32. COMMISSION DES 'SELECTED AREAS'

PRÉSIDENT: M. VAN RHIJN.

VICE-PRÉSIDENT: M. OORT.

MEMBRES: MM. Baade, Fr. Becker, Bok, Brouwer, A. N. Deutsch, Fehrenbach, F. S. Hogg†, Kharadze, Knox-Shaw, Redman, H. Shapley, Stoy, R. E. Wilson, R. K. Young.

The following lines give a summary of the work of the Plan of Selected Areas from September 1947 to September 1950.

1. DURCHMUSTERUNG AND ATLAS

Two surveys of the Selected Areas of the Systematic Plan are available: [1] and [5].*

Harvard, Groningen.

The Durchmusterung of the areas of the Special Plan is being printed at present.

Observatoire du Houga.

An atlas of the areas of the Systematic Plan north of and including declination $-15°$ will be made at the Observatoire du Houga. The atlas will facilitate the use of the Selected Areas. A number of stars are identified on the charts by means of their numbers in various catalogues. The limiting magnitude is 17; the scale is $1' = 5$ or 6 mm. and the field approximately $60' \times 60'$

2. PHOTOGRAPHIC AND VISUAL OR PHOTOVISUAL MAGNITUDES, COLOUR INDICES AND EFFECTIVE WAVE-LENGTHS

The investigations [2] to [4] and [6] to [14] had been completed before the publication of the previous report.

Mount Wilson. Photovisual magnitudes, Northern Areas.

Thirty-six of the forty-two Selected Areas of the programme for photovisual magnitudes are finished and the results are averaged in catalogue form. The remaining six areas require minor revisions and collection according to Mount Wilson Catalogue number. The catalogue will be printed in 1951.

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 on plates taken at the Harvard Observatory. The field is $-3°{\cdot}5 \times 3°{\cdot}5$. The spectral classes of the same stars are being determined at the Hamburg Observatory. The results for areas 1–91 have been published, see [46]. The zone of declination 0° is being printed at present.

Harvard Observatory.

The photographic magnitudes and colours of the stars in Selected Area 141 are being determined by B. Bok at the Harvard Southern Station. Mrs Bok and Dr Bok have nearly completed the establishment of a photo-electric standard sequence of this area in blue and yellow light; magnitude 9–15·5. The zero point has been obtained by tying in with Selected Area 68, the photo-electric standards of which have been determined by Stebbins and his collaborators (see p. 476). The red and blue photographic magnitudes of Selected Areas 158 and 193 will be connected with the magnitudes of the

* [1] means No. 1 of the List of Publications in section 10.

https://doi.org/10.1017/S0251107X00032557 Published online by Cambridge University Press

C Regions and the Selected Areas at declination $+15°$. Probably the areas will also be investigated photo-electrically. The areas are the key centres for Bok's work on the stellar distribution and absorption characteristics in four centres of the Sagittarius-Scorpio region and three centres of the Carina-Crux region of the Milky Way respectively

Abastumani Astrophysical Observatory: Colours in the Northern Areas.

The colour indices of 14,000 stars in areas nos. 1 to 43 have been published, see [16]. The magnitudes of the measured stars are 10 to 13.

Lund Observatory.

Mr A. Reiz is primarily interested in the red giants in areas with galactic latitude 20° approximately. The spectra of the stars were collected by means of plates taken with the Cleveland Schmidt telescope. Photo-electric standard magnitudes and colours will be determined by Mr Reiz at the Stockholm Observatory. The next task is to secure the necessary photographic plates and to measure them in the Lund iris photometer.

Stockholm: Northern Areas.

The magnitudes and colours of stars in a number of areas at declination $\geqq +45°$ have been determined by Mr Elvius at the Stockholm Observatory; see section 7.

Leiden Observatory.

1. Photographic magnitudes in the Southern Selected Areas. This programme consists of two parts:

(*a*) Determination of photographic magnitudes of stars in areas of about 4×4 square degrees with a limiting magnitude of about 10·5. The plates were taken by Dr Wesselink with the Rockefeller astrograph of the Leiden station at Johannesburg. All plates were taken with objective grating for determination of scale. In order to obtain a common zero-point the areas have been interconnected zonal-wise, whereas the different zones have been connected with the zone of declination -45 by means of the areas 164, 170, 176, 182, which have been used as standard fields. All exposures have been made with both components of the telescope being used simultaneously.

The plates are measured in a Schilt-microphotometer which has been specially adopted for this programme. Before the next I.A.U. meeting all 159 plates taken with one of the objectives will probably have been measured by Mr Kooreman. Only the first steps in the reduction have been made so far.

(*b*) The extension of these magnitudes to a fainter limit of about 14·5. The plates for this programme have been taken. The measurement, however, will not be started until part (*a*) of the programme has been completed.

2. Colours of B- and A-type stars in Northern Areas down to declination $-15°$. Dr Walraven measured photo-electric colours of B- and A-type stars in the Selected Areas 1, 3, 8–11, 14, 15, 17. 20–28, 30, 33, 35, 37–43, 46–51, 57, 59, 62–7, 85–9, 97, 100, 108–12, 132–6 with the 120 cm. reflector of Saint Michel Observatory. Most of the areas are below 30° galactic latitude. The effective wave-lengths are approximately 5590, 5300, 4000 and 3470 A. The magnitudes range from 9 to 13. A dozen stars are measured in each area. The zero-point is determined by comparison with the north polar sequence.

The measures have been reduced and will be discussed and prepared for publication in the near future.

Cambridge (England): Areas at declination $+15°$

Photographic and photovisual magnitudes are being determined in the Selected Areas at $+15°$ in the range 7^m to 10^m by comparison with the Pole. In the first place attention has been concentrated on the following preferred areas: 68, 70, 73, 76, 78, 81, 84, 86 and 89. Photography has been completed for all areas. Measurement and reduction has been completed for the preferred areas and is continuing with the others.

The preferred areas have also been compared with the Pole photo-electrically, in two colours, using a pulse-counting photometer. This work is nearly completed. In all this work the Mount Wilson Catalogue has been used for standards at the Pole. The relation of this Catalogue to the Polar Sequence is to be checked by further photo-electric observations.

Mount Wilson Observatory, Washburn Observatory.

Magnitudes and colours of 102 stars in Selected Areas 57, 61 and 68 have been obtained from photo-electric observations at the 60-inch and 100-inch telescopes on Mount Wilson. The range covered extends from photographic magnitude 9·0–19·3. Comparison with the North Polar Sequence gave data for converting all magnitudes and colours to the International System. In all three Selected Areas the difference between the photo-electrically determined magnitudes and the Mount Wilson Catalogue values is nearly zero at the bright end but becomes progressively more positive as the faint limit is reached. The difference ranges up to 0·6 magnitude and points to an error in the photographic scale.

The results have been published by Joel Stebbins, A. E. Whitford and H. L. Johnson in the *Astrophysical Journal*, **112**, 469, 1950.

Dr Baade writes that magnitudes and colours will be determined at the Mount Wilson and Palomar Observatories in the following areas:

No.	α	δ
68	$0^h\ 11^m$	+15°
71	3 11	+15
51	7 24	+30
54	10 24	+30
57	13 4	+30
61	16 59	+30
89	21 8	+15

The magnitudes and colours between photographic magnitudes 9 and 20·5 will be determined photo-electrically, the magnitudes 20·5–22·5 will be investigated photographically. The zero-point of the magnitudes will be determined by comparison with the Polar Sequence and the photo-electric magnitudes and colours will be reduced to the international system. It is intended to add later red magnitudes with an effective wave-length of about 7000 A.

Lick Observatory.

Photo-electric magnitudes in the wave-lengths 6800 and 8250 have been determined in the areas 51, 57, 61, 64, 68 and 71 by G. E. Kron and J. Lynn Smit. The limiting magnitudes are between 12 and 15, *Astrophysical Journal*, **113**, 327.

