

## 32. COMMISSION DES "SELECTED AREAS"

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MEMBRES: MM. W. S. Adams, Alden, F. Becker, Mme Payne Gaposchkin, MM. Hins, Knox-Shaw, A. Kohlschütter, Schlesinger, Schwassmann, Seares, van Maanen.

The following lines give a summary of the work concerning Kapteyn's Plan of Selected Areas up to December 1937.

### I. DURCHMUSTERUNG

Two surveys of the Selected Areas of the Systematic Plan are available: [1] and [3].\*

#### HARVARD, GRONINGEN

The plates for the Durchmusterung of the areas of the Special Plan have been taken at the Harvard Observatory and have been measured at the Kapteyn Laboratory, Groningen. The measured area of each plate is given in the preceding report. The Durchmusterung is nearly ready for the printer. The standard magnitudes of a few areas are, however, not yet satisfactory. Some plates for the determination of these standard magnitudes have been taken since 1935 at the Harvard Observatory and have been sent to Groningen. They have not yet been measured.

### 2. PHOTOGRAPHIC AND VISUAL OR PHOTOVISUAL MAGNITUDES. COLOUR INDICES

The investigations [4], [5] and [7] had been completed before the publication of the previous report in 1935.

#### MOUNT WILSON: PHOTOVISUAL MAGNITUDES, NORTHERN AREAS

The photovisual magnitudes in forty-three of the northern Selected Areas, Nos. 1, 2, . . . 7; 8, 10, . . . 18; 20, 24, . . . 40; 45, 49, . . . 65; 69, 73, . . . 89; 92, 96, . . . 112; 116, 120, . . . 136, are being investigated by F. H. Seares. He reports that no progress has been made on this work since 1935 owing to the urgency of the investigation of magnitudes, both photographic and photovisual, of a large number of stars near the North Pole to serve as supplementary standards. As this investigation itself, however, should in certain cases be helpful to observers of magnitudes in Selected Areas, the following summary of this work is given here: The number of Polar Sequence standards among the brighter stars is insufficient for a satisfactory transfer of the international scale and colour system to other parts of the sky. The difficulties are especially troublesome when using large-field short-focus cameras, for which the plate corrections are usually complicated.

To meet this need, F. H. Seares and Miss Mary C. Joyner, with the co-operation of F. E. Ross of the Yerkes Observatory, are engaged in the preparation of a catalogue of about 2000 stars north of declination  $+80^\circ$  and extending down to a limiting photographic magnitude of about 11.5. The precision for a large part of

\* [1] means No. 1 of the list of Publications in section 12. This notation is continued in the following pages.

the stars should be comparable with that of the Polar Sequence standards. The photographic magnitudes are finished; the photovisual values should be completed sometime during 1938.

#### HARVARD: PHOTOVISUAL MAGNITUDES, NORTHERN AREAS

The photovisual magnitudes of the stars in the zone of declination  $+75^\circ$  have been published in *Harvard Annals*, **105**, see [12a]; the magnitudes in the zone of declination  $+60^\circ$  are being determined at present and the work will probably be extended to lower declinations.

#### MCCORMICK OBSERVATORY: PHOTOVISUAL MAGNITUDES, NORTHERN AREAS

S. A. Mitchell reports that in fifty-two Selected Areas the observations of the photovisual magnitudes down to the 13th magnitude with the 10-inch and 26-inch refractors are now in progress. Only areas between galactic latitudes  $-20^\circ$  and  $+20^\circ$  and north of declination  $-30^\circ$  are included in the programme.

#### POTSDAM: PHOTOGRAPHIC MAGNITUDES, NORTHERN AREAS

The photographic magnitudes of stars in the areas at declination  $+15^\circ$  and in the special areas 2 to 7, 24 and 25 are being determined by W. Münch using the "Halbgittermethode" of Schwarzschild.\* The plates have been taken with the 15 cm. Zeiss triplet (focal length 150 cm.) and the 80 cm. photographic refractor (focal length 1210 cm.). The measured area is  $3^\circ.8 \times 3^\circ.8$  for the triplet plates and  $0^\circ.48 \times 0^\circ.48$  for the refractor plates. The limiting magnitudes are 11.5 and 14.5 respectively. Prof. Münch has investigated since 1935 the accuracy of the "Halbgittermethode" and has determined a correction to the magnitudes depending on the fog of the plate. The correction for distance from the centre of the plate is being investigated.

#### HARVARD, GRONINGEN: PHOTOGRAPHIC MAGNITUDES, NORTHERN AREAS

Photographic magnitudes of the stars in the northern Selected Areas brighter than 13.0 are being determined at the Kapteyn Laboratory. The measured field is  $3^\circ.5 \times 3^\circ.5$ . The spectral classes of the same stars are being investigated by Prof. Schwassmann at the Hamburg Observatory (see section 8). The plates, taken with the 8-inch Draper telescope (focal length 126 cm.) of the Harvard Observatory, are being measured at the Kapteyn Laboratory with a thermopile and galvanometer. The magnitudes of the areas 1 to 43 have been published, see [32].

