19. COMMISSION DE LA VARIATION DES LATITUDES

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We note with much regret the death on 3 November 1960 of Sir Harold Spencer Jones, a member and former President of this Commission.

OBSERVATIONS

Alger-La Bouzaréah, France. From October 1957 to July 1960 inclusive, 1087 groups comprising a total of 28 928 stars were observed with the Danjon astrolabe.

Belgrade, Yugoslavia. The same programme as in previous years was followed up to 1 January 1960. The new programme then adopted consists of 60 pairs in six groups. At present these two programmes are being observed by turns. From 1 September 1957 to 1 September 1960, 2780 pairs were observed. Regular publication of the results has been continued in *Bulletin de l'Observatoire de Beograd.* B. Sevarlić has completed the discussion of the material accumulated from 1949 to 1957 (7000 observations) with special attention to the analysis of non-polar variation of latitude. At present the discussion of observations made from 1957·0 to 1960·0 is in progress.

Blagoveschensk, U.S.S.R. Observation with the zenith telescope ZTL–180 described in *Trans. IAU* **10**, 283–4 has been conducted.

Carloforte, Italy. Observation on the programme of the International Latitude Service (ILS) has been continued. Between 6 January 1958 and 6 April 1960 a total of 8379 observations was obtained.

Dresden, G.D.R. During the International Geophysical Year and its prolongation for the year 1959 observation with the Zeiss transit instrument of 100 mm aperture and 1000 mm focal length was conducted at Technische Hochschule, Dresden. The observing list consisted of 90 pairs; stars were taken mainly from FK 3 and FK 3 Supp.

Engelhardt Observatory near Kazan, U.S.S.R. The zenith telescope ZTL–180 was put into operation in October 1957 and since then up to 23 September 1960 a total of 2740 observations has been obtained.

The observing programme consists of four groups each containing eight star-pairs. In addition observations of bright zenith stars α Cassiopeiae and ϵ Ursae Majoris were commenced in August 1959.

Gorky, U.S.S.R. The Dubrovsky Observatory at Gorky has continued observations with the Bamberg zenith telescope of 90 mm aperture. The observing list consists of the bright near-zenith stars α Cassiopeiae and ϵ Ursae Majoris and two pairs composed of bright stars.

Gaithersburg, Maryland, U.S.A. Observation on the programme of the ILS has been continued. Between 6 January 1958 and 6 April 1960 a total of 7074 observations was obtained.

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Hamburg, G. F. R. According to the AGK 3R programme readings of the meridian marks were made at the Hamburg Observatory before and after observation of each zone. The data thus obtained enabled J. von der Heide to derive the $(x \sin \lambda - y \cos \lambda)$ component of the polar motion 1956·5 to 1959·3.

Herstmonceux, England. At the Royal Greenwich Observatory the analysis of the first two years' observations with the Photographic Zenith Tube (PZT) was completed towards the end of 1957 and an observing programme incorporating the revised star places was commenced on 1 January 1958. Details of this programme, including the catalogue of star places and proper motions, are given in *Royal Greenwich Observatory Bulletin* No. 11; the results for the years 1958 and 1959 are given in *Bulletins* Nos 11 and 18 respectively. Between 1 January 1958 and 31 October 1960 a total number of 538 plates has been obtained with an average number of 11 stars on each plate. The time and latitude results are sent regularly to the Central Bureau of the ILS and to the Bureau International de l'Heure. The latitude observations indicate a large apparent systematic drift of the zenith toward the north during the night; this is closely confirmed from year to year and can be represented empirically by the term $0''{\cdot}10 \sin(\odot - \alpha)$.

A Danjon astrolabe OPL No. 9 was brought into use in the autumn of 1959. The observations obtained since then will be analysed for corrections to adopted star places before definitive results are derived.

Irkutsk, U.S.S.R. Observation with the zenith telescope ZTL–180 has been continued. The observing list consists of 32 pairs in four groups and the bright near-zenith star β Draconis.

