

4. REMARKS CONCERNING N₃₀

By H. R. MORGAN

For work on the planetary tables it was necessary to consider the uncertainties in the observed positions of the planets due to errors in the star places used in their reductions, especially during the last century. It became necessary also to examine the general systematic errors in the present fundamental catalogues, and their effects upon the determination of the precession; on time determinations; and on stellar motions in general.

For this study normal positions of the standard stars were derived for the epoch 1930, using observations of some 5000 stars as given in 70 recent catalogues, 1920–50. Thirty of these catalogues depend upon independent or fundamental observations, and these, together with observations of the Sun, Moon and planets, determine the fundamental system. This system, N₃₀, is independent of any other system. Independent proper motions were determined by comparing the 1930 normal positions with the normal positions at the mean epoch, thirty years earlier, in the *Albany General Catalogue*. The latter positions were corrected for some well-known errors.

Comparisons of N₃₀ with GC and with FK 3 are given in the Introduction to the N₃₀ Catalogue; also in *M.N.* 114, 478, in *A.J.* 56, 97, and in *A.J.* 54, 145. The effects on the precession are discussed in *B.A.N.* no. 431, and the effects on time determinations in *M.N.* 113, 251.

In *B.A.N.* no. 357, Dr Oort gives the results of a critical study to determine the true uncertainty of the fundamental systems. By an independent discussion of the same observations that were used for the FK 3 system he finds decided systematic corrections to FK 3, especially in the proper motions. This, of course, is shown more forcibly in the independent discussion of modern observations, N₃₀. The comparisons with N₃₀ show rather large systematic errors in FK 3 both in the positions at 1950 and in the proper motions, especially at some of the higher declinations. A considerable part of this may be due to the motions as derived from the old observations.

In his George Darwin Lecture (1936), Dr Kopff stated: 'The catalogues between 1850 and 1900 are not free from systematic errors; and so it must be the task of the future to bring our knowledge of the proper motions more and more near the truth.' The comparisons with N₃₀ are considered by Dr Kopff (*A.R.I.* Dec. 1952) as showing necessity for revision of the FK 3 system, and he has again taken up the task.

If the 1900 equations are used in the revision of FK 3, it seems inevitable that unless the weights of the proper motion terms are radically reduced their uncertainties will have a harmful effect in the revised system. The revised positions, when available (1958), will depend upon some thirty years or more of the motions.

A close agreement between the revised system and the N₃₀ system may be expected, however, and as this revision is assured and will probably be adopted by the I.A.U., it seems unnecessary, and also undesirable, to propose at this time any other substitute for the system.

The number of stars in FK 3 (1500) has been quite too small for satisfactory comparisons with observational catalogues. The proposed addition of the 2000 'supplemental stars' will afford better comparisons. However, it may be a decade or more before such stars become well integrated into the system, as a considerable portion of them are poorly observed.