

Systematic Accuracy of Photographic Star Positions and Proper Motions. HEINRICH EICHHORN, *Van Vleck Observatory* AND CAROL ANN WILLIAMS, *Yale University Observatory*.—The accurate knowledge of the covariance matrix associated with a set of observed positions and/or proper motions substantially increases their usefulness whenever they are to be used as basic material for statistical investigations.

The variance (essentially the error) of a photographic star position is composed of intrinsic variance, which as a rule increases toward the plate edges, the measuring variance, and the variance introduced as a function of the covariance matrix of the plate constants. The error connected with the latter is systematic and can be estimated from the covariance matrix of the plate constants.

Theoretical expressions for the covariance matrices of the plate constants were established replacing, by definite integrals, the product sums occurring in the matrix of the system from which they are obtained by a least-squares solution. This was done for several models for the connection between standard and measured coordinates and various plate formats. For all models considered, diagrams were constructed showing loci of equal "plate constant variance" referred to unit star density. From these, in connection with appropriate tables, many questions concerning the systematic accuracy of photographic astrometric data can be answered, the most important being: (a) How many reference stars are needed (given a model for the connection between standard and measured coordinates) if the maximum (average, minimum) systematic error of a star position is not to exceed a certain limit? and (b) Under given circumstances, will an added term in the formula for the conversion of measured to standard coordinates increase or decrease the systematic accuracy of the positions?

Vertical Motions at Different Heights in the Solar Atmosphere. JOHN W. EVANS, *Sacramento Peak Observatory*.—Although the vertical motions in the solar atmosphere responsible for the "wiggles" in Fraunhofer lines are largely oscillatory (Leighton, Noyes, and Simon, *Astrophys. J.* **135**, 474, 1962; Evans and Michard, *ibid.* **136**, 493, 1962) the instantaneous velocity field is random. The rms vertical velocity σ_v increases systematically with the strength of the line measured, and hence with geometrical height on the sun (Evans and Michard, *Astrophys. J.* **135**, 812, 1962). We should therefore expect to find a decrease in σ_v as we measure the velocities at increasing distances $\Delta\lambda$ from the centers of strong high-level lines, where we see to lower levels in the solar atmosphere.

The Doppler shifts in the profiles of $H\alpha$, $H\beta$, D_1 , and b_2 have been measured for at least 50 points along each line. The measured velocities show without exception the expected smooth decrease from a maximum near the line center to a value $\frac{1}{2}$ to $\frac{1}{3}$ as great at the largest $\Delta\lambda$'s at which velocities could be determined. Less exact measurements (by the method described by Evans and Michard) in Fe 3856.4 and Ca II 8542 lead to a similar result.

This finding tidies up our concept of the height dependence of σ_v . We can use σ_v with some confidence as a tool for ordering the Fraunhofer lines according to effective height of origin, and to relate them to the height of absorption in the wings of the strong lines. We must remember, however, that the "effective height" of a line is not very clearly defined since the contribution function extends over a considerable height range, and differs somewhat from one line to the next. As an index to height, however, σ_v has the merit of being a straightforward observational quantity depending only on mass motion, which must be the same in a given element of volume for all atoms regardless of their properties or the physical state of their environment.

The 300-foot Transit Telescope at the National Radio Astronomy Observatory. JOHN W. FINDLAY, *National Radio Astronomy Observatory*.—The transit telescope which has recently been built at the National Radio Astronomy Observatory is a parabolic dish 300-ft in diameter mounted on two towers fixed on an east-west line. The antenna may be pointed to within ± 10 sec of arc anywhere within the declination range -20° to $+90^\circ$. The mesh surface allows the telescope to be used at frequencies up to at least 1420 Mc/sec. Measurements of the gain and beamwidth of the telescope have been made at 750 and 1400 Mc/sec, and position calibration curves have been prepared. The telescope has been used in a number of observational programs, the results of which are being reported by other authors.

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Significance of a Luminosity Concentration Law in Elliptical Galaxies. ROBERT A. FISH, *Miller Institute for Basic Research in Science, University of California*.—New photometry of elliptical galaxies in the Virgo Cluster and in the field based on Lick Observatory 120-in. plates, combined with the results of earlier workers, points to a correlation between the effective radius of a galaxy (as defined by de Vaucouleurs and measured along the minor