Poulkovo Observatory.

The colour indices of 8848 stars in areas of the zones of declination +30° and +15° have been determined by Dr G. A. Tikhov. All B.D. stars have been observed. The diameter of the field is 4° The colours are determined by the method of the longitudinal spectrograph. The colour indices are being printed at present in Vol. **2** of the *Catalogue of Colour Indices*, (*Publications de l'Observatiore Central à Poulkovo*, Vol. **66**, 1951). Vol. **3** containing the colour indices at declinations 0° and −15° is being prepared for the printer. See also [8].

3. Variable Stars

Hamburg.

A. A. Wachmann has observed variable stars in the areas 41 and 64, see [18] and [20]. The area 98 is being observed at present. The plates for area 18, taken at the Hamburg Observatory. are being investigated at the Münster Observatory.

Edinburgh. Areas at $+75°$ declination.

E. A. Baker and R. W Wrigley have observed variable stars in the areas 2 and 7, see [19] and [21]. This work has now been suspended.

Sternberg Astronomical Institute of the University of Moscow.

Systematic observations of variable stars have been made in Selected Areas 1, 2, 3, 8, 9, 10, 19, 24, 25, 38, 39, 65, 66, 88 and 89. No report has been received about the progress of this work.

4. Proper Motions

The investigations [22] to [31] had been completed in 1948.

Cambridge (England): Northern Areas.

Areas of the systematic plan at declination $0°$ to $+60°$ 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 areas will be re-photographed after a suitable interval.

Bonn: Northern Areas.

The areas of the northern hemisphere between $0°$ and $+75°$ declination have been photographed with the 30 cm. refractor (focal length 513 cm.) some thirty years ago. Two exposures are made on each plate: one of 60 min. and one of 1 or 2 min. The measurable field is $85' \times 85'$, the limiting magnitude is 15. The plates will be repeated in the future for the determination of the proper motions.

Alger, Groningen: Northern Areas.

The proper motions in most of the areas at the equator are being determined at the Kapteyn Laboratory by means of plates taken at the Alger Observatory. The early plates are the regular plates of the *Carte du Ciel* Catalogue. At least half of each plate is covered by the $3°.5 \times 3°.5$ field of the Bergedorfer Spektral Durchmusterung. The work will be completed in 1952.

Yerkes Observatory Areas between declination $+90°$ and $-15°$

Most of the areas between the North Pole and declination $-15°$ have been photographed by Ross at the Yerkes Observatory with the 10-inch Ross telescope in 1928–32. The limiting magnitude is 16–17; the measurable field has a diameter of 4–5° The plates might be used later for finding the stars of large proper motion. (*Publ. Amer. Astr. Soc.* **9**, 98, 1937.)

Lick Observatory: Areas from declination $-15°$ to the North Pole.

The sky north of $-20°$ is being photographed with the Lick astrograph (aperture 50 cm., focal length 360 cm.) with the purpose of finding the proper motions of faint stars relatively to extragalactic nebulae. The proper motions of the latter being zero, we get a system of absolute proper motions. The proper motions of the bright stars will be determined, referred to the same system and free from magnitude error, by means of grating exposures and other means.

The proper motions of the stars in the Selected Areas, which are not too far from the centre of a plate of the regular programme, can be measured on these plates. If, on the other hand, this distance is too large for a satisfactory determination of the proper motions, special plates will be taken with the corresponding Selected Areas in the centre of the plate. The Lick plates therefore will yield absolute proper motions of the stars in the Selected Areas declination $-15°$ to $+90°$ Some 868 of the whole programme including 1246 plates have been taken. The astrometric properties of the plates are entirely satisfactory.

Seventeen plates of Selected Areas have been taken in 1947. This programme will be resumed in 1951.

Poulkovo Observatory: Northern Special Areas.

The publication [32] contains the proper motions in the special areas 9, 12, 17, 24 and 25. The proper motions are derived from plates taken in 1910–15 and in 1937–38 respectively with the 13-inch astrograph (scale 1 mm. = 1′). Two pairs of plates are measured for each area. The catalogue contains magnitudes on the international system, rectangular co-ordinates and relative motions. The probable error of the proper motions is $\pm 0''{\cdot}005$.

Yale-Columbia Southern Station: Southern Areas.

First epoch plates for the determination of the proper motions in the southern areas will be taken at the Yale-Columbia southern station. The purpose is to obtain absolute photographic positions and proper motions of stars with a wide range of magnitudes. The reader may be referred to *Trans. Astr. Union,* **7**, 334, 1950.

The 1927 series taken with the Yale refractor (aperture 66 cm., focal length 1100 cm.) will be repeated in the near future and the proper motions will be determined at the Kapteyn Laboratory, Groningen.

5. Standards of Position

The right ascensions and declinations of approximately ten stars in each area have been determined, see [33–38].

The positions of the brighter stars in the entire Southern Hemisphere will be determined jointly by the Yale Observatory (declination 0° to −30°) and the Cape Observatory (declination −30° to 90°). The stars of the Selected Areas occurring in this investigation will serve as standards of position for these areas.

6. Spectral Classification

The publications [39–46] have appeared before 1948.

Hamburg: Northern Areas.

The zones of declination +90° to +15° of the Bergedorfer Spektral Durchmusterung have been published. The zone 0° is being printed at present.

Stockholm Observatory: Northern Areas.

The spectral types of stars in a number of areas at declination ≧ +45° have been determined by Mr Elvius, see section 7.

A comparison between the McCormick system of classification on the one hand and the Bergedorfer [46] and Potsdam systems [44] on the other hand are given in *Astr. J* **54**, 12, 1948 and *Astrophys. J* **93**, 425, 1941.

7. Absolute Magnitudes and Intensity Measures of Fraunhofer Lines

The publications [47–52] have been issued before 1948.

Mount Wilson. Northern Area.

The accurate spectral classifications including giant, subgiant, dwarf and subdwarf character of the stars measured for radial velocity are given in the table at the end of this report. No further specifications of the absolute magnitude will be made.

David Dunlap Observatory: Northern Areas.

The absolute magnitudes of the stars, the radial velocity of which has been determined, [53] and [55], will be observed. The standard spectra for the purpose have been obtained.

Stockholm: Northern Areas.

Mr Elvius has undertaken a spectrophotometric investigation of fourteen Selected Areas situated around the Milky Way in Cygnus and Cepheus. The areas are 1, 2, 6, 7, 15, 16, 17, 18, 19, 20, 40, 41, 42 and 43. The field is one square degree. Spectra are observed with an objective prism to photographic magnitude 13·5 and are recorded in a microphotometer. The absolute magnitudes are derived according to the methods developed by the Swedish astronomers.

The areas 2, 6, 7, 15, 16, 17, 18, 19, 20, 40, 41 and 42 have been published in *Stockholms Observatoriums Annaler*, Band **16**, nos. 4 and 5, 1951.

Photographic and photovisual magnitudes have been determined by means of plates taken with the 40 cm. astrograph. Monochromatic magnitudes in the blue are also obtained.

Spectroscopic absolute magnitudes have been derived for most of the stars.

The work will be extended to the remaining areas between declination +45°, and the North Pole.

Abastumani Observatory.

The absolute magnitudes of stars in twenty-six areas in galactic latitudes ±30° have been determined with an objective prism attached to a 20 cm. camera by N. B. Kalandadze. The limiting magnitude is 8·5–9·0. The number of observed stars is 180 of spectral class B and A and 240 of spectral class G and K. The probable error is $\pm 0^{m}\cdot 10$ for the former and $\pm 0^{m}\cdot 25$ for the latter group.

8. Radial Velocities

The publications [53–5], published before 1948, contain radial velocities of stars in the Northern Hemisphere.