Kitab, U.S.S.R. The old Bamberg zenith telescope and the new instrument ZTL–180 have been operated continuously, both observing the programme of the ILS. From 6 January 1958 to 6 April 1960 over 5000 pairs were observed with each of the instruments. The analysis of the results has revealed a marked difference between non-polar annual terms in latitude variations obtained with the Bamberg zenith telescope and ZTL–180. Since the programme is common, the difference could by no means be ascribed to any systematic error of adopted declinations.

Milan, Italy. Preliminary results of the observations made during the International Geophysical Year have been published in *Mem. Soc. astr. Ital.* **30**, 1960. Beginning with 1960·3 latitude observation with the Bamberg transit instrument was resumed. The Horrebow-Talcott method is followed.

Mizusawa, Japan. Latitude observations with three instruments of different types were continued. During the period from 7 July 1957 to 6 July 1960, 5073 star pairs on 531 nights, 6401 star pairs on 536 nights and 5132 stars on 492 nights were observed with the visual zenith telescope, the floating zenith telescope and the PZT respectively.

In September 1959 a screen was built around the observation hut of the floating zenith telescope to shelter it from the mechanical effect of wind.

C. Sugawa investigated the non-polar latitude variation at Mizusawa in connection with the wind effect, anomalous refraction and the tilting of the air-strata of equal density in the upper atmosphere. He revealed also a significant lunar tidal variation in concurrent latitude observations with the visual and floating zenith telescopes from 1943 to 1954.

Moscow, U.S.S.R. Observation with the zenith telescope ZTL–180 has been continued at the Sternberg Astronomical Institute on the same programme as in the previous years.

Mount Stromlo Observatory, Canberra, Australia. Observations with the PZT have been continued regularly since November 1958 and most of the plates have been measured. The IBM 610 electronic computer has been programmed to furnish the apparent places and to reduce the observations for the relative star corrections. Definitive values of the variation of latitude at Mount Stromlo since November 1958 should be available during 1961. A programme machine to operate the PZT automatically is about to be installed.

Neuchâtel, Switzerland. The PZT (Grubb, Parsons and Co., Ltd., Newcastle) is located in a special housing near the Observatory. The Danjon astrolabe was mounted at the beginning of the IGY, at a different location about 1200 m above sea-level for meteorological reasons. The operation of the PZT is now automatic to the extent that a whole night's observation is programmed in advance and performed without any human attendance or survey.

The reduction for both instruments is performed by an electronic computer.

The position errors of both star programmes have been smoothed out. After three years of observation the first observation programme, consisting of 189 stars in twelve groups, has been discontinued. Beginning July 1960 observations are being made according to a new programme of 187 stars, 64 of which had already been included in the former programme.

Ottawa, Canada. Observations with the PZT have been carried on regularly at the Dominion Observatory, Ottawa. Since 1959·0 a revised catalogue has been in use with a notably smaller $\Delta\delta_a$. Efforts being made to improve the star places still further include (*a*) all-night observations throughout the year for two years and (*b*) re-measurement and re-reduction of all plates taken since 1953·0 on a strictly homogeneous basis. In connection with these efforts the operation of the PZT is being made more fully automatic, and the measurement and reduction of the plates is being increasingly mechanized. In May 1960 the PZT was moved about 100 m south-east into a specially designed hut; a reduction of between 25% and 50% in the external mean error of the nightly latitude is already apparent.

Paris, France. The Danjon astrolabe has been operated continuously. A. Danjon, B. Guinot and others have discussed in a series of papers various matters connected with the application of this instrument to time and latitude services.

Poltava, U.S.S.R. Latitude observations with two zenith telescopes have been continued. Up to 1960·0 the same programme as in the previous years was followed but somewhat modified: an 'extra-link' centred at 22^h was added. Beginning with 1960·0 the programme of the Bamberg zenith telescope has been reduced to two groups.

