

24. COMMISSION DES PARALLAXES STELLAIRES ET DES MOUVEMENTS PROPRES

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 Paloque, Schilt, Smart, Stearns, Vyssotsky, Wagman, Wilkens.

TRIGONOMETRIC PARALLAXES

The *General Catalogue of Trigonometric Stellar Parallaxes* (1952), compiled at the Yale Observatory by Louise F. Jenkins, contains all the determinations available in May, 1950.

In a letter of 22 May 1962 Dr Brouwer announced that Miss Jenkins, Morris Davis and he had decided to reprint the 1952 volume, which is almost out of print, by photo-offset and to issue simultaneously a supplement consisting of two parts: (i) additional observations of stars in the 1952 catalogue, and (ii) additional stars not contained in the 1952 catalogue. This supplement has been compiled, and was published in 1963.

According to previous reports the number of new parallax determinations has been decreasing steadily:

<i>Trans. IAU</i>	9 , 1955	..	..	..	..	..	..	..	600
	10 , 1958	..	..	..	..	..	..	..	300
	11 , 1961	..	..	..	..	..	..	..	150

Since the last report there is a tendency towards an increase in the number of such determinations. As far as I am informed, about 200 new parallaxes have been published by Allegheny and Yale (Southern Station) Observatories.

At the Van Vleck Observatory, where Prof. Heinrich K. Eichhorn is now in charge of astrometric work, the parallax programme was re-activated and consists mainly of dwarf M stars from Vyssotsky's list. The reduction of parallax measurements is now done by a rigorous method which employs plate constants rather than dependencies. An extensive paper which will fully describe the method and contain the determination of several parallaxes is being prepared for publication in the *Astronomical Journal*.

Dr Lourens reports that at the Cape Observatory the parallax programme has been concentrated mainly on the measurement and reduction of plates to determine the relative proper motions in declination for those stars whose relative parallaxes and proper motions in right ascension had already previously been published.

At the Royal Greenwich Observatory the measurements of trigonometric parallaxes are being continued. The current observing list contains 268 stars. An average number of 17 plates per star had been obtained up to March 1963. Preparation of Volume III of the Greenwich Parallax Catalogue is well advanced.

At the Sproul Observatory the programme includes mainly astrometry of nearby stars.

Dr W. Morgan writes that the Yerkes Observatory has been temporarily inactive in astrometry for the past two years.

The realization of the parallax programme for stars fainter than 13.5 apparent magnitude is now in a decisive stage.

Prof. Strand reports that the assembly of the 61-inch astrometric reflector at Flagstaff is complete and that observations were started in October 1963. The quartz optics were finished in August 1963 and tests in the shop indicate that they are of superior quality (1). Prof. Strand notices that 'a new era in the field of photographic astrometry will be initiated with this new instrument since it will be possible for the first time to obtain parallaxes of large numbers of stars between the thirteenth and eighteenth magnitudes'. Prof. Strand continues in his letter of 23 September 1963: 'On the occasion of the initiation of the programs of the 61-inch reflector it will be appropriate to review the states of those fields of astronomy for which astrometric data form an important basis. The Office of Naval Research is prepared to support a symposium to take place in Flagstaff on 22, 23 and 24 June 1964'.

Dr S. Vasilevskis at the Lick Observatory reports that a double-slide camera with automatic photo-electric guiding has been built for direct photography, mainly parallax work, with the 36-inch refractor. In good seeing the smallest well-exposed images are 50 microns in diameter, and the photovisual magnitude reached in one-hour exposure is beyond 19.

A parallax programme of faint stars to approximately $m = 17$ has been initiated with the 36-inch refractor and the new automatic camera. Most of the stars selected have no previous parallax determination, and they fall into three main groups—red dwarfs, white dwarfs and U Gem type variables. More than 1000 plates have been already taken (October 1963).

Since eventually the plates will be measured automatically more than 20 stars are usually chosen for reference for each parallax, with the mean magnitude of the order of 16. Two exposures of different lengths are made on each plate through a coarse objective grating.

With regard to the automatic measuring machines, considerable progress has been made both at the U.S. Naval Observatory and at the Lick Observatory. K. Aa. Strand writes that a contract for the construction of such a machine to be used for measurement of parallax plates was awarded in May 1963. The expected delivery date is 1964. Dr Vasilevskis reports that 'one of the two components of the automatic measuring equipment (2) has been completed by the Gaertner Scientific Corporation and tested by us. Its performance in every respect is equal or better than that requested by our specifications'.