Comparison with the *Mount Wilson Catalogue of Photographic Magnitudes in Selected Areas 1 to 115* shows that the scale and zero-point of the Groningen magnitudes for the areas 1 to 19 agree with the international system; for the areas 20 to 43 the magnitudes of the stars  $m < 10.0$  are  $0^m.25$  brighter than the values of the *Mount Wilson Catalogue*, whereas for the fainter stars the agreement is satisfactory.

#### HARVARD: PHOTOGRAPHIC MAGNITUDES IN SOUTHERN AREAS BRIGHTER THAN 13<sup>m.0</sup>

The photographic magnitudes of the stars in the *Potsdam Spektral-Durchmusterung* of the Selected Areas at declinations  $-45^\circ$  and  $-60^\circ$  have been published as *Harvard Mimeograms*, Series II, Nos. 2 and 3. The magnitudes of the stars at

\* *Astronomische Nachrichten*, **183**, 297, 1910.

declination  $-15^\circ$  brighter than  $13^{m.0}$  in *Harvard Annals*, **102** have been published as *Harvard Mimeograms*, Series II, No. 1. The work is being continued.

The photographic magnitudes of the standard sequences in the Selected Areas 140 to 206 have been determined by S. Gaposchkin and have been published in *Harvard Annals*, **89**, No. 9. These magnitudes will provide a basis for a new discussion of the scale of the Harvard-Groningen Durchmusterung.

#### HARVARD: PHOTO-RED MAGNITUDES IN SOME SELECTED AREAS

Photo-red magnitudes of the stars of Selected Areas 179, 181, 182, 194, 196, 197, 198, 199 in the *Potsdam Spektral-Durchmusterung* have been determined but have not yet been published. The average colour indices and general discussion for these Selected Areas have been published in *Harvard Annals*, **105**.

The red magnitudes of standard stars for the Selected Areas 140 to 206 have been determined by S. Gaposchkin and have appeared as *Harvard Annals*, **89**, No. 9.

The plates necessary for the determination of the photo-red magnitudes of stars in the *Potsdam Spektral-Durchmusterung* in the Selected Areas 140 to 206 have been secured and are now being measured. As successive zones of declination are completed, it is planned to issue the photo-red magnitudes as Series IV of the *Harvard Mimeograms*. A discussion of colour, magnitude, and spectrum is being made concurrently, with special reference to colour excess and its dependence on apparent magnitude and galactic latitude.

#### HARVARD: PHOTOGRAPHIC MAGNITUDES OF FAINT STARS IN SOUTHERN AREAS

An extensive re-examination of the photographic magnitudes in the southern Selected Areas from the 11th to the 17th magnitude has been inaugurated at the Harvard Observatory. The work is to be done with the 24-inch Bruce telescope (focal length 344 cm.). The Bruce telescope has little time to give to this programme and it is expected that the work will take some three years.

After the completion of this programme the scale of magnitudes in the southern areas will probably be extended to the 19th magnitude with the 60-inch reflector. These programmes will be carried out by Mrs Payne Gaposchkin and S. Gaposchkin.

#### POTSDAM: PHOTOGRAPHIC MAGNITUDES, SOUTHERN AREAS

The photographic magnitudes of the stars in the southern areas, the spectra of which have been classified,\* are being determined at the Potsdam Observatory by W. Becker and K. Walter. The magnitude limit is  $12^m$  photographic, in fields  $4^\circ \times 4^\circ$ . The plates are being measured with a photo-electric photometer. The measurements of the zone of declination  $-30^\circ$  will be finished in 1937. The magnitudes of eight standard fields in the equator will be compared with the polar sequence.

#### PULKOVO: COLOURS OF B.D. STARS IN THE NORTHERN AREAS

M. Okulicz has left the Pulkovo Observatory and his observations of visual magnitudes will not be continued.

G. A. Tikhov is at present determining the colours of the B.D. stars in the areas 44 to 91; the colours in the areas 1 to 43 have been published, see [9].

\* See section 8.

## STOCKHOLM: COLOURS IN NORTHERN AREAS

Y. Öhman has applied his new method of determining colour equivalents with the rotatory spectrograph\* to faint stars in the Selected Areas 15, 19, 26, 32, 55 and 56 with the special aim of finding white dwarfs. So far he has discovered one such star, viz. *Mount Wilson Catalogue of photographic magnitudes in Selected Areas 1 to 139*, no. 82 of area 26.

### 3. STAR COUNTS

#### HARVARD

Star counts will be made by Mrs Priscilla Fairfield-Bok in the northern areas on plates taken at the Harvard Observatory with a Ross-Fecker 3-inch lens of 21 inches focal length. The counts will be performed between the photographic magnitudes 8.5 and 14.5 in fields covering 70 square degrees around the centres of the northern Selected Areas.

### 4. VARIABLE STARS

#### HAMBURG

Thirty-five variables in Selected Area 41 have been observed by A. A. Wachmann in a field of 34 square degrees, see [10]. The limiting magnitudes of the plates is 15<sup>m</sup>.5.