From 1 January 1958 to 1 October 1960 totals of 4760 and 3992 observations were made with the Zeiss and Bamberg instruments respectively. In addition 1199 observations of the bright near-zenith stars α Persei and η Ursae Majoris were obtained with the Zeiss zenith telescope during the same period. These stars were observed also with the Bamberg instrument from 1 December 1957 to 12 January 1960 and then discontinued, the total number of observations being 440.

A Danjon astrolabe was brought into use in June 1960.

Potsdam, G.D.R. The Danjon astrolabe (No. 10) was operated continuously at the Geodätisches Institut, Potsdam. The observing list consisted of 12 groups each containing 24–29 stars. For the chain method to be applicable the observations were scheduled in a manner similar to that of the ILS. During the period from 1 January 1958 to 7 October 1960, 707 groups were observed.

Pulkovo, U.S.S.R. Observations with the zenith telescopes ZTF-135 and ZTL-180 have been continued on the same programme as in the previous years. The yearly number of observations with the former instrument is about 4200, with the latter about 1800. The PZT was put in service on 30 August 1958. Since then to 16 May 1959, when the instrument was partly dismounted for modification, some 2000 observations had been made. The Danjon astrolabe has been installed. Thus a project to equip the latitude service of the Pulkovo Observatory with instruments of all the main types is accomplished.

It is hoped that concurrent observations with these instruments will enable sources of systematic errors in latitude observations to be thoroughly investigated.

Tokyo, Japan. The PZT has been operated continuously for determination of time and latitude. During 1958 and 1959, 198 and 139 night observations were obtained respectively.

M. Torao has deduced from Tokyo observations the following term in the variation of latitude

$$\Delta\phi = -0''\cdot007 \cos (2t_{☾} - 65°)$$

where $t_{☾}$ is the Moon's hour angle. He has also found that the diurnal term was

$$-0''\cdot062 \sin (H^{\mathrm{h}} - 3^{\mathrm{h}})$$

where H^{h} is the time elapsed from sunset.

Ukiah, U.S.A. During the period 1 July 1957 to 30 June 1960 a total of 11 697 observations were made with the Bamberg zenith-telescope.

Ulan-Bator, Mongolia. The Zeiss zenith telescope of 135 mm aperture and focal length of 1760 mm was installed and tested.

No particular reports have been received from the observatories at *Borowiec*, (Poland), *Washington* and *Richmond* (U.S.A.), and *La Plata* (Argentina), but it is understood that these observatories have continued latitude observations with the same instruments and on the same programmes as in the previous years.

It is understood also that the programme of the ILS has been observed with the ZTL–180 at the *Tientsin Latitude Station* (China), and that the Danjon astrolabes have been operated at *Besançon* (France), Honolulu (Hawaii) and the *Zi-Ka-Wei Observatory* (Shanghai, China).

Results of latitude observations made at the Mizusawa and Tokyo Observatories during the International Geophysical Year, have been published in detail by the National Committee for the IGY, Science Council of Japan (**1, 2**). Preliminary results of all latitude observations made in the U.S.S.R. during the same period have been published by the Committee for the IGY, Academy of Sciences of the U.S.S.R. (**3**).

COMPUTATION OF POLAR CO-ORDINATES

During the period of this report three independent Polar Motion Services have been in regular operation.

1. The Central Bureau of the ILS has derived the polar motion from latitude observations at the international stations Carloforte, Kitab, Mizusawa, Ukiah and Gaithersburg. The stations were giving yearly about 15 000 values for the latitude. The polar co-ordinates up to 1960·3 have been published in (**4**).

2. The Bureau International de l'Heure has continued computing the preliminary co-ordinates of the pole for time determination. The following report on the activity of the Bureau has been received from N. Stoyko.

