24. COMMISSION DES PARALLAXES STELLAIRES ET DES MOUVEMENTS PROPRES

PRÉSIDENT: M. S. A. MITCHELL, *Director of the Leander McCormick Observatory, University of Virginia, U.S.A.*

MEMBRES: MM. Adams, Alden, Bianchi, Curtis, C. R. Davidson, de Sitter, Fox, Harper, Jones, Jordan, Knox-Shaw, Lee, Lindblad, Lockyer, Luyten, Miller, Moffitt, Nechvíle, Russell, Schlesinger, Shapley, Slocum, Smart, Van Maanen, Van Rhijn, Voûte.

In November 1931 the President circulated a letter to the members of the Commission which in part was as follows:

In view of the fact that it is now over a quarter of a century since Schlesinger by photography began to determine trigonometric parallaxes by a long focus telescope, and fifteen years since Adams and Kohlschütter derived the first spectroscopic parallaxes, it would seem appropriate to take stock of our present position and to make plans for future development.

Will you be good enough, therefore, to furnish such statements concerning the following topics as are appropriate to the work of your observatory?

Trigonometric and Spectroscopic Parallaxes

1. What stars have made the backbone of your observing programme?
2. What is your grand total of parallaxes to date, i.e. measures completed and ready to publish?
3. When was parallax work started at your observatory?
4. What are your plans for the continuation of the work?
5. Have you any suggestions regarding co-operation among the various workers?
6. Have you any recommendations regarding the ever-recurring subject of systematic errors?

Proper Motions

What determinations of proper motions are being carried out at your institution?

Dynamical Parallaxes

Are you carrying out any work on Dynamical parallaxes?

The answers received and brief summaries, separated according to different phases of the work, are given below.

TRIGONOMETRIC PARALLAXES

YALE UNIVERSITY OBSERVATORY, Johannesburg, South Africa. 26-inch Photographic Refractor.

(1) The principal part of our observing programme is made up of all stars in the *Draper Catalogue* brighter than 5·51 visual magnitude and south of declination 10° north. This is an extension of the observing programme constructed by the writer for the Allegheny Observatory in 1914, which includes similar stars north of declination 13° south. In both programmes stars earlier than type A0 were omitted. In addition each programme includes several hundred stars of large proper motion within the same limits of declination and in general brighter than visual magnitude 9·0. (2) We have completed the observations for about 850 parallax stars; of these 450 have been measured and reduced, and of the latter 161 have been published in the *Astronomical Journal*. Three measuring engines are

https://doi.org/10.1017/S0251107X00016503 Published online by Cambridge University Press

busy at this work, two at New Haven and one at Johannesburg. At the present time we are measuring and reducing at the rate of about 250 parallaxes per annum and are securing the plates at the rate of about 200 parallaxes per annum. (3) This work was started at Johannesburg in the fall of 1925. (4) We plan to finish the programme described above, the total number of stars being about 1500. We are not planning upon extending the work after these have been completed. (5) It is my intention to issue a second edition of the *Catalogue of Stellar Parallaxes* to include all data available at the end of 1932, and for this purpose to discuss anew questions concerning systematic errors of the various series.

FRANK SCHLESINGER, *Director*

Suggestions regarding co-operation and the determination of systematic errors. These questions seem to be interlinked and should be considered jointly. It has long been felt that the continuous observation of a limited number of parallax stars at all observatories might throw some light upon systematic differences and the constancy of these differences. The stars selected for this purpose should be near the equator so that they would be accessible to both northern and southern observers. They should be of such a brightness that both photographic and photovisual telescopes could be employed. The same comparison stars should be used at all observatories and the same dependences in the reduction of the measures. Preference should be given to such stars that the measures will serve other purposes as well, such as orbital motion (Procyon for example), mass-ratios, acceleration of motion (as in Barnard's star), etc.

It is realized that for definitive comparisons a large number of stars should be observed, but a limited number might give some information and point the way to future lines of investigation.

HAROLD L. ALDEN

ALLEGHENY OBSERVATORY, Pittsburgh, Pennsylvania, U.S.A. 30-inch Photographic Refractor.

