

sense; their values cannot by any means be determined by observations.

From what has been said it is now easy to see how Eq. (2) for the earth may be used to define a measure of time. The values of A and n adopted were those of Newcomb, because there was no reason to prefer any others, and the new definition of the second depends on his value of n . The values of A and n are now not subject to corrections determined by observations. It is now meaningless to speak of an error in the tabular mean longitude of the sun, or of an error in its tabular mean motion. On the other hand it is now possible to determine a and b for the earth by observations. The measure of time defined by Eq. (2) for the earth, with Newcomb's constants, is ephemeris time.

Whether Eq. (1) or Eq. (2) is used to define the measure of time, the practical determination

of time is the same in principle. A table is constructed, showing in adjacent columns values of t and of v (or θ). A determination of time consists in measuring the value of v (or θ), and consulting the table to ascertain the corresponding value of t .

It is particularly to be noticed that no assumption is made about the variability or invariability of the measure of time. The only assumption is that the equations of motion are known. In the case of mean solar time, Eq. (1) for the earth has been shown to be inconsistent with Eq. (2) for the earth, the moon, Mercury, Venus, and the great satellites of Jupiter, whereas the Eqs. (2) mentioned are consistent with one another. It is this result that has persuaded us that the theory of rotation of the earth is incomplete, and to discard mean solar time in favor of ephemeris time.

DISCUSSION

Dr. W. FRICKE,* referring to the paper read by Dr. Nemiro, said that the revision of the fundamental system of star positions FK₃ which will result in the formation of FK₄ is expected to be completed early in the year 1960. At this moment a statement is already possible about the accuracy of the individual corrections to FK₃ which were published in 1957. According to the results obtained from the observations at Danjon's astrolabe at the Observatory of Paris during the last few years, these corrections are an effective improvement of FK₃. The systematic corrections to FK₃, which are being deduced at present by the use of absolute star catalogues, will be partly based on catalogues from the Pulkovo Observatory, which are excellent. Nevertheless, Dr. Nemiro's remark is true, that also in FK₄ the influence of the errors of older star catalogues will not be entirely eliminated. Therefore, his proposals have to be welcomed that the time determinations with modern transit instruments be organized so that they give a possibility of deriving the accidental and systematic errors of the right ascensions of the stars of the fundamental catalogue with highest precision. Moreover, the use of the impersonal astrolabe has to be recommended for high precision observations.

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Dr. CLEMENCE thought that in the future the Danjon astrolabes should play an important role in the construction of fundamental catalogues of bright stars. By reason of the numerous observations made in the time services these instruments could greatly reduce systematic errors of various sorts in existing catalogues. It would still be necessary to rely on meridian circles for the equinox and equator, and for the positions of reference stars needed in the reduction of photographic catalogues.

Prof. PAVLOV mentioned that in recent years the time service is experiencing a great change. The function of the International Time Service is turning more and more into a service for checking the rotation of the earth; at the same time, the determination of uniform time is becoming in greater degree dependent on the atomic standards of frequency.

In connection with the first problem, the requirements of the precision of astronomical determinations of time, and particularly of catalogues of star positions, have significantly increased. Prof. Danjon has made a bold attempt to deduce seasonal variations of the rotation of the earth from observations conducted at a single observatory. His work is of great interest. The possibility of a similar kind of deduction from observations with transit instruments requires, first of all, a careful elimination of systematic errors in star catalogues.