Observatoire de Haute Provence Northern Areas.

The radial velocities of faint stars in the Selected Areas near the Milky Way will be determined at the Observatoire de Haute Provence, Saint Michel l'Observatoire, by means of objective prism plates.

Mount Wilson Observatory: Northern Areas and declination −15°

The radial velocities of the stars observed at Mount Wilson are given in a table at the end of this Report.

9. Investigations wholly or partly based on Observational Material of the Selected Areas

A summary is given of the investigations which have been received in the Netherlands since the Zürich Meeting in 1948.

1. Selecktive Absorption in den 4 Kapteynschen Eichfeldern 8, 9, 18 und 41 by W Lohmann und G. R. Miczaika, *Veröffentlichungen der Badischen Landessternwarte zu Heidelberg*, Bd. **14**, no. 10, 1946.

The selective absorption is derived as a function of the distance by means of the colour indices derived from [15]. It is found that absorbing material is present in each of the four areas.

2. Galaktische Dichtegradienten bei strenger Berücksichtigung der interstellaren Absorption von G. R. Miczaika, *Veröffentlichungen der Badischen Landessternwarte zu Heidelberg*, Bd. **14**, no. 14, 1947.

The density distribution for stars of the spectral classes B, A and F is determined for the Selected Areas 1, 8, 9, 18, 19, 26, 40, 41 and 42 by means of Brill's method. Most of the areas are near the Milky Way. The numbers of stars as a function of the photo-

https://doi.org/10.1017/S0251107X00032557 Published online by Cambridge University Press

graphic magnitude are derived from the Bergedorfer Spektral Durchmusterung [46] and the luminosity curve is adopted in accordance with Schwassmann and van Rhijn (*Zeitschrift für Astrophysik*, **10**, 161, 1935). The photographic absorption as a function of the distance is derived from the differential absorption derived by Becker (*Zeitschrift für Astrophysik*, **17**, 285, 1939) and Lohmann and Miczaika [15], assuming the λ^{-1} law for the dependence of the absorption on the wave-length. It appears that in the areas investigated the density does *not* decrease with increasing distance from the Sun; the hypothesis of a local group around the Sun must be abandoned.

3. Secular parallaxes of faint stars as deduced from *Pulkovo Catalogue* data on proper motions in Kapteyn areas by A. N. Deutsch, *Bulletin de l'Observatoire Central à Poulkovo*, Vol. **17**, 3, p. 55, 1947.

The parallaxes have been determined on the basis of their proper motions [31]. The probable error of the proper motions is $\pm 0''\cdot005$, the magnitude error is negligible. The co-ordinates of the solar apex are found to be right ascension = 285°, declination +36° The deviation from the normal apex (270°, 30°) is probably real and is due to a local star stream. Differences are formed between the absolute proper motions by Hins [27] and the Poulkovo relative proper motions. Their mean value represents the parallactic displacement of the reference stars, used in the reduction of the Poulkovo proper motions plus a systematic error which is probably present in the proper motions in right ascension by Hins. The mean secular parallax of the Poulkovo reference stars appears to be $0''\cdot0085$ and the systematic error in the $\mu_\alpha \cos \delta = 0''\cdot0056$ (μ_α = proper motion in right ascension, δ = declination). The secular parallaxes are computed for the galactic zones 0° to +25°, +25° to +49° and +50° to +84° as a function of the international photographic magnitude. These are compared with the McCormick parallaxes (*McCormick Publications*, Vol. **7**, 1937) and the values by Oort (*Bulletin of the Astronomical Institutes of the Netherlands*, **8**, 75, 1936). A comparison is further made between the mean Poulkovo parallaxes of areas with and without interstellar absorption. The galactic absorption is found to be equal to 1 mag. per kiloparsec. A number of G dwarfs has been found with an absolute magnitude 2–3 mag. below the main sequence.

4. Motions of the seventh magnitude A-type stars by Donald A. MacRae and Scott Nevin, *Astr. J.* **53**, 120, 1948.

The radial velocities [53] and [55] are used. The solar motion for stars of all spectral types together and for the A-type stars respectively are determined. Further, the constants of the velocity ellipsoid, the dispersion of the velocity component perpendicular to the Milky Way and the density distribution in this direction are computed. The result is:

z (*pc*)	Density
0	1·00
200	0·31
400	0·023
600	0·002

5. The distribution of the stars according to apparent magnitude and galactic latitude by J. Schilt, *Astr. J* **53**, 126, 1948.

In a star system, where the density is a function of the distance to the Milky Way z exclusively, the following formula holds:

$$m = f(\log N - 0\cdot6b) + b + \Delta \text{ abs.}$$

m = photographic magnitude.
$b = 5 \log \operatorname{cosec} \beta$.
β = galactic latitude.
N = number of stars per unit area in latitude β brighter than m.
Δ abs. = difference in absorption between the region of latitude β and the north galactic pole = $k(\operatorname{cosec} \beta - 1)$, k being a constant. It is supposed that the absorption takes place in a thin layer in front of the stars considered.

f is an arbitrary function.

https://doi.org/10.1017/S0251107X00032557 Published online by Cambridge University Press

The validity of the above formula is tested by means of numbers of stars counted in several regions among which are the Selected Areas. It is found that the function f and the constant k can be determined in such a way that the formula is satisfied for $m > 13{\cdot}0$; for brighter stars most catalogues show systematic differences.

6. The determination of light absorption in the dark clouds by means of proper motions by A. N. Deutsch, *Bulletin of the Central Observatory at Poulkovo*, **17**, no. 6, 89, 1948. The following summary is based on a report by Prof. A. N. Deutsch and *Astronomical Newsletter*, No. 43:

The proper motions listed in paper [32] have been used for this investigation. In each of the five areas an outline of obscuring clouds was sketched, the outlines were checked against the Ross-Calvert Atlas. Then average values $\overline{M}_x$ and $\overline{M}_y$ were formed separately for stars outside and inside the obscured parts and the differential secular parallax $\Delta \frac{h}{\rho}$ was computed. By means of the McCormick curves (*McCormick Publ.* Vol. **7**, 70, table VI, 2) these were converted into differences in magnitude. The underlying assumptions are: (1) that the density and luminosity functions are the same for stars in clear and obscured regions; (2) that the obscuring clouds are in the form of thin layers in front of the obscured stars. The results are summarized as follows:

Kapteyn Special Area	Total photogr. abs. m m	Distance of cloud
9	1·0 ± 0·6	550 parsec.
12	1·5 ± 0·2	350
17	2·5 ± 0·5	400
24	2·4 ± 0·2	250
25	1·3 ± 0·1	600

7. Star-streaming among faint low-latitude stars investigated according to the dispersion method by C. H. Hins and A. Blaauw: *Bulletin of the Astronomical Institutes of the Netherlands*, Vol. **10**, 365, 1948.

The dispersion method for the derivation of the direction of the principal axis and the ratio of the axes of the velocity ellipsoid is applied to the combined Radcliffe and Poulkovo proper motions [26] and [31] in the northern Selected Areas and to the McCormick proper motions (*Publications of the Leander McCormick Observatory*, Vol. **7**, 1937) in the zone $-20°$ to $+20°$ galactic latitude. The galactic longitude of the vertex direction is found to be 323°, coinciding with the direction towards the galactic centre. This result disagrees with the deviation of the vertex from the direction towards the centre, found by other investigators on the basis of partly the same observational material, using Schwarzschild's method. The discrepancy is probably due to an ambiguity in the determination of the position angle of the direction toward the vertex in each area in the latter method.

10. Publications containing Observational Data on the Plan of Selected Areas

Durchmusterung and Magnitudes

[1] Durchmusterung of Selected Areas. By E. C. Pickering, J. C. Kapteyn and P. J. van Rhijn. *Harvard Annals*, **101–3**, 1918–24.

