tion of the hourly differences of observed zenith distances. The closing errors of such cycles of differences are purely errors of observation, and the derivation of the periodic terms in standard star places is not obscured by the computation of other terms in the reduction to right ascension and declination.

The observations of latitude in the past thirty years number about 15,000. The mean value is 37° 20′ 25″.6; and there is no evidence in our results of any definite change in position, either abrupt or progressive, that is large enough to be measured by meridian circle observations.

Possible Changes in the Orbital Elements of the Short Period System of Polaris

By J. H. Moore and E. A. Kholodovsky

(abstract)

In 1899 Dr. Campbell, from observations secured with the Mills spectrograph, found that the radial velocity of *Polaris* is variable, with an amplitude of about 6 km/sec in a period of approximately 3.968 days. Moreover a comparison of the 1899 results with the observations of 1896 showed definitely that the center of mass-velocity of the short period system is variable. Observations have been secured each year since 1899 at the Lick Observatory for the purpose of determining the orbit of the center of mass. The velocity curve of the short period system representing the observations of 1921 indicated that the form of the curve had changed appreciably from that shown by the curve for 1899, but was not sufficiently well determined to establish with certainty the nature of this change.

During the months September, 1923, to January, 1924, we have obtained a series of 63 spectrograms well distributed through the 4-day cycle. These have been measured by Mr. Kholodovsky, and form the basis for an accurate determination of the orbital elements on the assumption that the short period variation is due to the orbital motion of *Polaris* in a binary system. The recent elements when compared with those

of 1899 indicate a change in the position of periastron of about 23°. The eccentricity appears to have increased about 0.1 and the semi-amplitude of the velocity curve to have decreased 0.3 km/sec in the 24 years. We have found no evidence of a change in the period. Unfortunately the observations secured in the intervening years seem to furnish insufficient evidence concerning the probable period of these variations. As far as they go they appear to be in harmony with one of at least many years. Our determinations of the velocity of the system indicate that the period of its variation is in excess of 27 years.

The subject is of special interest in view of the fact that *Polaris* is a *Cepheid* variable, the light period being identical with the short period variation in radial velocity. The observed changes in the orbital elements are the ones we should expect in the case of a short period binary which is a member of a triple system, and are quite similar to those found for the spectroscopic pairs in the well known triples κ *Pegasi* and 13 *Ceti*.

Do the Star Streams of Kapteyn Exist?

By C. V. L. Charlier

(abstract)

There is no doubt but that the discovery by Kapteyn in the year 1904 of the singular regularities in the proper motions of the stars—which he tried to explain through the two star streams—is the most important discovery in stellar statistics in recent decades. The fact subsists, the explanation is, however, no longer valid.

It is now twenty years since that time. A short time in the history of astronomy. But what progress has been made in stellar statistics during these 20 years! As a guest, at present, in the United States I am glad to state that most of this work has been done in this country. I am thinking now, in the first place, of such matters as are connected with the problem now in question.

Kapteyn based his researches on the *proper motions* as they had been determined by Auwers principally from the observa-