Report from Bureau International de l'Heure

'Le développement du Service International Rapide des Latitudes (SIR) qui a été crée en 1955 continue. Le nombre des stations participantes à ce service qui a été égal à 10 avant l'Assemblée Générale de l'UAI à Moscou, atteint actuellement 17: Alger, Belgrade, Besançon, Carloforte, Engelhardt (près Kazan), Greenwich (Herstmonceux), Irkutsk Astr., Kitab,

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Mizusawa, Ottawa, Paris, Poltava, Potsdam, Poulkovo, Richmond, Tokyo et Washington. On utilise 20 instruments de différents types, dont 4 astrolabes de Danjon, 6 lunettes zénithales photographiques (PZT) et 10 lunettes zénithales de dimensions différents.

'Au début on a rapporté les résultats du SIR au pôle moyen du SIL (Service International des Latitudes). A partir du I-er janvier 1959 (Circulaire No. 34) on rapporte les co-ordonnées instantané du pôle au pôle moyen de l'époque d'après la décision de l'Assemblée Générale de l'UAI à Moscou, 1958.

'Pour passer de l'ancien pôle moyen du SIL au pôle moyen de l'époque, on a corrigé progressivement à la fin de l'année 1958 les co-ordonnées x de $-0''\cdot040$ et y de $-0''\cdot114$. Ainsi on tient compte actuellement dans le calcul des co-ordonnées interpolées et extrapolées du pôle instantané seulement des termes periodiques: annuel, semi-annuel et Chandlérien.

'En tout, on a publié 55 Circulaires mensuelles donnant les co-ordonnées interpolées et extrapolées du pôle instantané, ainsi que les corrections des longitudes pour 26 observatoires. Chaque mois ce calcul demande 3 jours du travail, représentation graphique et lissage des courbes inclus.

'Au mois d'août 1960 à Helsinki l'Assemblée Générale de l'UGGI a décidé qu'on publie les co-ordonnées du pôle instantané sous forme $x = x_0 + x_1$, $y = y_0 + y_1$, où x_1 et y_1 sont les co-ordonnées du pôle instantané par rapport au pôle moyen de l'époque (termes périodiques ci-dessus indiqués) et x_0 et y_0 les co-ordonnées du pôle moyen de l'époque. Le SIR publie chaque mois la partie périodique des co-ordonnées x et y, suivant la décision de Moscou, étant donné qu'on n'a pas établi encore le système des co-ordonnées x_0, y_0 (pôle moyen de l'époque).

'Pour la période 1958–1959 le passage des 4 au 3 stations du SIL change la co-ordonnée y du pôle instantané en moyenne de $0''\cdot024$. La différence varie entre deux systèmes des co-ordonnées pendant la même période, entre $+0''\cdot062$ et $-0''\cdot031$. Comme on fait au SIR l'interpolation des co-ordonnées du pôle instantané avec le recul de quelques jours seulement, il faut, donc, pour ne pas perdre de la précision, avoir un grand nombre des stations de latitude. Les 17 stations de latitude, participant actuellement au SIR, permettent donner les co-ordonnées du pôle avec un précision suffisante ($0''\cdot02$).

'Au début de l'existence du SIR, quand on a eu un nombre restreint des stations participantes, on été obligé de tenir compte pour chaque station du terme z par rapport aux co-ordonnées du SIL. Actuellement, avec l'augmentation du nombre de stations libres de latitude et l'amélioration de leurs catalogues d'étoiles, les co-ordonnées du pôle instantané calculées sans tenir compte de termes z individuels par rapport au SIL, donnent même les résultats meilleurs. Ainsi, le système du SIR peut être tout-à-fait indépendant du système SIL.

'*Sur la nécessité du SIR*. Les buts du SIR et du SIL ne sont pas tout-à-fait les mêmes. Le but du SIL est de donner les co-ordonnées du pôle instantané avec la plus grande précision possible en utilisant les résultats des stations internationales de latitudes. Ainsi, pour avoir les résultats définitifs de ce service, il faut attendre plusieurs années.