[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*, No. 289; *Ap. J.* **61**, 303, 1925.

[3] Photographic and photovisual magnitudes of the stars in the zone +45°. By J. A. Parkhurst. *Publications of the Yerkes Observatory*, **4**, pt. 6, 1927.

[4] Photovisual magnitudes for the Selected Areas at $\delta = +75°$. By P. J. van Rhijn and B. J. Bok. *Publications of the Kapteyn Astronomical Laboratory at Groningen*, **44**, 1929.

[5] 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.

[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 $14^{m}\cdot 0$ in 40 of Kapteyn's Selected Areas determined at the Royal Observatory, Greenwich, under the direction of Sir Frank Dyson, Astronomer Royal, 1931.

[8] Théorie du spectrographe longitudinal et catalogue des couleurs des étoiles de la Bonn Durchmusterung dans les aires 1–43 du plan systématique de Kapteyn. Par G. A. Tikhov. *Publications de l'Observatoire Central à Poulkovo*, Sér. 2, **50**, 1937.

[9] Photographic magnitudes in Selected Areas at $-15°$ By Cecilia Payne-Gaposchkin and Sergei Gaposchkin. *Harvard Observatory Mimeographs*, ser. **2**, no. 1.
Photographic magnitudes in Selected Areas at $-45°$ and $-60°$ By Cecilia Payne-Gaposchkin and Sergei Gaposchkin. *Harvard Observatory Mimeographs*, ser. **2**, nos. 2 and 3.

[10] Photovisual magnitudes for the Selected Areas at $\delta = +75°$ By B. J. Bok and W J. Swann. *Harvard Annals*, **105**, 371, 1937.

[11] Standards for Selected Areas 140–206. By S. Gaposchkin. *Harvard Annals*, **89**, no. 9, 1937.

[12] Farbenindices in den offenen Sternhaufen N.G.C. 1027 und IC 1805 und den Kapteynschen Eichfeldern 26, 35 und 40. Von Martin-Christopher Clasen. *Astronomische Abhandlungen der Hamburger Sternwarte in Bergedorf*, **4**, no. 10, 1937.

[13] Over kleuraequivalenten van sterren in Selected Areas 40 en 41 van Kapteyn. Door A. Velghe. *Mededelingen van de Koninklijke Vlaamse Academie voor Wetenschappen, Letteren en Schone Kunsten van Belgie, Klasse der Wetenschappen*, **3**, no. 5, 1941.

[14] Magnitudes and colours in the globular cluster Messier 12 and Selected Area 108. By J J. Nassau and J. A. Hynek. *Astrophysical Journal*, **96**, 37, 1941.

[15] Selektive Absorption in den 4 Kapteynschen Eichfeldern 8, 9, 18, 41. Von W. Lohmann und G. R. Miczaika. *Veröffentlichungen der Badischen Landessternwarte zu Heidelberg*, Bd. **14**, no. 10, 1946.

[16] Colour indices of 4488 stars in Kapteyn's Selected Areas at average and high galactic latitude. By E. K. Kharadze. *Bulletins of the Abastumani Astrophysical Observatory*, No. 10, 1949 (Russian paper). Colour indices have also been published in *Abastumani Bulletins*, No. 6 (1942), No. 7 (1943) and No. 8 (1945).

Variable Stars

[17] Observations of variable stars in the Selected Areas 1 to 115. By H. Knox-Shaw. *Astronomische Nachrichten*, **253**, 217, 1934.

[18] Photographische Beobachtungen von Veränderlichen auf dem Kapteyn Eichfeld 41. Von A. A. Wachmann. *Astronomische Abhandlungen der Hamburger Sternwarte in Bergedorf*, **4**, no. 5, 1935.

[19] 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.

[20] Beobachtung von Veränderlichen in der Umgebung von Kapteyn Feldern der nördlichen Milchstrasse. Teil II (Eichfeld 64). Von A. A. Wachmann. *Astronomische Abhandlungen, Ergänzungshefte zu den Astronomischen Nachrichten*, Bd. **11**, no. 5, 1948.

[21] The variables in the Selected Areas at 75° and 60° north declination. By E. A. Baker and R. W Wrigley. *Publications of the Royal Observatory Edinburgh*, Vol. **1**, no. 1, 1939 and Vol. **1**, no. 3, 1949.

[22] Parallaxes and proper motions of 1041 stars in the zone +45° By O. J. Lee. *Publications of the Yerkes Observatory*, **4**, pt. 4, 1926.
[23] Proper motions of the special area no. 12. By W. M. Smart. *Cambridge Observations*, **26**, 1928.
[24] Proper motions of some very faint stars. By A. van Maanen and H. C. Willis. *Mount Wilson Contributions*, No. 412, 1930.
[25] Faint stars in the Selected Areas (zones +75° and +60°) with large proper motion. By A. N. Deutsch. *Poulkovo Observatory Circular*, No. 8, 1933.
[26] Radcliffe Catalogue of Proper Motions in the Selected Areas 1 to 115. Compiled by H. Knox-Shaw and H. G. Scott-Barrett, 1934.
[27] 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.
[28] Eigenbewegungen von 3189 Sternen in den Kapteynschen Arealen $\delta = +75°$ und +60° und in dem Areal 28. Von A. N. Deutsch und E. J. Perepelkin. *Publications de l'Observatoire Central à Poulkovo*, Sér. 2, **45**, 1935.
[29] Proper motions of 651 stars in 97 Selected Areas. By P. Th. Oosterhoff. *Ap. J* **83**, 340, 1936.
[30] Dark clouds in Kapteyn's Special Areas 2, 5, 9 and 24 and the proper motions of the stars in these regions. By B. Hiemstra. *Publications of the Kapteyn Astronomical Laboratory at Groningen*, No. 48, 1939.
[31] The proper motions of 18,000 stars in 74 Kapteyn's Areas from +75° to +15° declination. By A. N. Deutsch. *Publications de l'Observatoire Central à Poulkovo*, Sér. 2, **55**, 1940.
[32] Proper motions of 3188 stars in 5 Special Kapteyn Areas (nos. 9, 12, 17, 24 and 25). By A. N. Deutsch and W. W. Lafdofsky. *Bulletin of the Central Observatory at Poulkovo*, **17**, no. 6, 1948 (Russian paper).

Meridian Positions

[33] Katalog von 1885 Sternen für das Aequinoktium 1925. Von R. Prager. *Veröffentlichungen der Universitäts-Sternwarte zu Berlin-Babelsberg*, **5**, Heft 3, 1924.
[34] Estrellas Kapteyn para las areas seleccionadas australes observadas. Por H. A. Martinez. *Publicaciones Observatorio Astronomico La Plata*, **11**, no. 1, 1927 and **15**, 1939.
[35] 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.
[36] 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.
[37] Bestimmung der Orter von 10 Polarsternen in Kapteyn Feld 1. Von B. Sticker. *Astronomische Nachrichten*, **256**, 349, 1935.
[38] Ortsbestimmung von zehn Polsternen. Von L. Courvoisier. *Astronomische Nachrichten*, **261**, 5, 1936.

Spectral Classification

[39] 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.
[40] Spektral-Durchmusterung der Kapteyn-Eichfelder des Südhimmels, I. bis III. Teil enthaltend das Polfeld und die Zonen −75°, −60° und −45° Von Friedrich Becker. *Publikationen des astrophysikalischen Observatoriums zu Potsdam*, **27**, 1931.
[41] Spektral-Durchmusterung der Kapteynschen Eichfelder des Südhimmels, IV Teil, Zone −30° Von H. Brück. *Publikationen des astrophysikalischen Observatoriums zu Potsdam*, **28**, 1935.