I should like to add that, as regards my question on the necessity of defining more accurately the programme of determining trigonometric parallaxes at separate observatories, the opinion of the majority of the members of the Organizing Committee is that it would be desirable to have a list of the most-needed parallaxes and of the programmes for the future. On the other hand, individual initiative in the selection of stars and methods should not be suppressed, but rather encouraged.

SPECTROSCOPIC PARALLAXES

Little can be added to the previous report on spectroscopic parallaxes. Some papers have been published on the determination of the absolute magnitudes of stars, in particular the paper by Elvius at the Uppsala Observatory (see also the appendix to the report of Commission 33).

I have received the following answers regarding the revision of the 1935 Schlesinger Catalogue of spectroscopic and possibly dynamic parallaxes:

'I should like to say that, in my opinion, there would be little point in re-issuing the spectroscopic and dynamical parallaxes anew. We are at present in a state of flux, especially in-so-far as spectroscopic parallax determinations are concerned' (W. Luyten).

'I do not think it will be necessary to produce catalogues of revised spectroscopic and dynamical parallaxes of individual stars or binaries' (K. Aa. Strand).

'I feel that at this time it would be best to publish an updated catalogue of trigonometric parallaxes only, which may be supplemented with the dynamical ones. The spectroscopic parallaxes are still in a state of flux, and it would be difficult to draw the line where to stop. . . . I discussed the matter with Dr Herbig of Lick Observatory, and he is in agreement with the above' (S. Vasilevskis).

PROPER MOTIONS

The following report should be supplemented by reference to the reports of Commissions 8, 23 and 33, all of which report on proper motions.

The extensive programme for obtaining absolute proper motions of stars referred to galaxies is being continued.

Dr Vasilevskis reports that at the Lick Observatory the taking of second-epoch plates for determination of stellar proper motions with reference to galaxies will start in 1967. An experimental programme of repeating approximately 100 to 200 fields will start in 1965. A second four-element 20-inch objective was installed in the Carnegie Astrograph, to complement the Ross-Fecker lens that has been in operation since 1946. The new lens is corrected for yellow light, with a minimum focus at 5500Å. The lens is of an exceptionally high quality over the whole $6^\circ \times 6^\circ$ field.

At Yale University, efforts concerning the installation of a twin 20-inch astrograph for the purpose of extending to the South Pole the Lick Observatory proper motion programme are in progress. The site of the instrument will probably be chosen in South America. I am not well informed on the latest steps concerning this instrument.

Prof. A. N. Deutsch reports that the Pulkovo programme for obtaining the first-epoch plates of selected areas of galaxies and fundamental stars in the declination zone $+90^\circ$ to -25° is being completed at many observatories, which took part in this international work (see the previous report of Commission 24 (3)). As regards the southern hemisphere the observations at Santiago and Perth observatories have temporarily been interrupted due to the transfer of the astrographic instruments to other sites. We hope that the observations will be renewed in 1964-1965.

The new 700 mm meniscus astrometric telescope is under construction, and the installation of this instrument is to be expected in 1964 in Chile for the common use of the Pulkovo and Santiago astronomers. The telescope has a double meniscus and elliptical primary mirror 1 m in diameter, the focal length being about 2 m. The images should be very good in the entire field of 25° square (4). The instrument is designated for precise astrometric work, in particular for the determination of absolute proper motions of stars referred to very faint galaxies.

At Tashkent Observatory, preliminary results have been obtained on the determination of proper motions of stars referred to galaxies in 23 selected areas of the Pulkovo programme. The second-epoch plates have been taken after an interval of 20 years (5).

At Pulkovo Observatory, the second-epoch plates of 70 areas have also been taken with an interval of 20 years for the same purpose. The measurements will commence next year.

Another important international programme of determining the absolute proper motions of stars is the well-known AGK3. The final AGK3 will give proper motions of 180 000 stars with a mean error of ± 0.008 . This work is making good progress (6).