(1) *Programme:* (*a*) All stars brighter than magnitude 5·51, north of $-13°$, except B-type. (*b*) Fainter stars whose proper motion comes within the limit of the formula $\mu \geqq 1/10\ (m - 5{\cdot}0)$, where m is the magnitude; preference being given to stars brighter than 7·0. (*c*) As many Cepheids as we can observe with the magnitude limit of our guiding telescope, 8·5 or 9·0. (*d*) A few binaries whose separation is not less than 2″. (2) The total number of plates obtained is now 46,000, of which about 80 per cent. are parallax. About 1400 stars have been completely observed, 1050 of which have been measured and computed. The values for 913 have been published. A volume of parallaxes in detail is now in the press, bringing the number thus published up to 779. Approximately 30 plates are obtained of each star, with an average exposure time of 3 minutes, giving comparison stars of magnitude 12·3. (3) Parallax work was started in September 1914. (4) We expect to continue observing for a number of years. Some stars observed in early years with short exposures and fewer plates will be re-observed in order to reduce the probable error. Our aim is an average of 0″·005. The last lists measured and computed give an average of 0″·0054. (5) We are duplicating to a certain extent the work of other observatories on stars of especial interest.

FRANK C. JORDAN, *Director*

Royal Observatory, Cape of Good Hope. 24-inch Photographic Refractor.

(1) Stars of proper motion exceeding 30″ per century and south of − 10° declination, including many faint stars. Some stars of smaller proper motion whose parallaxes have been determined elsewhere have been included to provide material for determining systematic errors. (2) 315 parallaxes have been published. About 30 additional parallaxes have been determined. (3) April 1926. (4) The work will be continued at approximately the same rate for at least several years more. Newly discovered proper motion stars are continually being added to the programme. (5) The only other parallax observations in the southern hemisphere are being made with the Yale telescope and are confined mainly to bright stars. Thus bright stars with large proper motion are common to the Cape and Yale programmes, which are otherwise mutually exclusive. (6) With a view to the investigation of systematic errors it is desirable that every observatory engaged upon parallax work should include in its programme of observations a certain number of stars which are on the observing programme of—or which have been observed at—one or more other observatories. It seems to me desirable that, as far as possible, there should be determinations at two (or more) observatories of the parallax of a star.

H. Spencer Jones, *Director*

Royal Observatory, Greenwich, England. 26-inch Photographic Refractor.

(1) The programme which has been confined almost entirely to stars north of dec. + 64° includes: (*a*) All stars brighter than $5^{m}{\cdot}5$. (*b*) Stars brighter than $7^{m}{\cdot}0$ with proper motion greater than $0''{\cdot}100$. (*c*) Stars brighter than $8^{m}{\cdot}0$ with proper motion greater than $0''{\cdot}150$. (*d*) Stars brighter than $9^{m}{\cdot}5$ with proper motion greater than $0''{\cdot}200$. (*e*) Faint stars with proper motion greater than $0''{\cdot}300$ found in the photographic re-observation of the Greenwich Astrographic Zones. (*f*) A few double stars for which dynamical parallaxes have been determined. (2) A volume containing 266 stars has been published and since that date 200 parallaxes have been published in the *Monthly Notices of the Royal Astronomical Society*, making a total of 466 to date. (3) Commenced in January 1913, the work has been prosecuted continuously, except for a break during the War. (4) It is proposed to extend the programme as the present list is cleared off by including as many stars as possible of class K0, north of + 64° declination, without regard to proper motion, to obtain information as to the complete distribution of this class. (5) Whatever co-operation may be possible each observer should apply himself to that work to which his instrument is best suited. Where possible the parallaxes of bright stars and stars of large proper motion should be obtained at two or more observatories. (6) *Systematic errors*. It is difficult to understand how these arise, but it seems most probable that they are due to some instrumental defect which is not constant and yet may persist through a period, perhaps through a continuance of certain climatic conditions. If this is so its complete elimination is not possible, but the effect of errors persisting over long periods may be minimised by increasing the number of epochs of observation. Any corrections for systematic error should be applied with great caution and from ample material. Our practice at Greenwich has been to give half weight to poor plates after examination in the micrometer. Approximately 10 per cent. fall in this category. Plates having residuals exceeding three times the probable error are re-measured and the means taken. Ten residuals greater than five times the probable error have been bracketed out of 5000 plates.

C. R. Davidson

Mount Wilson Observatory, Pasadena, California, U.S.A. 60 and 100-inch Reflectors.

(1) Programme: Stars for use in spectroscopic parallax determinations, making about 50 per cent. of the total, faint stars of large proper motion, long and short period variables, novae, planetary nebulae, etc. (2) 349 stars. (3) November 1913. (4) Our programme for the future will consist of faint stars of large proper motion, possible early type dwarfs, fields begun for various reasons and which should be completed. (5 and 6) For the determination of systematic errors parallax observers should include on their programmes large numbers of the list of stars published several years ago by Mitchell and van Maanen.