[42] 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.
[43] Revised spectral types of a group of stars in Kapteyn area 98. By M. L. Humason. *Mount Wilson Contributions*, No. 560, 1937.
[44] Spektral-Durchmusterung der Kapteyn-Eichfelder des Südhimmels Zone −15° Von F. Becker. *Publikationen des astrophysikalischen Observatoriums zu Potsdam*, **28**, Heft 2, 1938.
[45] Spektral-Durchmusterung der Kapteynschen Eichfelder des Südhimmels, VI. Teil. Ergänzungen zu den Zonen −75° und −60° Von F. Becker. *Publikationen des astrophysikalischen Observatoriums zu Potsdam*, **28**, Heft 3, 1938.
[46] *Bergedorfer Spektral-Durchmusterung der* 115 *nördlichen Kapteynschen Eichfelder*. Von A. Schwassmann und P. J. van Rhijn. Band **1**, Eichfeld 1 bis 19, 1935; Band **2**, Eichfeld 20 bis 43, 1938; Band **3**, Eichfeld 44 bis 67, 1947; Band **4**, Eichfeld 68 bis 91, 1951.

Spectroscopic Absolute Magnitudes and Intensity Measures of Fraunhofer Lines

[47] Spektrale Intensitäts-Messungen an 1393 Sternen des Südhimmels. Von F. Becker und A. Kohlschütter. *Veröffentlichungen der Universitäts-Sternwarte zu Bonn*, No. 27, 1933.
[48] 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.
[49] Spektral-photometrische Parallaxen von 533 G und K Sternen. Von F. Becker. *Zeitschrift für Astrophysik*, **10**, 311, 1935.
[50] Spektral-photometrische Parallaxen von 205 G und K Sternen. Von F. Becker. *Zeitschrift für Astrophysik*, **11**, 148, 1935.
[51] Spektrale Intensitäts-Messungen an 1984 Sternen des Südhimmels. Von F. Becker und A. Kohlschütter. *Veröffentlichungen der Universitäts-Sternwarte zu Bonn*, No. 29, 1936.
[52] Preliminary report on a spectrophotometric investigation in Kapteyn's Selected Areas 2, 6, 7, 15, 16 and 19. By Tord Elvius. *Stockholms Observatorium Annaler*, Band **14**, no. 8, 1945.

Radial Velocities

[53] The radial velocities of 500 stars. By R. K. Young. *Publications of the David Dunlap Observatory, University of Toronto*, **1**, no. 3, 1939.
[54] Studies of faint B-type stars. By Daniel M. Popper. *Astrophysical Journal*, **111**, 495, 1950.
[55] The radial velocities of 374 stars. By R. K. Young. *Publications of the David Dunlap Observatory*, **1**, no. 13, 1942.

11. Desiderata for Future Work and the Extension of the List of Selected Areas

1. One of the most urgent desiderata is the establishment of a reliable scale of magnitudes in the southern Selected Areas. The scale of photographic magnitudes in the Southern Hemisphere will probably be discussed by the Photometric Commission on the basis of the Circular Letters by Stoy.

2. The data of the *Mount Wilson Catalogue of Selected Areas* for the stars of magnitude 13–18 are very important for statistical investigations about the distribution of the stars in space. It is very desirable to extend this investigation to the Southern Hemisphere.

3. The scale of magnitudes in part of the northern Selected Areas has been checked photo-electrically by the work of Walraven and Stebbins, Whitford and Johnson. It is hoped that this work will be extended to the faintest stars of all northern and southern areas.

4. The determination of the colours, especially of the early type stars, is important.

https://doi.org/10.1017/S0251107X00032557 Published online by Cambridge University Press

5. The radial velocities of the stars south of declination −15° are unprovided for. They may possibly be determined by the Radcliffe observers at Pretoria.

6. It is generally agreed that the present Selected Areas in the Milky Way are too far apart for a study of galactic structure. The Sub-Commission, which considered the extension of the list of Selected Areas, came to the conclusion that the new Selected Areas should preferentially be taken in regions where the absorption of light is inconsiderable, if these can be found. A search for galactic windows is under way at present according to two different methods:

(*a*) The sky north of declination −30° is being photographed with the 120 cm. Schmidt telescope at Mount Palomar in blue as well as in red light. A search for extragalactic nebulae in and near the Milky Way will be made on these plates. Dr Baade's provisional impression is that hardly any nebulae show up in latitudes ≦3° but that the situation, in many longitudes, improves for latitudes ≧5°

(*b*) A survey for faint B stars of high luminosity has been carried on with the Schmidt telescope at the Case Institute of Technology by Nassau and Morgan. Dr Morgan reports as follows:

> The survey is complete to approximately 10·0 photographic magnitude for a galactic belt 12° wide and extending from galactic longitude 333° around the northern sky to 200° A total of 900-odd stars are included in the catalogue, soon to be published; these stars are now being observed individually for spectroscopic parallaxes with the 40-inch telescope of the Yerkes Observatory by Morgan; Dr A. E. Whitford of the University of Wisconsin is determining photo-electric magnitudes and colours for the same stars.
>
> A similar survey for galactic regions to the south is being carried out at the National Astrophysical Observatory at Tonanzintla, Mexico. The first section of this survey, consisting of around 200 stars for a belt 5° wide and extending from longitudes 180° to 240°, is now in the Press. The limiting magnitude for the Tonanzintla survey is about a magnitude fainter than the one described earlier. Since the practical limit in declination for this survey is near −50°, it is to be hoped that the survey will also include the interval between galactic longitudes 300° and 340° The Tonanzintla programme is being carried out by Señores Luis Münch, Guillermo Haro and Luis Terrazas, under the directorship of Señor Luis Erro.
>
> It would be of the greatest importance to make a similar survey over the remaining southern declinations, since the area between longitudes 240° and 280° is of prime importance in investigations of galactic structure.
>
> A search is now being made on the Case objective prism plates for main-sequence stars of classes B2 to B5 over the same limits as were used for the high-luminosity search.
>
> The principal region in low galactic latitude where blue B stars are observed is between galactic longitudes 180° and 210°.

It is to be hoped that both undertakings will be so far advanced before the summer of 1953 that the results can be used for the symposium to be held on the co-ordination of the research of the Milky Way. New Selected Areas may then be selected at that meeting.

List of Radial Velocities observed at Mount Wilson

The following list of stars observed at Mount Wilson was prepared by Dr R. E. Wilson. The columns are:

Number of Selected Area.

No. = number of the star in the *Henry Draper Catalogue* and *Draper Extension* respectively or, if the star did not occur there, in the *Bonn Durchmusterung*.

α_{1900} and δ_{1900} = right ascension and declination for 1900.

m = visual magnitude from the *Henry Draper Catalogue* and photographic magnitude from the *Draper Extension* or, if the star did not occur there, the magnitude from the *Bonn Durchmusterung*. For variable stars the minimum and maximum magnitude are given. In exceptional cases the magnitude is derived from other sources.

https://doi.org/10.1017/S0251107X00032557 Published online by Cambridge University Press

Sp = spectral class according to the Mount Wilson observers.

V = the radial velocity. If the radial velocity is observed at other observatories besides Mount Wilson, a mean value is given. Credit is given to each observatory contributing to the result in the column 'Obs.' All velocities are reduced to the Lick system. The corrections have been derived from Moore's publication,† with the exception of the following observatories, for which the values given in table are adopted (expressed in km./sec.):

Observatory		B7–A4	A5–F4	F5–G4	G5–K4	K5–M8
Mount Wilson	(W)	0·0	+0·5	+0·5	−0·5	−0·5
Victoria	(V)	+1·0	+1·0	+1·0	+0·5	+0·5
Yerkes	(Y)	−1·0	−0·5	−1·0	−1·0	−1·0
David Dunlap	(D)	+1·0	+0·5	0·0	−1·0	−1·5
Simeis	(S)	0·0	+1·0	0·0	−0·5	−0·5

Q = the quality of the radial velocity:

a means an average probable error ±0·4 km./sec.
b ,, ,, ,, ,, ±1·2 ,,
c ,, ,, ,, ,, ±2·5 ,,

Radial velocities *d* and *e* are of little value and the probable errors in these cases mean little. A rough guess of these errors gives ±7 for *d* and ±15 for *e*.