#### EDINBURGH: AREAS AT +75° AND +60° DECLINATION

E. A. Baker's work aims at furnishing for all variables, in the areas at +75° and +60° declination, that are brighter than 14th magnitude at maximum,

- (1) Map of surrounding stars;
- (2) Photographic magnitudes of comparison stars;
- (3) Positions correct to about 1'';
- (4) Observations sufficient for classification.

The plates are taken with a triplet lens of 25 cm. aperture and 150 cm. focal length. Each covers an area of 40 square degrees and reaches, under the best conditions, to the 16th magnitude. Eight pairs of plates of each region are being searched for variables with a blink-comparator. Observations were started in 1933, and about twenty plates of each region are now available. Results for area 2 have been published, see [11].

#### HARVARD

The northern areas are being photographed at Harvard with the Ross-Fecker 3-inch lens, mentioned in section 3, as an indefinitely running patrol. The plates are designed eventually to yield material for a systematic survey for variable stars.

Another survey for variable stars in twenty-six Selected Areas will be made with the Ross-Lundin camera; the limiting magnitude is 15. The distribution of the areas is planned so that all galactic latitudes will be appropriately represented.

#### STERNBERG ASTRONOMICAL INSTITUTE OF THE UNIVERSITY OF MOSCOW

An extensive plan of investigating all variable stars brighter than the visual magnitude 12 at maximum has been inaugurated at the Sternberg Astronomical Institute.† In the course of the work on the Plan systematic observations have been made on stars in Selected Areas 1, 2, 3, 8, 9, 10, 19, 24, 25, 38, 39, 65, 66, 88 and 89.

\* *Stockholms Observatorium Meddelande*, Nos. 31 and 32, 1937.

† *Popular Astronomy*, 45, 86, 1937.

## 5. PROPER MOTIONS

The relative photographic proper motions in the northern areas have been determined at the Radcliffe and Yerkes Observatories, see [13] and [17]. The proper motions in the northern areas have been derived from meridian positions by C. H. Hins, see [18].

### PULKOVO: AREAS AT DECLINATION $+75^\circ$ TO $+15^\circ$

A. N. Deutsch and E. J. Perepelkin have measured the proper motions of 3189 stars in the areas at  $+75^\circ$  and  $+60^\circ$  declination and in the area 28, see [19]. The plates have been taken with the 33 cm. astrographic telescope (focal length 346 cm.). The probable error of the proper motions is  $\pm 0''.0065$ . The measured area is the same as in the Durchmusterung of *Harvard Annals*, 101; outside this area only the fundamental stars are measured, see [18].

The proper motions in seventy-four areas between the pole and declination  $+15^\circ$  have been measured by A. N. Deutsch. The probable error is  $\pm 0''.004$ , the limiting photographic magnitude 15.0. The plates of the zones  $+60^\circ$  and  $+75^\circ$  declination, measured with an interval of twelve years (see [19]), have been repeated with an interval of twenty years; they are included in the seventy-four areas, mentioned above. The catalogue will be prepared for press within a few months.

### CAMBRIDGE (ENGLAND): NORTHERN AREAS

Areas of the systematic plan at  $\delta=0^\circ$  to  $+60^\circ$  and the special areas 8, 9, 10, 12, 18, 20 and 24 were photographed in 1930 with the Sheepshanks telescope (aperture 30 cm.; focal length 590 cm.). The limiting magnitude is about 15; the field to be measured is  $90' \times 90'$ . The areas will be re-photographed after the lapse of a suitable interval.

### DEARBORN: AREAS AT THE EQUATOR

The proper motions of stars in the zone  $\delta=0^\circ$  will be measured at the Dearborn Observatory by O. Lee. The telescope used is the 47 cm. refractor (focal length 703 cm.). Little progress has been made in this work during the last three years.

### BONN: NORTHERN AREAS

The areas of the northern hemisphere between  $0^\circ$  and  $+75^\circ$  declination have been photographed with the 30 cm. refractor (focal length 513 cm.) by F. Küstner. Two exposures were made on each plate: one of 60 minutes and one of 1 or 2 minutes. The measurable field is  $85' \times 85'$ ; the limiting magnitude 15. The plates will be repeated in the future for the determination of the proper motions.

The Director of the Bonn Observatory, A. Kohlschütter, intends to take a new series of plates of the northern Selected Areas with the same telescope, using a grating in front of the lens for the determination of the magnitude error. The plates will be used for the determination of the proper motions after the lapse of a suitable interval. Further, a more extensive programme has been developed with the intention of securing proper motions on an absolute basis. The proper motions of stars as faint as the 12th magnitude will be determined on an absolute basis by means of plates taken with the telescope that is now being used for the repetition of the *Astronomische Gesellschaft Catalogue*. The field of these plates is of course much larger than that of the 30 cm. refractor. Finally, A. Kohlschütter considers the possibility of connecting the proper motions of the stars in the Selected Areas

with the proper motions of the extragalactic nebulae, which, for all practical purposes, are zero. A special series of plates is wanted for this purpose. We thus would have the proper motions of the stars between the magnitudes 5 and 17 on a uniform system, e.g. the Boss system, and a check on this system will be furnished by the comparison with the extragalactic nebulae.