A. Van Maanen

Dearborn Observatory, Evanston, Illinois, U.S.A. 18·5-inch Visual Refractor.

(1) The parallax programme of the past has been made up in the main of proper motion stars for which it was not deemed necessary to use an occulting sector. (2) Abstracts have been published for about 125 stars. Complete details for a total of 193 stars, including the above, are now ready for the printer and will be published as soon as money becomes available, as Vol. **3**, *Annals of the Dearborn Observatory*. (3) 1913. (4) Except for an occasional star which is or may be of especial interest, we are not planning to continue this programme. On the other hand, due to the results reported in *Publications of Yerkes Observatory*, Vol. **4**, Part 4, and *Annals of the Dearborn Observatory*, Vol. **4**, Part 1, we have undertaken to complete the series of plates begun by Fox in the Equatorial Zone of Kapteyn's Selected Areas. This zone includes Areas 92 to 115. About half a dozen plates per area were secured before I came to Dearborn. I shall use between 20 and 30 exposures, each of about 1 hour for each field. Definitive measures and reductions are on the way. Relative parallaxes and proper motions of nearly 1000 individual stars, down to about magnitude 13, will become available when this work is done. The *Catalogue of 1172 Reference Stars in Areas* 2–115 recently published by Leiden will enable us to reduce the proper motions to absolute. (5) Now that we use parallaxes not only individually but statistically, I firmly believe that the bases on which rest the parallaxes of individual stars should be investigated. I cannot see how we can depend upon secular parallaxes until we have separated, for at least representative areas in the sky such as the Selected Areas, the nearby dwarfs from the more distant stars of normal or greater than normal luminosity. Therefore I suggest adherence to Kapteyn's original plan of determining the parallaxes of all the stars that are reachable about the centre of the Selected Areas. (6) With such results in mind as are shown in the *Annals of the Dearborn Observatory*, Vol. **4**, Part 1, I for my own part am forced to the conclusion that we can and must investigate directly the parallaxes of the fainter classes of stars. In that paper it is shown that the amount and distribution of negative parallaxes in the usual parallax work are directly related to the actual measurable parallaxes of stars such as the comparison stars that have been used.

Oliver J. Lee, *Director*

Yerkes Observatory, Williams Bay, Wis., U.S.A. 40-inch Visual Refractor.

(1) In the past the backbone of the Yerkes programme has been the brighter stars, especially those having considerable proper motion, or stars which were receiving special attention on the spectroscopic programme. In more recent years

https://doi.org/10.1017/S0251107X00016503 Published online by Cambridge University Press

some stars have been added from lists of spectroscopic parallaxes in cases where no trigonometric value was available. Recently a goodly number from the lists of proper motion stars found by Ross at this observatory have been added. Material from these lists will probably form a considerable portion of future additions to the programme. (2) The grand total of individual parallaxes to date is 342. (3) Work was started by Schlesinger in 1903. (4) Plans for the continuation of the work involve no immediate change in policy.

G. W. MOFFITT

VAN VLECK OBSERVATORY, Middletown, Connecticut, U.S.A. 20-inch Visual Refractor.

The total number of plates taken up to date is 4500, over 90 per cent. of which are for stellar parallax determinations. The programme includes most of the Wolf and Ross stars brighter than 12·0 with proper motion 0″·5 or greater, also a few of the brightest stars, a few binaries and several planetary nebulae. This programme was started in 1925 and will be continued along the same lines. Sixty-seven fields have been measured and reduced. The average number of plates used for a field is 22·5, the average number of epochs 6·9, average number of comparison stars 4·7, average probable error for a single plate = 0″·030, and average probable error for a parallax ± 0″·009.

Plates are now being taken for determining the magnitude of the parallax stars and of the comparison stars. In the near future we shall start duplicating the earlier plates for proper motion determinations.

During the winter of 1930–31 the parallax programme was interrupted, and the 20-inch refractor used for photographing Eros. One hundred and eighty-six plates were secured on thirty-five nights.

FREDERICK SLOCUM, *Director*

SPROUL OBSERVATORY, Swarthmore, Pennsylvania, U.S.A. 24-inch Visual Refractor.

(1) Binary stars, also the parallaxes of many special objects have been determined, including nebulae, Cepheids, and other objects. (2) 250 parallaxes have been published and 30 additional have been completed but not published. (3) 1912. (4) We shall continue for some time to determine parallaxes of binary stars, giving preference to those, the mass-ratio of which may be determined.