The AGK3 catalogue will give accurate positions of reference stars of the Carte du Ciel catalogue in the system of the FK4. The re-observation and determination of proper motions of stars of the Carte du Ciel catalogue is a question which should receive great attention. Prof. P. Sémirot, the President of Commission 23, is dealing with this complicated problem. I agree with Dr Vasilevskis that 'the proper motions, at least those determined photographically, should be considered together' (by both Commissions). Some interesting suggestions in this

respect have been made by Prof. H. Eichhorn in a typewritten paper entitled 'The Astrographic Catalogue'.

Prof. E. Paloque suggests that the proper motions of all the Carte du Ciel stars should be determined. The Toulouse Observatory published the fourth catalogue of positions and proper motions of reference stars in the zones $+4^\circ$, $+12^\circ$, with right ascensions between 10 and 11 hours (7).

Prof. Meurers reports that at the Vienna Observatory, together with Dr van Schevick from Bonn, a catalogue of proper motions of stars in the 'Selected Areas' has been prepared (8). The determination of the proper motions of stars in the 'Selected Areas' around the galactic pole has been started.

Mr Murray reports that during the past few years relative proper motions of 70 stars of current astrophysical interest (mostly suspected sub-dwarfs) have been determined at Herstmonceux.

A study of proper motions has been made in a field of one degree square in the Large Magellanic Cloud from a pair of long-exposure plates taken with the Cape astrographic telescope on a 40-year base-line. The results have been published in R. O. Bulletins (9).

Proper motions of nearly 5000 stars within a radius of $22'$ of ω Centauri have been measured at Herstmonceux from a pair of plates taken with the Cape 24-inch refractor. A catalogue is in preparation and should be published before the next General Assembly.

In the autumn of 1961 Woolley and Murray obtained at Mount Wilson a number of plates at the Cassegrain focus of the 60-inch reflector on a cluster field for which early plates had been obtained by van Maanen. At least two plate-pairs for each of the 14 clusters are now at Herstmonceux for measurement.

A programme of intensive photography of selected clusters has been initiated on the 26-inch Thompson refractor at Herstmonceux.

In this connection Mr Murray suggests that a topic which might well be discussed is the systematic observation of cluster fields with long-focus telescopes.

Prof. Luyten reports that at Minnesota he has published the *General Catalogue of the Bruce Proper Motion Survey*, giving proper motions for some 94 000 stars mainly in the southern hemisphere, and mainly brighter than $m_{pg} = 15$. In addition he has measured accurate motions for about 300 faint coronal blue stars, and for 80 wide double stars. He has also measured relative orbital motions for a number of binaries containing white-dwarf components, and is engaged in measuring proper motions for the brighter U Geminorum variables and ancient novae. He has published proper motions for 950 faint stars, down to the 21st pg-magnitude, found on Palomar Survey plates, and has published a list of 100 new white dwarfs found among them, as well as a general discussion of the motions of white dwarfs.

Finally, in the fall of 1962 a beginning was made with the retaking of the Palomar Survey plates. If and when the entire programme is completed we should then have a virtually complete catalogue of all stars brighter than $m_{pg} = 21$ with motions larger than $0''.2$ annually and north of declination -33° .

From Lowell Observatory Dr H. L. Giclas reports that 148 plates of the photographic proper motion survey with the 13-inch telescope have been completed through May 1963, in addition to a special study region in the Hyades (10). Approximately 60% of the plates in the northern hemisphere have been completed. From these 148 plates 8253 stars with proper motions of $0''.27$ per year have been measured, 484 stars with motion of $0''.5$ per year, for which no previous motion references have been found.

Dr V. Nechvile reports that he is preparing a list of faint stars with considerable proper motions, for determination of trigonometrical parallaxes. The other list of nearly 4000 stars

with determined proper motions has been prepared for the calculation of the exact equatorial co-ordinates for each star.

Dr J. Dommanget (Uccle) has finished his catalogue of 300 rectilinear trajectories of visual double stars which may be useful for the study of stellar proper motions.

Dr Shimizu, University of Kyoto, reports that K. Tuzi has derived proper motions in R.A. of the 4135 equatorial stars (-5° to $+5^\circ$) by comparing his own meridian observations with twenty-four of the former catalogues whose epochs are found in 1850–1915 (Tokyo-Mitaka Catalogue of Equatorial Stars for Equinox 1950, *Tokyo Astr. Obs. Ann.*, **8**, no. 1, 1962). The limiting magnitude of these stars is less than 8.9 and the probable error of the derived centennial proper motion in R.A. is less than $\pm 0''.05$.

