it appears that incidence of binaries is related to rotation. For moderately rotating stars, the incidence of binaries is a maximum, and it becomes less for very rapidly rotating stars and also for slowly rotating stars. This conclusion may have a bearing on theories of stellar evolution.

1. *Stellar Evolution*, p. 194, 1950.
2. An Analysis of Radial Velocity Measures of Eight Stars Formerly Assigned to the β Cephei Group. *Ap. J.* **109**, 185, 1949.

*David Dunlap Observatory,
Richmond Hill, Ont.*

Smith, Harlan J. and Richard E. McCrosky.
**Weather conditions in southwestern U. S. A.:
Cloud coverage.**

Analysis of night-time cloud coverage, with observatory site selection in mind, was carried out for 20 stations in southwestern U. S. A., using synoptic weather map data for the period 1939 to 1946. Monthly and annual averages of the number of clear hours per night were obtained for each station, with probable errors for the annual averages running around 4 per cent.

The results indicate that the best region is that within 100 miles of Yuma, Ariz., where on the average 6.8 hours per night are clear, with good weather prevailing all year. Eastward, across southern Arizona and New Mexico, winters are superlative but summers are lost almost completely to thunderstorm cloudiness in July and August. Nevada and the northern parts of Arizona and New Mexico have only moderate summer thunderstorm trouble, but suffer severely from general cloudiness in winter and spring. Averages in these areas are around 5 hours per night. A peninsula of clearer weather seems to extend up the Rio Grande toward Engle, N. M., while west Texas has uniform conditions, averaging 5.5 hours per night.

An "iso-ob" chart of the Southwest was prepared, having contours of equal annual observable time, drawn at intervals of 0.3 hour. Over the regions where the station net is dense, the chart should be a useful guide toward the location of sites.

This study will be published as a Technical Report of the Harvard Meteor Project.

*Harvard College Observatory,
Cambridge, Mass.,
and Las Cruces, N. Mex.*

**Strand, K. Aa. Astronomical refraction at large
zenith distances.**

The astronomical refraction within 30° of the horizon has been measured differentially by com-

paring the reduction of the distances between selected markings on the surface of the moon with the distances between the same markings at an altitude of 30° of the moon. Similar reduction of the distances between several of the bright members of the Pleiades were also used.

Using the 18½-inch visual refractor at the Dearborn Observatory, the moon was photographed near its full phase from the moment it appeared on the horizon until it reached an altitude of 30° . To insure the highest possible accuracy the selected markings were those which within a series appeared well defined and small enough to secure an accurate measurement of their centers. The final plate of a series taken close to 30° altitude served as the standard plate of the series and required the knowledge of its orientation which was obtained by means of a trail of a nearby bright star. At the altitude of the standard plate the effect of refraction was taken from existing refraction tables and since the effect of refraction at this altitude was less than one per cent of the effect of refraction near the horizon, any deviation between the actual refraction and the assumed refraction would have little effect upon the final results. In the reduction of the individual plates, the effects of changes in the moon's parallax and the earth's selenographic position were taken into account.

The obtained results indicate that the increment of refraction per half-degree increase in zenith distance can be obtained with a probable error $\pm .01$ for a series of twelve pairs of markings on a plate. Generally this error is somewhat larger for the first 2° of altitude.

The obtained increments of refraction were compared with those from the refraction tables listed in *Astronomisch-Geodätisches Jahrbuch*, after a reduction to the standard atmosphere. This comparison showed that the refraction for the individual nights could be obtained with an accuracy of 2 per cent. While the results in general indicate no errors in these tables, which are almost identical with those of Garfinkel,¹ the results for the individual nights indicate that the corrections, now employed to adjust the tables from standard to actual conditions, need revision.

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1. *A. J.* **50**, 169, 1944.

*Dearborn Observatory,
Northwestern University,
Evanston, Ill.*