#### ALGIERS, GRONINGEN: NORTHERN AREAS

Some plates have been taken at the Algiers Observatory for the determination of the proper motions in some of the northern areas in a field  $3^{\circ}.5 \times 3^{\circ}.5$  covered by the *Bergedorfer Spektral-Durchmusterung* (see section 8). The plates were taken with the 33 cm. astrographic refractor and will be measured at the Kapteyn Laboratory, Groningen. No progress has been made on this work in the last three years.

#### MOUNT WILSON: NORTHERN AREAS

A. van Maanen and H. C. Willis have determined the large proper motions of 122 stars in forty-two Selected Areas, see [15]. The plates were taken at the Newtonian focus of the 60 in. reflector (focal length 762 cm.). The lower limit of completeness is  $0''.050$  annually; the limiting magnitude 18 photographic.

P. Th. Oosterhoff has extended the investigation to another 651 stars in ninety-seven Selected Areas, see [20]. The investigations by van Maanen and Oosterhoff relate to the areas 1 to 139.

A. van Maanen is measuring at present the proper motions of faint stars in some northern Selected Areas on the same plates as were used in the determination of large proper motions, but now *all* stars of some areas are measured. The probable error of the proper motions in either co-ordinate is  $\pm 0''.0025$ . The nebulae which show measurable images are also observed; their number, however, is very small. A. van Maanen has not yet decided whether he will measure all northern Selected Areas or only part of them.

#### RADCLIFFE, GRONINGEN: NORTHERN SPECIAL AREAS

The proper motions of the stars in the special Selected Areas 2, 5, 9 and 24 have been determined at the Kapteyn Laboratory by B. Hiemstra by means of plates taken at the Radcliffe Observatory with the 60 cm. photographic refractor (focal length 690 cm.). The interval is 15 years. The probable error of the proper motions is  $\pm 0''.004$ .

All these areas show a black opening surrounded by rich parts of the Milky Way. The distance and absorption of the clouds have been computed by B. Hiemstra. The work will be published in the near future.

#### YALE OBSERVATORY, SOUTHERN STATION, JOHANNESBURG

An extensive programme of measuring the proper motions of the stars in the southern areas between magnitudes 6 and 16 on an absolute basis has been inaugurated at the Yale Observatory. The magnitude error of the proper motions will be eliminated by means of exposures with gratings placed in front of the lens. The work is being continued along the lines described in the former report.\*

\* *Transactions of the International Astronomical Union*, 5, 207, 1936.

## 6. TRIGONOMETRIC PARALLAXES

### YERKES: NORTHERN AREAS AT $\delta = +45^\circ$

The trigonometric parallaxes of the stars in the areas at declination  $+45^\circ$  have been published by O. Lee, see [13]. The limiting magnitude is 13 to 14 photographic.

## 7. STANDARDS OF POSITION

### LEIDEN, BONN, BABELSBERG, PARIS, STRASBOURG: NORTHERN AREAS

The right ascensions and declinations of approximately ten stars in each area of the northern hemisphere, excepting the polar area, have been determined at the Babelsberg, Bonn, Paris, Leiden and Strasbourg observatories, see [21], [23] and [24]. Final mean places have been derived by C. H. Hins, see [18].

The stars in the polar area have been observed at Babelsberg, Bonn and Leiden, see [25] and [26]. The reductions of the Leiden observations are well under way.

### PERTH AND LA PLATA: SOUTHERN AREAS

The positions of the standard stars in the southern areas have been determined by H. A. Martinez, see [22], and are also being determined at the Perth Observatory. No report has been received about the latter piece of work.

### BORDEAUX: AREAS AT DECLINATION $-15^\circ$

The positions of the standard stars at declination  $-15^\circ$  have been observed at the Bordeaux Observatory. The results will be published in the near future.

## 8. SPECTRAL CLASSIFICATION

### MOUNT WILSON: NORTHERN AREAS

M. L. Humason classified approximately thirty-five stars in each area north of and including the equator. The limiting magnitude is 12 to 13, see [29].

### HAMBURG: NORTHERN AREAS

The spectral classes of 67,898 stars in the areas 1 to 43 have been classified by A. Schwassmann, assisted by A. A. Wachmann. The field of each area is  $3^\circ.5 \times 3^\circ.5$ . The limiting magnitude is approximately 13 photographic, see [32]. The work is being continued.

### POTSDAM: SOUTHERN AREAS

The spectral classes for the areas in declination  $-75^\circ$ ,  $-60^\circ$ ,  $-45^\circ$ ,  $-30^\circ$  and  $-15^\circ$  have been published by F. Becker and H. Brück. The limiting magnitude is 12 photographic; the fields vary from 16 to 24 square degrees, see [28], [30] and [30a].