'Le but du SIR est de donner les co-ordonnées interpolées et extrapolées du pôle instantané le plus vite possible, pour que les services horaires puisse tout-de-suite réduire les resultats de leurs observations astronomiques et de l'utiliser pour l'interpolation et extrapolation de l'heure astonomique T.U.2. Les émissions classiques des signaux horaires radioélectriques sont émises en T.U.2. Il existe actuellement les émissions de fréquences étalons qui utilisent un temps uniforme. Ce temps est basé sur le temps débuit des résonateurs atomiques, dont la fréquence est corrigée de telle façon, pour que ce temps soit le plus proche au temps moyen T.U.2 de l'année

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précédente. Vers la fin de chaque année BIH (décision de l'URSI, Londres, 1960), doit déterminer d'après les observations astronomiques de différents services horaires la correction qu'il faut ajouter au temps atomique de base, dont la fréquence $f(Cs) = 9\,192\,631\,770$ Hz, pour avoir ce temps uniforme T.U.2. Actuellement cette correction de frequence est de 150×10^{-10}. Pour trouver cette correction, il faut connaître les co-ordonnées du pôle instantané d'après SIR le plus près possible à la date de ce calcul. Ainsi, même pour ce temps uniforme, l'existence du SIR est indispensable.

'Le SIR présente un premier exemple de la détermination des co-ordonnées du pôle instantané d'après un grand nombre de services de latitudes. Il a permis déjà étudier les résultats de différents services de latitudes. L'étude des termes périodiques dans le mouvement du pôle est facilité par les données du SIR.

'Mme Anna Stoyko a déterminé au BIH les co-ordonnées du pôle instantané d'après les services horaires. Ces co-ordonnées sont en bon accord avec les résultats du SIR et SIL. Le terme Chandlérien est en accord au 0"·0 avec SIR et SIL.

'*Propositions pour SIL.*

(*a*) Il faut augmenter le nombre des stations participantes au SIL pour que la précision de la détermination des co-ordonées du pôle instantané soit meilleure.

(*b*) Il faut établir le système *unique* des co-ordonnées x_0, y_0 en tenant compte de la décision de l'Assemblée Générale de l'UGGI à Helsinki, 1960.

(*c*) Il faut que le SIR soit lié assez étroitement avec le BIH, étant donné sa nécessité pour les services horaires. L'utilisation seulement des stations du SIL pour le calcul des co-ordonnées du SIR ne peut pas donner la précision suffisante.'

3. The Poltava Observatory has continued the calculation of the polar motion for use by the Soviet Time Service; Orlov's method has been followed and observations at Pulkovo, Poltava, the Engelhardt Observatory, Kitab and Irkutsk used in this calculation.

In recent years the idea has been gaining ground that the time observations could contribute substantially to the computation of the co-ordinates of the pole, for it has been shown that, in practice, time observations by themselves are capable of giving a satisfactory representation of the polar motion (**5**, **6**).

It is natural to take another step further: to combine the polar motion and variations of the rate of Earth's rotation into one problem, which is couched by C. A. Murray in the following terms:

'The general problem of time and latitude may be said to be the determination of three components of the vector representing the small rotation of a conventional co-ordinate system fixed in the Earth, relative to a rotating system defined by the celestial pole, a system of star places, and a standard clock. . . . Now that both astronomical time and latitude can be determined simultaneously with equal precision, and indeed with the same instrument, it is desirable to examine whether a complete solution of the problem is practicable, in which both time and latitude observations are included.'

An attempt was made by C. A. Murray to make use of the observations with the PZTs at Herstmonceux, Tokyo and Washington for the determination of both the polar motion and the variation of the rotation of the Earth compared with a caesium standard. This attempt has proved successful: the co-ordinates of the pole thus obtained are in fairly good agreement with those of the ILS.

Miss A. Korsun has derived the co-ordinates of the pole from observations at 20 observatories during the International Geophysical Year and its prolongation for the year 1959. The scheme of computation was such that the result was quite independent of the polar co-ordinates of the ILS.