Pl. = the number of plates from which the radial velocity is derived.

Obs. = the observatories at which the radial velocity is observed.

Md = McDonald Observatory.

Mi = University of Michigan Observatory

The other abbreviations are as given in the above table and in *Lick Publications*, Vol. **18**.

In the column 'Remarks':

SB = spectroscopic binary.

IS = interstellar velocity in km./sec. and its quality.

Em = velocity emission lines.

MSB is the catalogue of Merrill, Sanford and Burwell, *Publications Astronomical Society of the Pacific*, **45**, 306 and **54**, 107, 1942.

The table contains nearly all stars of the list in *Transactions of the International Astronomical Union*, Vol. **5**, 215, and some others selected from the list in the *Third Report of the Progress of the Plan of Selected Areas*, Appendix 4, written by the present author. These stars are selected exclusively on the basis of apparent magnitude with the exception of the numbers designated *, which are selected on the basis of large proper motion. The table further contains stars selected on the basis of some other quantity as, for instance, exceptional spectral class or variability. The numbers of these stars are designated by the § sign.

Area	No.	α 1900 h. m.	δ 1900 ° ′	*m*	*Sp*	*V*	*Q*	Pl.	Obs.	Remarks
1	57535	7 16·6	+87 57	8·91	A5	+ 4	*c*	4	W	SB
	*66368	7 58·1	+88 56	7·01	A0	− 8	*c*	4	W	—
	90162	10 19·4	+88 23	8·74	dF8	−23	*c*	4	W	SB
2	224402	23 52·5	+75 45	7·72	A0n	+ 6·8	*b*	3	W	—
	224917	23 56·7	+75 37	9·02	gK3	−15	*c*	4	W	SB
	919	0 8·5	+75 28	7·57	gM4	− 0·7	*b*	5	W	—
	947	0 8·8	+75 28	7·87	gG4	−15·9	*b*	3	W	—
	1359	0 12·7	+75 43	7·12	B9n	− 2·0	*b*	9	DW	—

† *Lick Publications*, vol. **17**, 1932.

Area	No.	α 1900 h. m.	δ 1900 ° ′	*m*	*Sp*	*V*	*Q*	Pl.	Obs.	Remarks
3	*25173	3 54·9	+74 55	7·32	dF5	+36·4	*b*	6	W	—
	26047	4 2·4	+75 34	8·62	dF4	− 7	*c*	4	W	SB, 2 spectra
4	66633	7 59·4	+74 39	8·2	A8n	+ 4·2	*b*	5	WL	—
	67739	8 4·3	+74 47	8·47	gK3	−12·1	*b*	3	W	—
	69054	8 10·1	+75 9	6·53	gK1	−31·7	*b*	3	W	—
	69659	8 12·8	+74 45	8·62	gK3	0	*c*	4	W	SB?
5	109213	12 28·0	+75 22	7·52	gG9	−29·7	*b*	4	W	—
	110312	12 36·1	+74 58	8·12	gK4	−41	*c*	5	W	SB?
6	+75°585	16 13·7	+74 54	8·5	gM5	−30·6	*b*	4	W	—
	147142	16 15·0	+75 27	6·51	gK3	−25·8	*b*	5	W	—
7	193591	20 15·9	+75 6	8·52	gM4	−17·3	*b*	4	W	—
	195121	20 24·3	+75 7	8·87	gK0	+ 0·5	*b*	4	W	—
	195191	20 24·8	+75 43	8·02	gK2	+10	*c*	4	W	—
	§195351	20 25·7	+74 55	8·3–10·5	gM8	−37	*d*	3	W	UU Dra
8	5747	0 54·0	+59 59	7·16	gG8	+16·2	*b*	3	W	—
	5797	0 54·5	+59 55	8·8	A8	− 8·1	*b*	5	W	—
	5890	0 55·3	+60 31	8·9	dF1n	+ 2·0	*b*	4	W	—
	6130	0 57·4	+60 32	5·94	A9	− 0·9	*b*	8	DW	—
	7010	1 5·4	+59 58	7·9	gK0	+12·1	*b*	3	W	—
	§	1 6·4	+60 41	10·8–12·2	cG2	−51·0	*b*	8	W	UZ Cas
9	18766	2 56·0	+59 55	7·16	dF4	−50	*c*	3	W	—
	19536	3 3·5	+60 15	7·26	A3	+13	*c*	9	DW	SB
	19968	3 7·5	+60 45	8·0	B5	− 7	*c*	3	W	—
	20040	3 8·2	+59 44	7·76	gG1	−34·5	*b*	5	W	—
10	33924	5 8·6	+60 3	7·21	dF4	+17·3	*b*	4	W	—
11	54099	7 2·5	+59 13	7·58	gG7	+11·8	*b*	3	W	—
	54122	7 2·6	+60 23	7·31	gG7	+ 5·1	*b*	3	W	—
	55178	7 6·8	+59 56	7·31	gG6	+ 7·7	*b*	3	W	—
	56243	7 11·2	+59 26	6·94	gK5	+ 8·1	*b*	5	W	—
12	77692	8 59·0	+59 45	6·19	A0	+ 4	*c*	14	DWV	—
	77818	8 59·7	+59 17	7·6	sgK0	−39·1	*b*	3	W	—
	*78249	9 2·1	+59 32	7·20	sgK2	+46·5	*b*	3	W	—
	*78364	9 2·7	+59 40	8·21	dF4	− 0·6	*b*	3	W	—
13	96656	11 3·0	+59 45	7·31	dG5	+ 7·0	*b*	4	W	—
	97140	11 5·8	+59 27	7·31	dF9	−25	*d*	3	W	SB
15	135244	15 9·0	+59 26	7·61	gK5	−11·3	*b*	3	W	—
16	158460	17 24·4	+60 7	5·66	A2	+12	*c*	13	VW	—
	159266	17 28·7	+59 46	8·4	gK0	−15	*c*	4	W	—
17	183968	19 27·0	+59 34	7·8	gK4	−25·4	*b*	3	W	—
18	204150	21 21·6	+60 23	7·61	B0n	−37	*b*	1	W	IS −8*c*
	204964	21 27·0	+59 56	7·51	B3	−19	*c*	6	W	IS −13*c*
	205139	21 28·3	+60 1	5·52	B1	−16·0	*b*	13	WVO	IS −16·2*b*
19	220102	23 16·0	+59 44	6·66	cF3	−24·4	*b*	7	DW	—
	§220369	23 18·1	+59 35	5·93	gK5	−11·7	*b*	3	W	—
	220819	23 21·8	+60 32	6·68	A5	+ 0·9	*b*	3	W	—
	220999	23 23·3	+59 8	7·45	A3n	−26	*c*	4	W	—
	221438	23 27·1	+59 59	9·2	A4	− 5·6	*b*	3	W	—
	221639	23 28·7	+59 52	7·31	sgG9	+ 0·1	*b*	4	WV	—
	221670	23 29·0	+59 54	7·41	gG6	+ 2	*c*	6	WV	SB
	+60°2582	23 30·9	+60 22	8·3	B8	−64	*c*	3	W	—

