ km}^{-1}$, the two-dimensional frequency spectrum $P(k)$ is of the low frequency type, i.e., the average energy per unit frequency decreases with frequency.

The results thus differ from those of Frenkiel and Schwarzschild and of Uberoi who found with Mount Wilson photographs that the frequency spectrum was nearly constant in the range from 30,000 to 2000 km, wave numbers from $2 \times 10^{-4} \text{ km}^{-1}$ to $3 \times 10^{-3} \text{ km}^{-1}$. The difference implies that more energy resides in larger scale granular structure for the shorter wave-length images used by Miller and indicates the importance of homogeneous granule studies simultaneously at several colors.

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Uberoi, M. S. 1955, *Ap. J.* 122, 466.

High Altitude Observatory,
Boulder, Colo.

Wlérick, Gérard, Axtell, James and Lee, Robert. Photoelectric observations of the electron solar corona.

The High Altitude Observatory staff has recently installed in Boulder a new instrument designed for the detection without eclipse of the