DETERMINATION OF THE DECLINATIONS OF LATITUDE STARS

The Meridian Department of the Belgian Royal Observatory has continued compiling the catalogue of 440 stars taken from all the observing lists used by the ILS. Extraction of the necessary data from diverse meridian catalogues is completed. Positions from recent catalogues not yet published have also been obtained. Thus, the total number of positions has surpassed 12 000. All the positions have been reduced to 1950·0 using Newcomb's constant of precession. For reduction to the FK 3 system the Tables by Boss and Gyllenberg were utilized. Punching of all the data is now in progress so that, without waiting for publication, they could be made available for the Central Bureau of the ILS and all interested persons.

Using the transit circle of the Tokyo Observatory, S. Nakano and H. Yasuda have determined declinations of stars taken from the observing lists of the Mizusawa, Tokyo, Washington and Richmond PZTs. The results are represented below as the corrections of adopted declinations relative to the FK 3R sytem.

$$(1)\ \text{FK 3R} - \text{Tokyo PZT, 1959} = +0''{\cdot}21 + 0''{\cdot}03 \sin\alpha + 0''{\cdot}18 \cos\alpha + 0''{\cdot}05 \sin 2\alpha + 0''{\cdot}07 \cos 2\alpha$$

$$(2)\ \text{FK 3R} - \text{Miz. PZT} = -0''{\cdot}17 + 0''{\cdot}13 \sin\alpha + 0''{\cdot}10 \cos\alpha - 0''{\cdot}07 \sin 2\alpha + 0''{\cdot}06 \cos 2\alpha$$

$$(3)\ \text{FK 3R} - \text{Wash. PZT} = -0''{\cdot}02 + 0''{\cdot}04 \sin\alpha + 0''{\cdot}02 \cos\alpha + 0''{\cdot}03 \sin 2\alpha + 0''{\cdot}06 \cos 2\alpha$$

$$(4)\ \text{FK 3R} - \text{Rich. PZT} = -0''{\cdot}28 + 0''{\cdot}16 \sin\alpha - 0''{\cdot}05 \cos\alpha + 0''{\cdot}13 \sin 2\alpha - 0''{\cdot}01 \cos 2\alpha$$

The investigation being aimed at the comparison of the declination systems adopted at these stations, not all the stars but only selected ones were observed, in general, two stars per hour for each station. It was believed that star places should have been smoothed with each PZT itself. It seems, however, that this is not necessarily the case, for there is a marked difference between (2) and (3), although the same system is adopted for both instruments.

M. Torao has found that the amplitude of the annual term in the latitude variation of Tokyo is appreciably smaller than that of Mizusawa, although both stations are at nearly the same longitude. The discrepancy almost vanishes if the corrections obtained by Nakano and Yasuda are applied to the declinations of the Tokyo PZT stars. Thus:

Annual term derived by Torao from observation with the visual zenith telescope at the Mizusawa Observatory:

$$-0''{\cdot}07 \sin 2\pi\tau - 0''{\cdot}12 \cos 2\pi\tau$$

Annual term derived by Torao from observation with the Tokyo PZT in 1959:

$$-0''{\cdot}02 \sin 2\pi\tau - 0''{\cdot}01 \cos 2\pi\tau$$

The same corrected for reduction of the declinations to the FK 3R system:

$$-0''{\cdot}12 \sin 2\pi\tau - 0''{\cdot}13 \cos 2\pi\tau$$

τ being the fraction of a year.

This result shows that there may still remain a systematic error in the star places of the Tokyo PZT, though the declinations were internally adjusted by the chain method.

S. Takagi has compiled a catalogue of the Mizusawa PZT stars based on FK 3 system.

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Declinations of the latitude stars of the Poltava Observatory have been deduced by Mme E. Lavrentjeva from meridian observations at the Main Astronomical Observatory of the Academy of Sciences of the Ukrainian S.S.R., Engelhardt and Odessa Observatories.