Determinations of proper motions of variable stars have been continued at several observatories—at the Sternberg Astronomical Institute, at the Astrophysical Laboratory of the Latvian Academy of Sciences (mainly zirconium and titanium stars), at the Van Vleck Observatory (carbon stars), at the Cape Observatory (RR Lyrae variables in high southern latitudes).

At the Sternberg Astronomical Institute, N. M. Artjikhina obtained the positions and proper motions of several novae by comparison of positions derived from the *Astrographic Catalogue* with the present position determined photographically (11).

N. M. Artjikhina and P. N. Kholopov have published a list of 40 novae recommended for the determination of co-ordinates and proper motions (12).

There are some other articles concerning proper motions of individual stars or groups of stars. Dr Vasilevskis points out in his report that, at the Berkeley meeting of the IAU, an invitation was extended for suggestions regarding the selection of stars for the proper motion programme; so far there is practically no response. A list of groups of stars intended for measurement is being prepared at Lick, and it may serve as a basis for discussions if such an opportunity arises at Hamburg.

In this connection it is perhaps time to raise the question of the compilation of a bibliography of available catalogues and lists of proper motions of stars. The reference book would contain a brief description of the material and data on the catalogues. I received approval for this suggestion from some of the members of the Organizing Committee. Prof. Luyten offered the following: 'This is a very important point, I believe, and I think the Hamburg Observatory might well be interested in getting out a new edition of the *Bergedorfer Eigenbewegungs Lexicon* . . . Then, we might perhaps ask all the members of the Commission to send in all the references to lists of proper motions they know about, and then designate one member of the Commission to put all the information together and publish it as a bibliography. Perhaps Hamburg would be willing to do this? . . . The important point in this compilation is, of course the question of relative proper motions, and how to change them to absolute, so in the publication of such a list a great deal of attention should be paid to the description of how the proper motions have been obtained, the magnitude of the comparison stars used, etc.'

Prof. Luyten proposes to calculate new tables for the corrections from relative to absolute proper motions by means of secular parallaxes and galactic rotation constants. The question is to find the most suitable values for the position of the solar apex, for the secular parallaxes (maybe for stars of different spectral classes) and for galactic rotation constants. The problem is rather difficult, and we shall always lose in accuracy in converting the relative proper motions to absolute, which is particularly disappointing in the case of open clusters.

Prof. Strand writes that the proposal by Dr Luyten might have merit, if it can be agreed upon what values be accepted for the constants involved in the computations.

The opinion of Dr Vasilevskis is that the present data on galactic rotation and secular parallaxes may not be definite enough for reductions of high precision. Since several indepen-

dent programmes (AGK3, KSZ, Cape, Lick) are approaching completion, it may be better to wait for this material.

In conclusion investigations on proper motions of galactic clusters should be noted, although these data are included in the report of Commission 37.

At Pulkovo Observatory V. Lavdovsky investigated five galactic clusters with regard to their proper motions and photometric data (13). In another paper (14), V. Lavdovsky discussed eight galactic clusters. The probable error of the relative proper motion of a cluster is on the average $\pm 0^{\circ}.0004$.

Zd. I. Kadla at Pulkovo derived the absolute proper motion of the globular cluster M13 relative to the galaxy NGC6207 (15).

At the Sternberg Astronomical Institute N. M. Artjukhina derived the proper motions of two galactic clusters and of stars in their vicinity (16).

An investigation of the proper motions of 1617 stars in the galactic cluster NGC6705 and its vicinity by P. A. Savitsky was published (17).

The first-epoch plates of galactic clusters and associations are being taken at Pulkovo, Moscow and Golosseevo with the normal astrograph, 26-inch refractor, wide-field astrograph and 40-cm refractor.

The proper motion programme on galactic clusters from plates taken with the 40-inch refractor of the Yerkes Observatory has been continued.

First-epoch photographs of open clusters are being taken with the new 20-inch yellow lens at the Lick Observatory to complement the set of plates taken earlier with the blue lens. First-epoch plates of planetary nebulae and of clusters, not included in the 20-inch programme, are being taken with the 36-inch refractor and the automatic camera.

W. H. Jefferys published a paper on the proper motions in star clusters M37 (18).

J. Meurers and his collaborators continued their investigations on proper motions of galactic clusters at the Bonn University Observatory.

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