By comparing early parallax plates made at the Observatory with plates made here from seven to fifteen years later, a determination is made of the proper motions of Boss stars and of faint stars (9–11 magnitude mainly) relative to the faint reference stars. 60 of the 80 regions available have been measured giving proper motions of 800 stars. At the completion of the measurements the results will be used for the determination of the mean secular parallax of the faint reference stars and of the solar apex with respect to them.

JOHN A. MILLER, *Director*

UNIVERSITY OBSERVATORY, Upsala, Sweden. 13-inch Photographic Refractor.

(1) Programme principally stars of large proper motion. (2) 17 stars. (3) The work was started in 1894 in an experimental manner by Dunér and Bergstrand. It was continued from 1897 to 1903 by Bergstrand and since 1924 by Asklöf, Schalén, etc.

ÖSTEN BERGSTRAND, *Director*

STOCKHOLMS OBSERVATORIUM, Stockholm, Sweden. 24-inch Photographic Refractor.

Plans for the programme are drawn up and work will be begun within a few months immediately after the full completion of the telescope.

BERTIL LINDBLAD, *Director*

LEANDER MCCORMICK OBSERVATORY, University of Virginia, U.S.A. 26-inch Visual Refractor.

(1) The programme is a varied one consisting of: (*a*) Bright stars of all spectral classes to magnitude 5·5; (*b*) Stars of large proper motion; (*c*) Visual binaries; (*d*) Stars whose spectroscopic or dynamical parallaxes seem to require a trigonometric determination as a check; (*e*) Stars of Ko type with proper motions greater than $0''\cdot1$; (*f*) Specially interesting stars, such as those having large radial velocities, Cepheids, long period variables, etc. (2) Total, 1028. Measurements have been temporarily suspended. (3) Work was started at the same time as at Allegheny; September 1914. (4) The work will be continued with such changes in programme as conditions warrant. (5) Attention is called to the opinion of Adams that spectroscopic and statistical parallaxes need the co-operation of trigonometric observers, so that all types of parallaxes may be on the same system. (6) That systematic errors exist in trigonometric parallaxes from different observatories is unquestionably true. However, it is so difficult to separate accidental from systematic errors or to secure a determination for zero-point in either spectroscopic or trigonometric parallaxes that I am firmly convinced that as yet we know little about systematic errors. In particular, as the result of investigations into the subject, I feel strongly convinced that even with Allegheny and McCormick with their greater number of parallaxes, there is not yet a sufficient quantity of determinations to warrant a division into 24 hours of right ascension and then deriving systematic corrections for each hour by harmonic analysis or other means. The question of systematic errors should form the most important topic of discussion at the forthcoming meeting of the Commission.

S. A. MITCHELL, *Director*

SUMMARY OF TRIGONOMETRIC PARALLAXES

Observatory	Number measured	Work started	Main features of programme
Allegheny	1050	1914	Bright stars (except B-type) north of $-10°$ decl.
Cape	345	1926	Stars with p.m. exceeding $0''\cdot3$ and south of $-10°$ decl.
Dearborn	193	1913	Faint proper motion stars, without sector
Greenwich	466	1913	Stars north of $+64°$ decl.
Johannesburg	450	1925	Bright stars (except B-type) south of $+10°$ decl.
McCormick	1028	1914	Bright stars all types, visual binaries, p.m. stars, etc.
Sproul	280	1912	Visual binaries
Upsala	17	1894	Varied
Van Vleck	67	1925	Faint proper motion stars
Mt Wilson	349	1913	Stars on spectroscopic programme, faint stars, etc.
Yerkes	342	1903	Varied
GRAND TOTAL	4587		

https://doi.org/10.1017/S0251107X00016503 Published online by Cambridge University Press

MOUNT WILSON OBSERVATORY, Pasadena, California, U.S.A. 60- and 100-inch Reflectors.

(1) The principal part of our observing programme consists of the stars in Boss's *P.G.C.* In addition we are observing many stars in Kapteyn's Selected Areas, stars of proper motion exceeding $0''\cdot2$ or $0''\cdot3$ annually, Cepheid variables and numerous visual binaries. The spectral types range from A to M. (2) We have a total of about 4000 stars nearly ready for publication. (3) Spectroscopic parallax work was begun at Mount Wilson in 1915. (4) The work will be continued regularly and will utilize all spectrograms obtained for measurements of radial velocity. Our programme is being gradually extended to include stars of fainter apparent magnitude such as some of the stars of large proper motion discovered by Ross. (5) It is most desirable from the point of view of spectroscopic parallax work that large numbers of trigonometric parallaxes be available for purposes of intercomparison and the establishment of reduction scales. I should like especially to see more trigonometric measures of A-type stars and the fainter Cepheid variables. (6) Apart from the complicated problem of systematic errors among different observers the question of the agreement of the scales of absolute magnitude and parallax derived by different methods is fundamental. It is essential to know whether mean parallaxes obtained from parallactic and peculiar motions agree with those calculated from trigonometric results or by other methods. The scale for the dwarf stars is excellently defined from trigonometric parallaxes and that for normal giants is coming into better agreement as material increases.