The above results of the Japanese astronomers confirm the importance of reduction of all latitude observations to a uniform system of declinations and proper motions. This is an ultimate purpose of re-observation of latitude stars according to the plan adopted by the tenth General Assembly of the IAU. Two lists have been compiled at the Sternberg Astronomical Institute in Moscow, one comprising 1877 zenith-telescope stars, the other 1118 PZT stars (**7**). The Main Astronomical Observatory of the Academy of Sciences of the Ukrainian S.S.R. was first to commence observation of the first list. A total of about 14000 observations with the Wanschaff vertical circle has already been made by A. S. Kharin. Observation of the same list was commenced in March 1960 at the Engelhardt Observatory.

ANALYSES OF LATITUDE VARIATIONS AND SOME PERTINENT PROBLEMS

A. Danjon has revised the whole organization of the latitude service from its basic principles to technical questions pertaining to instruments and their housing (**8**).

Mme S. V. Romanskaya continued a joint reduction of the 42000 latitude observations made with the Pulkovo zenith telescope, ZTF–135 from 1915 to 1941. She has obtained from these data the following constant of nutation:

$$N = 9''{\cdot}2055 \pm 0''{\cdot}0047$$

The following two problems continued to attract particular attention: (1) the motion of the mean pole, and (2) comparative advantages of different instruments employed for latitude observations. Having re-examined the former problem N. Sekiguchi has satisfied himself that his previous conclusion was correct: the secular displacement of the Earth's mean pole actually exists and can be represented by a series of connections of straight lines. The general behaviour of the motion is the displacement along the meridian 60° W (**9**).

In addition to this displacement W. Markowitz has found a long-period motion which he has called libration (**10**). According to Markowitz this libration takes place along the meridian 122° W in a period of 24 years. Its amplitude is $0''{\cdot}022$. Markowitz claims that secular and libration terms cannot be due to errors in the positions of the stars or to erroneous scale values and, in his opinion, it is unlikely that they are due to crustal displacements or to systematic errors of observation.

The problem of the secular motion of the pole received the most careful examination in T. Hattori's paper (**11**). He has come to the conclusion that the apparent secular motion of the pole can be composed of linear motion and sudden displacements. For the most conspicuous example, the mean pole suddenly displaced in 1920 by an amount $0''{\cdot}073$.

It is interesting to note that these different representations of the secular polar motion are based on the same initial data. All the writers make use of the observations at Carloforte, Mizusawa and Ukiah. This material, however, is insufficient for the secular motion of the mean pole to be derived with certainty. The number of participating stations being small, it is difficult to decide whether the apparent secular motion is real or spurious due to the fact that the mean latitudes of the stations are subjected to non-polar variations. The problem, as A. Danjon has pointed out, requires a statistical method of approach. In fact it is hoped that it would be possible to balance out local effects of diverse stations provided their number is large enough.

Comparative advantages of different instruments used for latitude observation has continued to be the point at issue. It should be noted, however, that it is becoming possible to proceed from mere arguing about this matter to practical testing of various instruments in the same conditions. This has been already done by astronomers of the Mizusawa Observatory where concurrent observations with the ordinary zenith telescope, the photographic zenith tube and the floating zenith telescope have been carried on. They have come to the conclusion that the precision of the observations with instruments of these types, and perhaps with the Danjon astrolabe too, is likely to be much the same. So the choice of instrument might be determined, not by the matter of accuracy, but by the ease of both handling the instrument and reducing the observations.

Comparison between the PZT and Danjon astrolabe was made at the Neuchâtel Observatory (**12**). As an index of accuracy the external error of a star group was taken. PZT and astrolabe groups consist of 10 and 25 stars, respectively, distributed over two hours of sidereal time. The external error of a group is defined as the root mean square deviation of the group from their mean. It has been found that for the PZT this error is $0''\cdot06$, for the astrolabe is $0''\cdot10$.

Astronomers of the Poltava, Pulkovo and Kitab observatories compared the precision attainable with visual zenith telescopes of different types (**3**).