## 9. SPECTROSCOPIC ABSOLUTE MAGNITUDES AND INTENSITY MEASURES OF FRAUNHOFER LINES

### MOUNT WILSON: NORTHERN AREAS

The spectroscopic absolute magnitudes of about 250 A to M stars brighter than the 8th magnitude in the areas 1 to 139 have been published by W. S. Adams and his collaborators, see [33]. The absolute magnitudes of all F to M stars and of some A stars observed for radial velocity (section 10) will be determined.

## BONN: SOUTHERN AREAS

Spectral intensity measures of 3377 southern stars between the magnitudes 5 and 9 have been published by F. Becker and A. Kohlschütter, see [34] and [35]. The intensities of several lines, the spectrophotometric colour indices and the intensity of the cyanogen absorption have been measured.

The spectroscopic absolute magnitudes of 738 G and K stars, mostly brighter than the 8th magnitude, have been derived from the cyanogen absorption by F. Becker, see [36] and [37].

## STOCKHOLM: NORTHERN AREAS

The spectroscopic absolute magnitudes of the stars in the northern areas brighter than 14<sup>m</sup> photographic will be determined at the Stockholm Observatory. The plates will be taken at the Newtonian focus of the 40-inch reflector. The field is about 30' × 30'.

### 10. RADIAL VELOCITIES

#### MOUNT WILSON

The radial velocities of 437 stars in the northern areas and in the zone of declination -15° are being observed at the Mount Wilson Observatory. W. S. Adams reports that

- for 209 stars, 3 or more spectrograms have been taken,
- for 37 stars, 2 spectrograms have been taken,
- for 69 stars, 1 spectrogram has been taken,
- 122 stars are unobserved.

The measurement of the spectrograms has been kept up to date. A list of the stars is found in *Transactions of the International Astronomical Union*, 5, 215, 1936. The stars of the list have *not* been selected on the basis of either large or small proper motion with the exception of the stars given in the quoted *Transactions*, p. 210.

#### DAVID DUNLAP OBSERVATORY

Since the David Dunlap Observatory was opened in 1935 it has been engaged in determining the velocities of stars in areas 3° × 3° with centres at the centres of the Kapteyn areas north of the equator. Down to photographic magnitude 7.5 there are approximately 500 stars. Four plates of each star are taken as a minimum and the programme is practically complete. The velocities will probably be published by the end of 1938.

### 11. INVESTIGATIONS WHOLLY OR PARTIALLY BASED ON OBSERVATIONAL MATERIAL OF THE SELECTED AREAS

A summary of the work published before the end of 1934 is given in *Transactions of the International Astronomical Union*, 5, 210, 1936.

The following investigations have appeared since 1935:

1. Die Dichteverteilung der Sterne in höheren galaktischen Breiten, von P. J. van Rhijn und A. Schwassmann. *Zeitschrift für Astrophysik*, 10, 161, 1935.

The density distribution in high galactic latitudes is derived for each spectral class from the distribution of the absolute and apparent magnitudes. The density for all spectral classes together is derived from the values for each spectral class

separately. The density gradient perpendicular to the Milky Way appears to depend on the absolute magnitude.

2. Mean parallaxes of faint stars derived from the Radcliffe Catalogue of proper motions, by J. H. Oort. *Bulletin of the Astronomical Institutes of the Netherlands*, **8**, 75, 1936.

This is a very extensive paper which cannot be summarized here in detail. The mean parallaxes of stars between  $9^m.5$  and  $14^m.5$  are derived from a comparison of the mean component of the proper motion in a direction approximately perpendicular to the direction of the solar motion with the corresponding mean linear velocity. The mean parallaxes vary smoothly with magnitude and galactic latitude. Further, mean parallaxes are derived for stars of a given magnitude and proper motion  $< 0''.100$ . Next, mean parallaxes are found for each spectral class separately. Finally, a quantity has been defined by means of the proper motions which gives a better insight into the distance distribution than the general mean parallaxes; the star-density for the region within 550 parsecs of the sun is derived.

The problem of the absorption of light in the galaxy is considered and some slight support is found for a low coefficient of absorption. Numerical values are given for the percentages of giants and dwarfs among the faint stars.

3. Mean parallaxes derived from  $\tau$ -components of faint stars, by A. van Hoof. *Bulletin of the Astronomical Institutes of the Netherlands*, **8**, 67, 1936.

In this paper mean parallaxes of stars between the magnitudes  $11.0$  and  $14.9$  are derived from a comparison of the mean component of the proper motion in a direction perpendicular to the direction of the solar motion with the corresponding mean linear velocity. The proper motions used in this investigation have been measured at the Radcliffe Observatory, see [17]. The mean parallaxes are somewhat smaller than Oort's values referred to above. The cause of the discrepancy is discussed by van Hoof.

4. Selective absorption of starlight by interstellar clouds, by F. H. Seares. *Proceedings of the National Academy of Sciences*, **22**, 327, 1936.