WALTER S. ADAMS, *Director*

DOMINION ASTROPHYSICAL OBSERVATORY, Victoria, B.C. 72-inch Reflector.

Spectroscopic parallax work was started at this observatory in 1921 on the stars of types F to M and, as recorded in a previous report, the parallaxes of 1105 stars were so determined. It had been hoped to continue the investigation on stars of A-type. Preliminary work by the writer showed that with some minor changes of the Mount Wilson method reasonably satisfactory determinations could be secured spectroscopically. The work was shelved for some time pending the securing of a registering microphotometer and attention was confined to the radial velocity measures.

A suitable microphotometer has now been installed so that, with the expected completion of the observing programme during the present winter season and the radial velocity results shortly thereafter, it is hoped to return to the spectroscopic parallax work at an early date. Including stars formerly taken on the Boss programme there will be about 1100 of type A available for discussion.

In the case of the stars of types O5 to B3, an investigation upon the distribution of the interstellar material by Plaskett and Pearce established the correlation between the intensities of the interstellar K lines and the distances of the stars. The distances depend upon the theory of the galactic rotation, the mean parallaxes derived from the proper motions being employed to define the value of the rotational coefficient A. The relation has been used by Pearce to determine the absolute magnitudes of 297 stars of types O5 to B3 and these results are being used as a basis for the spectroscopic absolute magnitude of the O5 to B5 stars. Spectra are available for about 500 additional stars within these types.

W. E. HARPER

https://doi.org/10.1017/S0251107X00016503 Published online by Cambridge University Press

NORMAN LOCKYER OBSERVATORY, Sidmouth, England. 12-inch Refractor.

(1) Stars of all types down to magnitude 6·5 of north declination, together with brighter stars of declination down to $-30°$. (2) 2300. (3) 1922. (4) Extension to fainter magnitudes (at present in the case of B-type stars only).

WILLIAM J. S. LOCKYER, *Director*

OSSERVATORIO DI BRERA, Milan, Italy. 40-inch Reflector.

At the Merate Observatory, which is a branch of this Observatory, we have finished the determination of the spectroscopic parallaxes of about 1200 stars of A and F types. We hope to be able to conclude the work before the end of the year 1932 and to publish the results in the first half of 1933. The work was started in 1928.

Soon we are planning to start photographic observations on trigonometric parallaxes with a Cassegrain mounting and focal length of 18 metres.

We have already published a *General Catalogue of Parallaxes* and a research on *The Distribution of Absolute Magnitudes*. (*Publications of Merate*, Nos. 4 and 5.) This research clearly shows a large dispersion in absolute magnitude for stars of all spectral types. We are now studying the spectra closely in order to ascertain the causes of the large dispersions and we are hoping to find some spectral characteristics to explain them. Until we do ascertain the causes of the large dispersion in absolute magnitudes we cannot be certain that spectroscopic parallaxes are on a firm basis.

E. BIANCHI, *Director*

STOCKHOLMS OBSERVATORIUM, Sweden. 18-inch Astrograph, 40-inch Reflector.

The spectroscopic parallax work which is at present in progress at the Stockholm Observatory is founded mainly on those criteria of absolute luminosity which can be studied in spectra of low dispersion, namely the intimate correlation between absolute magnitude and cyanogen absorption in the late spectral types and between the absolute magnitude and the intensity of the hydrogen lines for the early types. The work is a continuation on a broader scale of the work carried out at Upsala in earlier years, which was begun in 1922, and which has resulted in the following lists of spectroscopic absolute magnitudes. Individual distances or parallaxes have generally been calculated and given in the tables.