G. Cecchini judges latitude observations by the agreement of observed latitudes with those computed from the co-ordinates of the pole deduced by the ILS. Having applied this criterion to a number of different instruments he has satisfied himself that the superiority of the PZT and Danjon astrolabe over ordinary zenith telescope is not yet proved (**4**). A. A. Rubashevsky and E. P. Fedorov have pointed out that for the precision of latitude observation to be entirely defined it is necessary to compute not only the dispersion but also the correlation function of the observational errors, which can by no means be considered as independent values (**3**).

G. Cooklin, E. J. C. Read and A. Young carried out an extensive computation in order to ascertain whether short-term analyses of the variation of latitude could produce accurate representation of the variation. They have come to the opposite conclusion. Thus they claim that arguments hitherto adduced in favour of inconstancy of the period of free motion are of little value, as so far all these arguments are inevitably based on short-term analyses (**13**).

P. B. Fellgett, of the Royal Observatory, Edinburgh, reports that an analysis has been made on the EDSAC computer of the data published by A. M. Walker and A. Young (**14**). The method appears to circumvent previous difficulties. A most likely free period of 1·18 years, and decay to 1/e in about 12 years is found. The likelihood distribution is calculated explicitly and the range in the damping between the likelihood values 0·1 exceeds a factor 30. An approximately Weiner-optimised estimate of the excitation of the non-annual variation of latitude has been calculated, assuming the period and damping which minimizes a likelihood.

Dealing with the same problem but using other initial data (**15**), N. Panchenko has arrived at a distinctly different result: the time of decay to 1/e is not less than 90 years (**16**).

IAU SYMPOSIUM 'THE FUTURE OF THE INTERNATIONAL LATITUDE SERVICE'

It was recognized at the tenth General Assembly of the IAU that the existing international co-operation in the study of polar motion needed complete re-consideration. The following measures were then approved; they aimed at leading up to a plan for a future organization that would meet modern requirements and take the greatest advantage of modern observational and computing facilities.

(1) To publish a series of papers in which all interested scientists would have an opportunity of expressing their views on the past, present and future of latitude work (IAU Resolution No. 29).

(2) To discuss the matter at a special symposium (IAU Resolution No. 32).

The above collection of papers was published by the Astronomical Council of the Academy of Sciences of the U.S.S.R. It contains 12 papers considering the problem of polar motion in various aspects.

The symposium on 'The Future of the International Latitude Service' was held in Helsinki from 27 to 31 July 1960. In addition to the Report presented by G. Cecchini, Director of the Central Bureau of the International Latitude Service, and 12 papers published jointly, 9 others were presented to the Symposium. Almost all of them had been distributed in advance. It enabled the participants to proceed to discussion directly and with preliminary knowledge of each other's arguments and views.

Though not resulting in a definite plan for a future organization for the study of polar motion, the discussions at the Symposium have proved useful, and agreement has been reached on some important points.

It has been decided that in the future not only latitude observations but also time observations should be used in deriving the co-ordinates of the pole, and for this reason the International Latitude Service should be reorganized into the International Polar Motion Service. The opinion that the observations with the visual zenith telescopes at the international latitude stations should be terminated has been rejected. It was announced at the Symposium that in consequence of his ill-health G. Cecchini intended to relinquish the post of Director of the Central Bureau of the International Latitude Service. Thus it became an urgent matter to nominate a new Director and to decide on the new location of the Central Bureau.

Not being in a position to recommend any immediate decision on this matter the Symposium entrusted a small working group with the preparation of such a recommendation.

The proceedings of the Symposium are being published in *Bulletin Géodésique*.

E. P. FEDOROV
President of the Commission

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Note: *H.S.* stands for papers presented to IAU Symposium 'The Future of the International Latitude Service' (Helsinki, July 1960). *Bulletin Géodésique* No. 59, reprinted as *Symp. IAU* **13**.

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