Area	No.	α 1900 h. m.	δ 1900 ° ′	*m*	*Sp*	*V*	*Q*	Pl.	Obs.	Remarks
20	3989	0 37·4	+45 21	7·37	gM0	−20·7	*b*	6	WL	—
	4134	0 38·7	+45 42	7·52	dF2	+ 9	*c*	4	W	SB, 2 spectra
	4364	0 40·9	+44 53	7·82	A5n	+10	*c*	4	W	—
	4406	0 41·3	+45 49	7·60	dG3	+ 0·7	*b*	3	W	—
	4514	0 42·1	+45 42	8·4	gK2	−14·4	*b*	3	W	—
21	9996	1 32·5	+44 54	6·34	cA0	+ 3	*c*	17	VDW	—
	*10086	1 33·5	+45 23	6·66	dG4	+ 6·2	*b*	7	DW	—
	10212	1 34·8	+44 30	8·15	gK0	−27	*c*	4	W	—
	10322	1 35·8	+45 5	8·82	gK4	−26·9	*b*	3	W	—
	10486	1 37·2	+44 48	6·46	sgK2	+12·2	*b*	3	W	—
	10597	1 38·3	+45 39	6·48	gK5	−18·9	*b*	5	WV	—
22	16663	2 35·2	+45 4	8·42	dF6	+15	*c*	3	W	SB
	17115	2 39·7	+45 2	8·07	B9	− 0·1	*b*	4	W	—
23	23082	3 37·2	+44 34	7·81	cK5	+ 7·7	*b*	4	W	—
	23256	3 38·6	+45 2	7·67	dF0	+14·3	*b*	4	W	—
	23287	3 38·9	+45 17	7·47	A0	+ 1·5	*b*	3	W	—
	23300	3 39·0	+45 22	5·64	B8	+ 2·2	*b*	9	VW	—
	23566	3 41·1	+45 3	7·67	A6n	− 6	*c*	4	W	—
	23838	3 43·1	+44 40	5·79	gG2	+14	*c*	16	DW	SB
24	29882	4 37·4	+44 34	7·77	A6n	+27	—	2	W	—
	30221	4 40·6	+45 18	7·72	A2n	+ 8	*c*	3	W	—
25	37736	5 35·7	+44 48	7·67	A5n	+ 5·9	*b*	3	W	—
	38188	5 38·9	+44 44	7·82	B9n	+ 6·7	*b*	4	W	—
26	46981	6 31·2	+44 24	7·8	F2	−19	*c*	4	W	—
	47019	6 31·7	+45 8	8·8	gM2	−30·2	*b*	4	W	—
	47335	6 33·0	+44 25	6·82	gG8	−13	*c*	4	W	SB
	47914	6 35·8	+44 38	5·17	gK5	−73·1	*b*	10	DIW	SB?
	48270	6 37·5	+44 37	6·80	gK0	+19·9	*b*	3	W	—
	48410	6 38·2	+44 21	7·8	dG0	+ 5·1	*b*	3	W	—
28	73759	8 34·9	+45 15	7·87	gF2	+21·5	*b*	3	W	—
	74327	8 38·3	+44 33	8·5	F1	+23·4	*b*	5	W	—
	75117	8 43·0	+45 20	7·6	dF4	+20·1	*b*	3	W	—
	75135	8 43·1	+45 3	7·72	A0	+ 2·6	*b*	3	W	—
	75172	8 43·3	+45 20	8·6	A8n	−21·7	*b*	4	W	—
29	§84453	9 40·3	+45 35	6·80	sgK0	−43·7	*b*	9	VW	—
30	92764	10 37·6	+45 28	8·8	A5n	− 8	*c*	4	W	SB
	93013	10 39·4	+45 30	8·1	gG7	+12·6	*b*	3	W	—
	93213	10 40·7	+44 38	7·97	dF4	+26·0	*b*	3	W	—
31	101107	11 33·0	+44 10	5·52	A7n	+ 2	*c*	7	YW	—
	101227	11 33·8	+44 51	8·02	dG4	+14·0	*b*	5	W	—
	101300	11 34·4	+45 5	8·2	gG4	+ 3·6	*b*	4	W	—
	101549	11 36·0	+44 34	7·77	A3n	− 9	*c*	4	W	—
	101585	11 36·3	+44 45	7·77	gM3	− 0·4	*b*	3	W	—
	101716	11 37·2	+44 20	8·02	dF8	−25·7	*b*	4	W	—
	101967	11 39·0	+45 2	7·77	dF4	+15·1	*b*	5	W	—
32	112610	12 52·9	+44 21	8·02	dF4	+ 3·2	*b*	5	W	—
33	121825	13 52·8	+44 46	7·62	dF9	+23	*c*	3	W	—
34	130741	14 44·8	+44 39	9·4	dF5	− 1	*c*	3	W	—
	131316	14 47·8	+45 1	8·02	dF5	−28	*c*	3	W	—
	131315	14 47·8	+45 21	7·78	dG0	−25·1	*b*	3	W	—

Area	No.	α 1900 h. m.	δ 1900 ° ′	*m*	*Sp*	*V*	*Q*	Pl.	Obs.	Remarks
35	141930	15 46·6	+44 49	7·57	A2n	−16	*c*	12	DW	—
36	+45°2449	16 42·4	+45 48	8·4	gM4	−27·1	*b*	4	W	—
	152030	16 45·9	+45 23	8·7	dF2	− 6·2	*b*	4	W	—
37	162751	17 47·5	+44 31	7·67	A3	− 1	*c*	5	W	—
	163589	17 51·8	+45 33	8·2	dG3	−37	*c*	3	W	—
	163608	17 51·9	+45 13	7·97	A2n	−25·6	*b*	5	W	—
	163966	17 53·8	+45 1	6·83	A0n	−30	*c*	9	DW	—
	163990	17 53·9	+45 23	6·22	gM6	+13	*c*	6	VW	—
38	173666	18 41·4	+44 47	7·82	dF4	−34·7	*b*	3	W	—
	174504	18 45·7	+45 9	6·84	A9	−14·1	*b*	8	DW	—
	174600	18 46·2	+45 11	8·62	gK4	+12·3	*b*	3	W	—
	175055	18 48·5	+45 0	7·22	B9	−22	*c*	5	W	—
39	186882	19 41·9	+44 53	2·97	A1n	−21·0	*b*	19	YLWV	—
	+44°3242	19 43·0	+44 48	9·2	gM3	−35·5	*b*	4	W	—
	187810	19 46·8	+44 54	8·3	gK0	−20·6	*b*	3	W	—
	188537	19 50·6	+45 12	7·77	gG9	−18·3	*b*	3	W	—
40	198237	20 43·9	+45 13	6·69	gM0	− 5·9	*b*	3	W	—
	199098	20 49·8	+44 48	5·59	gG8	−24	*c*	8	DW	—
	199138	20 50·1	+44 48	8·3	A1	−43·9	*b*	4	W	—
41	208310	21 50·4	+45 5	8·52	A0n	− 2	*c*	4	W	—
	208395	21 50·9	+45 19	8·27	A0	0	*c*	4	W	SB
	208513	21 51·6	+44 29	7·8	A0	−16	*c*	5	W	SB
44	2313	0 21·9	+30 37	7·61	gM1	+30·0	*b*	3	W	—
	2343	0 22·2	+30 21	8·41	gG7	−18	*c*	8	DW	SB
45	8826	1 21·9	+30 1	8·5	dF3	− 8·1	*b*	3	W	—
	8909	1 22·7	+30 2	6·87	dF4	−16	*c*	8	DW	SB
	9023	1 23·8	+30 22	8·26	dF3	+ 4·7	*b*	3	W	—
	9070	1 24·2	+30 29	8·2	dG5	+11·8	*b*	3	W	—
	+29°252	1 24·5	+29 36	9·2	gM2	−19·6	*b*	3	W	—
	9269	1 26·1	+30 6	8·41	gK0	+42·3	*b*	9	WD	—
	9483	1 28·0	+29 54	8·1	A4n	+13	*c*	4	W	SB
46	15788	2 27·2	+29 31	7·8	gG7	+11	*c*	3	W	—
	16042	2 29·5	+30 14	8·51	sgG4	−14·2	*b*	3	W	—
	16090	2 30·0	+30 44	7·9	dG0	− 4	*c*	6	WL	SB?
	16245	2 31·3	+29 59	7·41	A0n	+ 7·4	*b*	10	DW	—
	16397	2 32·7	+30 25	7·21	dG0	−100·3	*b*	4	W	—
47	21483	3 22·7	+30 2	7·06	B3	− 4·8	*b*	9	WV	—
	21611	3 24·2	+29 42	7·51	A0n	+10	*c*	10	DW	—
	21834	3 26·1	+29 39	7·96	A5n	+ 3	*c*	3	W	—
48	27787	4 18·1	+29 54	9·0	A1n	−27	*c*	3	W	SB
	28271	4 22·5	+30 9	6·26	dF4	−36·6	*b*	11	DW	—
	28592	4 25·3	+29 41	8·4	dF0	+30	*c*	4	W	—
49	35600	5 20·8	+30 7	5·72	B9	+16·7	*b*	7	W	IS+14·8*b*
	35601	5 20·8	+29 50	8·0	cM0	− 1·2	*b*	3	W	—
	35984	5 23·4	+29 7	6·24	dF2	+13·2	*b*	14	DSW	—
	36044	5 23·8	+29 29	7·16	gG6	+46·7	*b*	3	W	—
	36281	5 25·5	+29 22	8·6	G7	−22·9	*b*	3	W	—
	36335	5 25·9	+29 7	7·8	dF0	−30·6	*b*	4	W	—
50	45336	6 21·7	+29 19	7·6	gK8	− 4	*c*	4	W	—
	257670	6 22·3	+30 21	9·5	gF0	− 4·3	*b*	4	W	—