		Number of stars
B. Lindblad.	Spectrophotometric determinations of stellar luminosities	
,, ,,	Distances and tangential velocities for stars in the Greenwich polar zone (1925)	1066
,, ,,	Researches based on determinations of stellar luminosities (second paper, 1926)	1101
,, ,,	On the absolute magnitudes and parallaxes of bright stars determined by the cyanogen criterion (1927)	351
,, ,,	The luminosities, individual parallaxes and motions of B- and A-type stars (1927)	399
J. Harald Petersson.	The distribution of distances and velocities of stars in the Carrington zone on the basis of spectrophotometric analysis (1928)	2003
Carl Schalén.	The space distribution of B- and A-type stars in bright and dark galactic regions (1928)	4300
Yngve Öhman.	Spectrophotometric studies of B-, A- and F-type stars (1930)	882

https://doi.org/10.1017/S0251107X00016503 Published online by Cambridge University Press

The total sum of stars investigated in published works is thus 10,102. As a great deal of the material concerns the Greenwich polar zones, it is a matter of great interest to compare the results with the trigonometric investigations carried out in this zone at Greenwich.

The precision of the absolute magnitudes of late type stars corresponds to a probable error of about 0·6, which corresponds to a probable error of about 30 per cent. in the parallaxes. For some of the early spectral types the precision is probably greater. Though the methods for brighter stars cannot compete with the method of Adams and Kohlschütter, it promises to be of use for fainter stars.

The work now continued at the Stockholm Observatory is a direct continuation of the above-mentioned work at Upsala and is effected with the new 18-inch Zeiss astrograph (with objective prism) and the 40-inch Grubb Reflector in conjunction with a quartz spectrograph from Zeiss designed for small dispersion spectra. The objects to be attacked are especially the Milky Way stars between galactic latitudes $\pm 10°$, down to magnitudes $13^{m}\cdot0$, and for selected regions $14^{m}\cdot0$.

BERTIL LINDBLAD, *Director*

HARVARD COLLEGE OBSERVATORY, Cambridge, Massachusetts, U.S.A.

(1) Spectroscopic parallaxes have been determined for both early and late type stars; the latter in 1921–1924, the former during the last two years. (2) Possibly a thousand. (3) In 1921. (4) (*a*) Spectroscopic parallaxes for galactic stars of early type, using the intensity of the hydrogen lines, and establishing the zero-point statistically from proper motions (Öpik). (*b*) Spectroscopic parallaxes for early type stars in galactic clusters, using the intensity of the lines of hydrogen, and establishing the zero-point by means of the Ursa Major cluster (Anger). (*c*) Parallaxes of faint stars of late type, to parallel the Harvard Photographic Photometry (Payne). (*d*) Spectroscopic parallaxes of southern second type stars. The plates have been secured but not yet measured.

HARLOW SHAPLEY, *Director*

SUMMARY OF SPECTROSCOPIC PARALLAXES

Observatory	Number	Work started	Main features of programme
Mt Wilson	4000	1915	Stars in Boss's *P.G.C.*, Cepheids, visual binaries, proper motion stars, etc.
Victoria	1105	1921	Stars in Boss's *P.G.C.*
Norman Lockyer	2300	1922	Stars of all types brighter than magnitude 6·5
Brera	1200	1928	Stars of A- and F-types
Stockholm, Upsala	10102	1922	Stars in Greenwich zones, early type stars
Harvard	1000	1921	Varied
GRAND TOTAL	19707		

PROPER MOTIONS

OBSERVATORY, Cambridge, England. 12-inch Photographic Polar Siderostat.

Part of the available time is being devoted to the continuation of the measurement of proper motions by the method of superimposing a recent plate photographed through the glass on an early plate taken directly. The early plates belong mostly to the parallax programme of Hinks and Russell, the interval being about a quarter of a century.

From colour-index plates, taken at the Radcliffe Observatory, Oxford, of four of our proper motion regions with 500 faint stars an investigation was made of the relation between star-streaming and spectral type. Further information concerning

https://doi.org/10.1017/S0251107X00016503 Published online by Cambridge University Press

other Cambridge regions is being gathered through co-operation with the Stockholm Observatory.

Several theoretical investigations based on proper motions have been published in *M.N.R.A.S.*

I should like to urge the desirability of prosecuting the measurement of proper motions by observatories with the requisite early plates so that the problems of the systematic motions and the distribution of the stars may be more fully studied.

W. M. SMART

NATIONAL OBSERVATORY, Prague, Czechoslovakia.

Proper motions of 3900 stars have been determined by the comparison of photographs in twenty-three areas taken by the Henry brothers at the Paris Observatory with those taken here by the astrographic telescope after an interval of 35 years. Results for 402 stars have appeared in our Publications, others are reduced and ready for publication.

V. NECHVÍLE, *Director*

RADCLIFFE OBSERVATORY, Oxford. 24-inch Photographic Refractor.