The colour indices of stars between the photographic magnitudes  $10^m.0$  and  $13^m.5$  are derived in thirty Selected Areas. The colour excess, found by comparison with normal colour indices for the same spectral class, appears to change appreciably from one area to another. Most of the groups of normal colour are in regions of normal density of extragalactic nebulae and areas showing large colour excesses are mostly within Hubble's zone of avoidance. The colour excesses are, therefore, probably due to absorption of light in space.

The polar region is probably covered by a veil of obscuration; the mean colour index of A0 stars on the international system in unobscured regions is therefore  $-0.14$  instead of zero.

5. Zur selektiven interstellaren Absorption, von G. Becker. *Zeitschrift für Astrophysik*, **11**, 356, 1936.

The author investigates whether the colour indices of the Bonn spectral photometry show a selective absorption of light in space. The result is negative. The colour indices of the K stars depend clearly on the absolute magnitude.

6. The absorption of light in interstellar galactic space and the galactic density distribution, by P. J. van Rhijn. *Publications of the Kapteyn Astronomical Laboratory at Groningen*, **47**, 1936.

The absorption of photographic light in the Milky Way is found by means of Joy's radial velocities of Cepheid variables. It appears to amount to  $1.1$  magnitudes per 1000 parsecs. The density distribution in the galaxy is investigated by means of

the distribution of absolute and apparent magnitudes. There is some evidence in favour of the existence of a local group around the sun extending to a distance of about 1000 parsecs.

7. Eine Bemerkung zu den Spektralvergleichen in der Bergedorfer Spektral-Durchmusterung, von E. Holmberg. *Meddelande från Lunds Astronomiska Observatorium*, Ser. I, Nr. 146, 1937.

The differences between the spectral classes of the *Draper Catalogue* and the *Bergedorfer Spektral-Durchmusterung* are discussed statistically in this paper.

8. An absorbing cloud in galactic latitude  $+18^\circ$ , by Lois T. Slocum and B. W. Sitterly. *Harvard Bulletin*, No. 905, 1937.

The distribution of apparent magnitudes in the region around Selected Area 7 shows the existence of a cloud of total absorption 1.5 magnitudes at about 500 parsecs distance in the direction  $\alpha = 21^{\text{h}}5^{\text{m}}$ ,  $\delta = +74^\circ$ .

9. Ueber die Verteilung der Sterne verschiedener Spektralklassen, von H. Brück. *Zeitschrift für Astrophysik*, 13, 266, 1937.

The distribution of the stars of different spectral classes according to apparent magnitude and galactic latitude is derived from the spectra in the twenty-four Selected Areas at declination  $-30^\circ$ . The relative frequency of the different spectral groups varies with the apparent magnitude, the A type being more numerous among the brighter stars and the G type among the fainter ones. The density of stars in space decreases with increasing distance from the sun for all spectral classes. The coefficient of absorption being unknown, no definite value for the diameter of the system can be derived.

10. Red indices of stars in eight southern Selected Areas, by Cecilia Payne Gaposchkin. *Harvard Annals*, 105, 383, 1937.

The red indices for each area are tabulated as averages for successive intervals of spectral class and apparent magnitude. Apart from the well-known decrease in the average colour of second-type stars with magnitude due to a decreasing proportion of giants, no conspicuous effects are present, except for two areas of lowest galactic latitude ( $+2^\circ$  and  $+6^\circ$ ). In these two areas the B stars and the later type giants show considerable colour excesses.

## 12. PUBLICATIONS CONTAINING OBSERVATIONAL DATA ON THE PLAN OF SELECTED AREAS

### DURCHMUSTERUNG, MAGNITUDES AND VARIABLE STARS

1. Durchmusterung of Selected Areas, by E. C. Pickering, J. C. Kapteyn and P. J. van Rhijn. *Harvard Annals*, 101-103, 1918 to 1924.

2. Reduction of the Harvard-Groningen Durchmusterung to the International System of Magnitude and Colour, by F. H. Seares, Mary C. Joyner and Myrtle L. Richmond. *Mount Wilson Contributions*, 289, *Ap. J.* 61, 303, 1925.

3. Mount Wilson Catalogue of Photographic Magnitudes in Selected Areas 1 to 139, by F. H. Seares, J. C. Kapteyn and P. J. van Rhijn. *Carnegie Institution Publication*, No. 402, 1930.

4. Photographic and photovisual magnitudes of the stars in the zone  $+45^\circ$ , by J. A. Parkhurst. *Publications of the Yerkes Observatory*, 4, Part 6, 1927.

5. Photovisual magnitudes for the Selected Areas at  $\delta = +75^\circ$ , by P. J. van Rhijn and B. J. Bok. *Publications of the Kapteyn Astronomical Laboratory at Groningen*, 44, 1929.

6. Study of colour indices of faint stars in five Selected Areas in the Milky Way, by L. F. Slocum. *Lick Observatory Bulletin*, No. 434, 1931.