The Selected Areas in the northern hemisphere and on the equator, 115 areas of the systematic plan and 20 areas of the special plan, are being photographed in duplicate. There remain 33 plates to be taken, all of which fall for observation in the winter and spring months. Though the future of this observatory is still unsettled, it is known that the present site has to be vacated by the summer of 1935. Unless the weather of the next three winters is abnormally bad, it should be possible to complete the programme before that date.

Reduction follows closely behind observation, and it is hoped that printing will be commenced during 1932. Definitive values of the magnitude equation mentioned in the last report have been adopted and are being applied to the proper motions. The mean limiting magnitude of the stars measured is 15·3 Int., and the average probable error of a proper motion in one co-ordinate is $\pm$ 0″·0049.

H. KNOX-SHAW, *Director*

KAPTEYN ASTRONOMICAL LABORATORY, Groningen, Holland.

We are measuring at present the proper motions of the stars in the Selected Areas at the equator. The early plates are Algiers *Carte du Ciel* plates from 1895 approximately. The new plates have been taken in 1930 to 1931 by the Algiers astronomers and Dr Gonnessiat has kindly sent the plates to Groningen for measurement. The stars to be measured for proper motion are the ones for which the spectral class is being determined at the Hamburg Observatory and the photographic magnitude is being observed at this laboratory on plates taken at the Harvard Observatory. I am glad that parallax observers are publishing their programmes. In statistical investigations it is very important to know the bases of selection of the stars on the various programmes.

P. J. VAN RHIJN, *Director*

ROYAL OBSERVATORY, Cape of Good Hope.

Parallax areas are rephotographed after approximately five years for the determination of the proper motions in declination.

The Cape Astrographic Zones have been rephotographed (through the glass) for proper motion determinations by comparison with the earlier plates. It is proposed to determine the proper motions of all C.P.D. stars to a magnitude limit of 9·5 (C.P.D. photographic scale), and of all fainter stars for which a sensible proper motion can be detected. The measurement of the plates is nearing completion and the reductions are well advanced. The final catalogue will contain the proper motions of more than 40,000 stars.

H. SPENCER JONES, *Director*

YALE UNIVERSITY OBSERVATORY, New Haven and Johannesburg.

(1) In 1925 we made a list of all stars in the *Preliminary General Catalogue* that are south of the equator and that have well-determined proper motions. These stars were taken up first in the determination of parallax so that for nearly all of them we have two or more good plates as early as 1926. In the next two or three years we expect to secure two or three good plates each of these regions and we shall thus have the data for determining relative proper motions in these fields with a probable error of about 0″·003 in each co-ordinate. (2) Similar plates have been secured, with exposures usually of 10 minutes, of all the southern Selected Areas. These show stars as faint as photographic magnitude 15 on the international scale. These will be repeated after an interval of about ten years and will yield relative proper motions whose probable errors should average 0″·0025. (3) One hundred and six variable stars of long period are being investigated for proper motion; two or three plates of each have been secured at the average epoch 1929·5. (4) At New Haven we are continuing our work of re-observing by photography the Astronomische Gesellschaft stars and of deriving their proper motions. We have published data of this kind for approximately 23,000 stars in the zones $-2°$ to $+1°$, $+1°$ to $+2°$, $+50°$ to $+55°$ and $+55°$ to $+60°$. Similar information is nearly ready for about 18,000 stars in the two zones $+20°$ to $+25°$ and $+25°$ to $+30°$. The average probable error of all these proper motions is less than 0″·010.

FRANK SCHLESINGER, *Director*

HARVARD COLLEGE OBSERVATORY.

(1) Dr Luyten continues at the University of Minnesota the extensive blinking programme for faint stars of large proper motion in the southern hemisphere on plates taken with the 24-inch Bruce telescope. (2) Proper motions for forty-four cluster type variables have been determined by Mrs Priscilla Fairfield Bok. (3) The old blinking machine has been rebuilt so as to enable accurate measurement of field proper motions by superposing a recent plate exposed through the glass and an early plate of the same region. The following problems will be attacked: (*a*) Determination by B. J. Bok of field proper motions for faint stars in high galactic latitudes from plates taken with the 24-inch Bruce telescope (scale 1 mm. = 60″). The programme consists of the repetition of plates taken 30 or more years ago containing at least 50 small extra-galactic nebulae. It is planned to measure these star-like nebulae along with the stellar images and obtain in this way absolute proper motions for faint stars on the assumption of zero proper motion for the distant nebulae on the plate. (*b*) A search for faint members of well-known moving clusters. Investigations on the moving cluster in Perseus and the Hyades have been planned. (*c*) Determination of the group motion for a few of the nearest galactic clusters in the southern hemisphere.

HARLOW SHAPLEY, *Director*

UNIVERSITY OF MINNESOTA OBSERVATORY, Minneapolis, Minn., U.S.A.

Work is being carried out at this observatory in co-operation with Harvard. By means of the Blink microscope a survey is being made of large proper motions in the southern hemisphere. Up to date some 6000 new proper motions have been found of stars brighter than the 16th magnitude.

I would like to recommend that trigonometric parallax observers publish the galactic latitude for each star, since it is now certain that the size of the correction from relative to absolute parallax is dependent on galactic latitude.

W. J. LUYTEN, *Director*

ROYAL OBSERVATORY, Greenwich.

The re-observation of the Greenwich Astrographic Zones (+ 64° to the North Pole) to obtain proper motions of all the stars in the *Astrographic Catalogue* was begun in 1923 and is now completed. The new photographs were taken through the glass of the plate and were compared with the earlier photographs, by being clipped face to face with them in the micrometer, with the new images and the old in juxtaposition. The difference of the co-ordinates was measured for all stars in the *Astrographic Catalogue*. A displacement of about 1″ from the average of the surrounding stars is unmistakable and as the average interval between the plates exceeds 30 years this corresponds to a proper motion of 3″ a century.

The measurement is complete and Volume **5** of the *Astrographic Catalogue* has been published. It contains all the stars whose proper motion exceeds 3″ a century found in Volume **1** of the *Astrographic Catalogue* (Dec. + 64° to + 72°).

Volume **6** containing the stars in Volume **2** (Dec. + 72° to the North Pole) will be published in 1932.

F. W. DYSON, *Astronomer Royal*

MOUNT WILSON OBSERVATORY.

The proper motion programme consists of: (*a*) Boss stars for which the old plates are over ten years old. (*b*) Very faint stars down to 20th magnitude in selected areas for statistical work. (*c*) Cepheids. (*d*) Spiral nebulae with stellar or almost stellar nuclei. (*e*) Internal motions in some of the larger spirals.

A. VAN MAANEN

YERKES OBSERVATORY.

The work of Ross in duplicating Barnard's plates with the Bruce telescope has resulted in the discovery of 900 new proper motion stars.

G. W. MOFFITT

ALLEGHENY OBSERVATORY.

Proper motion stars have been selected which can be reduced to the 14th magnitude by means of the rotating sector. Observing has been started but has not continued long enough to obtain results.

F. C. JORDAN, *Director*

LEIDEN OBSERVATORY, Holland.

Proper motion work on the region of the Pleiades down to the 14th or 15th magnitude is progressing steadily.

W. DE SITTER, *Director*

Leander McCormick Observatory, University of Virginia, U.S.A.

Work is progressing satisfactorily on the large proper motion work being conducted by Van de Kamp, Vyssotsky and others. The programme consists in rephotographing regions in the sky for which 12 or more years have elapsed since the early parallax series. Altogether there are 346 regions, mainly surrounding Boss stars, the regions being rather uniformly distributed north of $-30°$ declination. Each of the recent plates carries an exposure of the North Polar Sequences.

The average number of faint stars per plate in the Milky Way is 150 and at the galactic pole 20; for the whole sky the average being 50. Up to date 300 regions with a total of 14,800 stars have been measured. It is estimated that the completed work will contain 17,000 stars. The magnitudes of the faint stars are being measured by the Schilt microphotometer. During three visits to Harvard, Vyssotsky classified 6000 spectra in 300 regions to visual magnitude 11·3.

The relative proper motions of the faint stars are being determined with a probable error of about 0″·006. The reduction to absolute motions by means of the central Boss star of each region adds a probable error of 0″·005. Hence the total probable error of the absolute motions of the faint stars will be about 0″·008. The complete material will be discussed for solar motion, secular parallax, etc., etc.

About two years ago two plates each of two images were taken on 141 Cepheid regions. Up to date we have secured two plates on 261 long period variables; the completed programme will contain more than 400 variables. The plates on both of the Cepheid and long period variable programmes will be utilized to derive proper motions and eventually for parallaxes. We are working in co-operation with Mount Wilson on the Cepheid programme and with Johannesburg on the long period variables. Other proper motion investigations under way are on visual double stars.

S. A. Mitchell, *Director*

S. A. Mitchell
President of the Commission

https://doi.org/10.1017/S0251107X00016503 Published online by Cambridge University Press