7. Photographic magnitudes of stars brighter than  $14^m.0$  in 40 of Kapteyn's Selected Areas determined at the Royal Observatory, Greenwich, under the direction of Sir Frank Dyson, *Astronomer Royal*, 1931.

8. Observations of variable stars in the Selected Areas 1 to 115, by H. Knox-Shaw. *Astronomische Nachrichten*, **253**, 217, 1934.

9. Théorie du spectrographe longitudinale et catalogue des couleurs des étoiles de la Bonn Durchmusterung dans les aires no. 1-43 du plan systématique de Kapteyn, par G. A. Tikhov. *Publications de l'Observatoire Central à Poulkovo*, Série II, **50**, 1937.

10. Photographisché Beobachtungen von Veränderlichen auf dem Kapteyn Eichfeld 41, von A. A. Wachmann. *Astronomische Abhandlungen der Hamburger Sternwarte in Bergedorf*, **4**, Nr. 5, 1935.

11. Variables in Kapteyn's Selected Areas 2 to 19, by E. A. Baker. *Monthly Notices of the Royal Astronomical Society*, **97**, 541, 1937 and **98**, 65, 1937.

12. Photographic magnitudes in Selected Areas at  $-15^\circ$ , by Cecilia Payne-Gaposchkin and Sergei Gaposchkin. *Harvard Observatory Mimeographs*, Series II, No. 1.

Photographic magnitudes in Selected Areas at  $-45^\circ$  and  $-60^\circ$ , by Cecilia Payne-Gaposchkin and Sergei Gaposchkin. *Harvard Observatory Mimeographs*, Series II, Nos. 2 and 3.

12a. Photovisual magnitudes for the Selected Areas at  $\delta = +75^\circ$ , by B. J. Bok and W. J. Swann. *Harvard Annals*, **105**, 371, 1937.

12b. Standards for Selected Areas 140-206, by S. Gaposchkin. *Harvard Annals*, **89**, No. 9, 1937.

#### PROPER MOTIONS AND TRIGONOMETRIC PARALLAXES

13. Parallaxes and Proper Motions of 1041 stars in the zone  $+45^\circ$ , by O. J. Lee. *Publications of the Yerkes Observatory*, **4**, Part 4, 1926.

14. Proper motions of the special area No. 12, by W. M. Smart. *Cambridge Observations*, **26**, 1928.

15. Proper motions of some very faint stars, by A. van Maanen and H. C. Willis. *Mount Wilson Contributions*, No. 412, 1930.

16. Faint stars in the Selected Areas (zones  $+75^\circ$  and  $+60^\circ$ ) with large proper motion, by A. N. Deutsch. *Poulkovo Observatory Circular*, No. 8, 1933.

17. Radcliffe Catalogue of Proper Motions in the Selected Areas 1 to 115, compiled by H. Knox-Shaw and H. G. Scott-Barrett, 1934.

18. General Catalogue of Positions and Proper Motions of 1190 Standard Stars in the areas 2 to 115 of Kapteyn's Plan of Selected Areas, by C. H. Hins. *Annalen van de Sterrewacht te Leiden*, deel **15**, vierde stuk, 1934.

19. Eigenbewegungen von 3189 Sternen in den Kapteynschen Arealen  $\delta = +75^\circ$  und  $+60^\circ$  und in dem Areal 28, von A. N. Deutsch und E. J. Perepelkin. *Publications de l'Observatoire Central à Poulkovo*, Série II, **45**, 1935.

20. Proper motions of 651 stars in 97 Selected Areas, by P. Th. Oosterhoff. *Astrophysical Journal*, **83**, 340, 1936.

#### MERIDIAN POSITIONS

21. Katalog von 1885 Sternen für das Aequinoctium 1925, von R. Prager. *Veröffentlichungen der Universitäts-Sternwarte zu Berlin-Babelsberg*, **5**, Heft 3, 1924.

22. Estrellas Kapteyn para las areas seleccionadas australes observadas, por H. A. Martínez. *Publicaciones Observatorio astronómico La Plata*, **2**, No. 1, 1927.
23. Katalog von 1172 Sternen in Kapteyn's "Selected Areas" auf Grund der Beobachtungen am Repsoldschen Meridiankreise, von C. Mönnichmeyer und J. Hopmann. *Veröffentlichungen der Universitäts-Sternwarte zu Bonn*, No. 21, 1930.
24. Catalogue of 1172 Reference Stars in the areas 2 to 115 of the Systematic Plan of Selected Areas. Observations of the Leiden Observatory, by C. H. Hins and J. J. Raimond, Jr. *Annalen van de Sterrewacht te Leiden*, deel **15**, derde stuk, 1930.
25. Bestimmung der Oerter von 10 Polarsternen im Kapteyn Feld 1, von B. Sticker. *Astronomische Nachrichten*, **256**, 349, 1935.
26. Ortsbestimmung von zehn Polsternen, von L. Courvoisier. *Astronomische Nachrichten*, **261**, 5, 1936.

#### SPECTRAL CLASSIFICATION

27. The space distribution of the stars of different spectral classes as determined from studies in the Cygnus region of the Milky Way, by A. D. Maxwell. *Lick Observatory Bulletin*, No. 390, 1927.
28. Spektral-Durchmusterung der Kapteyn-Eichfelder des Südhimmels, I. bis III. Teil enthaltend das Polfeld und die Zonen  $-75^\circ$ ,  $-60^\circ$  und  $-45^\circ$ , von Friedrich Becker. *Publikationen des astrophysikalischen Observatoriums zu Potsdam*, **27**, 1931.
29. Spectral types of faint stars in Kapteyn's Selected Areas 1 to 115, by M. L. Humason. *Mount Wilson Contributions*, No. 458, *Ap. J.*, **76**, 224, 1932.
30. Spektral-Durchmusterung der Kapteyn Eichfelder des Südhimmels, IV Teil, Zone  $-30^\circ$ , von H. Brück. *Publikationen des astrophysikalischen Observatoriums zu Potsdam*, **28**, 1935.
- 30a. Spektral-Durchmusterung der Kapteyn Eichfelder des Südhimmels, Zone  $-15^\circ$ , von F. Becker. *Publikationen des astrophysikalischen Observatoriums zu Potsdam*, **28**, Heft 2, 1938.
31. Revised spectral types of a group of stars in Kapteyn area 98, by M. L. Humason. *Mount Wilson Contributions*, No. 560, 1937.
32. *Bergedorfer Spektral-Durchmusterung der 115 nördlichen Kapteynschen Eichfelder*, von A. Schwassmann und P. J. van Rhijn, Band I, Eichfeld 1 bis 19, 1935; Band II, Eichfeld 20 bis 43, 1938.

#### SPECTROSCOPIC ABSOLUTE MAGNITUDES AND INTENSITY MEASURES OF FRAUNHOFER LINES

33. The spectroscopic absolute magnitudes and parallaxes of 4179 stars, by W. S. Adams, A. H. Joy, M. L. Humason and A. M. Brayton. *Mount Wilson Contributions*, No. 511, 1934.
34. Spektrale Intensitäts-Messungen an 1393 Sternen des Südhimmels, von F. Becker und A. Kohlschütter. *Veröffentlichungen der Universitäts-Sternwarte zu Bonn*, No. 27, 1933.
35. Spektrale Intensitäts-Messungen an 1984 Sternen des Südhimmels, von F. Becker und A. Kohlschütter. *Veröffentlichungen der Universitäts-Sternwarte zu Bonn*, No. 29, 1936.
36. Spektralphotometrische Parallaxen von 533 G und K Sternen, von F. Becker. *Zeitschrift für Astrophysik*, **10**, 311, 1935.
37. Spektralphotometrische Parallaxen von 205 G und K Sternen, von F. Becker. *Zeitschrift für Astrophysik*, **11**, 148, 1935.

### 13. DESIDERATA FOR FUTURE WORK

1. The *Durchmusterung* of stars as faint as magnitude 19, which for the zones in declinations  $+90^\circ$  to  $-15^\circ$  has been published in the *Mount Wilson Catalogue*, should be extended to the south pole. This extension will probably be undertaken at the southern station of the Harvard Observatory (see section 2).

2. Meridian observations of the positions of the stars in the southern areas has been undertaken by the La Plata and the Perth Observatories. At least one more determination of the meridian positions seems desirable.

3. The radial velocities for the areas south of declination  $-15^\circ$  are unprovided for.

The radial velocities of a number of stars fainter than magnitude 9 would be very valuable, even if the probable errors were larger than usual. W. S. Adams is considering the possibility of measuring the velocities of a number of stars down to the magnitude 12 in the northern Selected Areas with a new spectrographic equipment which is being constructed at present.

4. The problem of the absorption of light in interstellar space for the regions of the Selected Areas is of great importance for statistical investigations. The distribution of the external galaxies down to magnitude 18 approximately is being examined at present at the Harvard Observatory; as the whole sky will be covered by this investigation, the distribution of the external galaxies and hence a preliminary value of the photographic absorption in the direction of the Selected Areas will be known in the near future.

It seems very important to investigate the differential absorption in the direction of the Selected Areas by means of colour excesses of B stars. The Harvard colour indices (section 2) will provide valuable material for an investigation of the differential absorption in the southern hemisphere.

H. L. Alden writes that the Ross camera plates, covering an area of 120 square degrees, would permit, through star counts of the area and adjoining regions, an estimate of the amount of obscuration in the area concerned on the assumption that the stellar distribution is uniform in that part of the sky. The limiting magnitude of the plates is about 13 photographic.

5. F. Becker, at the Bonn Observatory, writes that in his opinion the present Selected Areas in the Milky Way are too far apart for a study of galactic structure and that we therefore should select a number of additional areas in the galaxy. The writer of this report agrees with F. Becker on the first point, but thinks that the selection of new areas should be delayed until we know more about the absorption of light in the galaxy.

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*President of the Commission*