https://doi.org/10.1017/S0251107X00032557 Published online by Cambridge University Press

Area	No.	α 1900 h. m.	δ 1900 ° ′	m	Sp	V	Q	Pl.	Obs.	Remarks
50	45541	6 23·0	+29 33	8·0	A2n	+43·7	b	3	W	—
	258213	6 23·9	+30 31	9·7	gK0	+15	c	4	W	SB
	45784	6 24·4	+29 53	8·06	dF2	+34·8	b	3	W	—
	46158	6 26·7	+30 23	8·0	A2n	− 9	c	4	W	SB, 2 spectra
	259274	6 27·2	+29 44	8·8	gF2	− 0·4	b	3	W	—
51	58746	7 21·9	+29 37	7·41	A8n	+11·7	b	8	DW	—
52	71594	8 23·2	+29 49	8·33	A0n	+23	c	4	W	—
	72052	8 25·7	+30 3	8·2	dF8	−24·2	b	6	LW	—
	+29°1770	8 26·2	+29 49	8·5	gF5	+10·8	b	3	W	—
	72146	8 26·2	+29 39	7·06	gG6	+ 2·1	b	3	W	—
53	81594	9 21·5	+29 41	8·86	gK3	+ 3·2	b	3	W	—
54	90441	10 21·4	+30 11	7·81	gF2	+13·3	b	4	W	—
	90717	10 23·4	+30 15	6·68	gK1	+ 2·1	b	3	W	—
	+30°2022	10 23·8	+30 12	8·5	gK0	+102·2	b	4	W	—
	91163	10 26·4	+30 14	7·81	dF8	−20·4	b	3	W	—
55	100255	11 27·1	+29 37	7·81	dF2	+13·7	b	3	W	—
	+30°2180	11 33·3	+30 19	8·1	gF8	− 6·3	b	5	W	—
56	104319	11 55·7	+29 45	8·46	dG0	+15·3	b	4	W	—
	104451	11 56·6	+30 6	8·36	gF3	−13	c	4	W	SB
	104688	11 58·2	+29 41	8·46	gK4	− 5·7	b	4	W	—
	104710	11 58·4	+30 14	7·66	gM5	− 4·2	b	3	W	—
	105182	12 1·6	+30 3	8·46	gK4	−16·7	b	4	W	—
57	113865	13 1·5	+29 34	6·44	A3n	+ 3·2	b	7	WV	—
	114172	13 3·8	+29 55	8·61	dG0	−39·7	b	4	W	—
	114401	13 5·2	+29 22	8·8	gK1	− 4·2	b	5	W	—
	114448	13 5·5	+29 59	8·6	gK0	+ 2	c	3	W	—
	114635	13 6·7	+29 24	8·8	dF7	−11	c	4	W	—
58	122442	13 56·8	+28 53	7·92	A7	− 2·3	b	3	W	—
	122992	14 0·0	+29 37	8·2	gM4	−16·6	b	3	W	—
	123409	14 2·4	+28 54	7·03	sgG6	−55·1	b	3	W	—
59	133544	15 0·0	+29 26	7·81	A2n	−18·1	b	3	W	—
	+29°2621	15 1·9	+29 23	8·0	gG6	− 8·5	b	3	W	—
	+29°2622	15 1·9	+29 48	8·5	gF0n	−25	c	5	W	—
	+30°2611	15 2·7	+30 25	8·3	dG2	−278·2	b	4	W	—
60	143393	15 55·0	+29 44	7·21	gK3	+17·8	b	4	W	—
	143586	15 56·2	+29 55	8·61	sgG9	−21·2	b	4	W	—
	143585	15 56·2	+30 23	8·7	gG5	+ 2·8	b	5	W	—
	143807	15 57·4	+30 7	4·91	A0	−20	c	7	YWV	SB
	144044	15 58·8	+30 27	8·7	gK1	+ 2·6	b	5	W	—
	144063	15 58·9	+29 14	8·7	gG4	− 6	c	4	W	—
61	153650	16 55·6	+29 42	7·76	A1	+ 3	c	5	W	SB
	154127	16 58·5	+29 26	7·51	A3n	−27·0	b	3	W	—
	+30°2925	16 58·9	+29 58	8·4	dF6	−13·1	b	4	W	—
	154227	16 59·1	+29 38	7·96	gK3	− 3·1	b	3	W	—
	+29°2933	17 0·9	+29 48	8·0	gK4	− 7	c	4	W	SB
	154651	17 1·7	+29 46	7·56	A0	−10·1	b	5	W	—
62	164136	17 54·7	+30 11	4·48	dF1	−22·2	a	36	LSDWV	—
	164253	17 55·2	+30 3	6·92	gG4	−21·3	b	7	WS	—
	164595	17 56·8	+29 34	7·16	dG1	+ 7·2	b	3	W	—
	164755	17 57·6	+30 39	7·09	gK4	−29·1	b	3	W	—

Area	No.	α 1900 h. m.	δ 1900 ° ′	*m*	*Sp*	*V*	*Q*	Pl.	Obs.	Remarks
63	176938	18 57·5	+29 23	6·64	A1n	−17·3	*b*	7	DW	—
	+30°3392	18 58·3	+30 18	8·5	A5	− 5·6	*b*	6	W	—
	177809	19 1·1	+30 35	6·39	gM2	−16	*c*	5	W	—
	178003	19 1·9	+29 46	6·62	gM0	−28·2	*b*	3	W	—
	178091 A	19 2·2	+30 17	8·2	dG5	−46·1	*b*	3	W	—
	178091 B	19 2·2	+30 17	9·7	dG7	−48	*d*	1	W	—
	*178450	19 3·6	+30 5	8·06	dG5	± 9	*c*	4	W	SB
64	189087	19 53·2	+29 33	8·2	dG7	−29·7	*b*	3	W	—
	189379	19 54·6	+29 40	7·41	A4n	− 6	*c*	4	W	SB
	189690	19 56·2	+29 38	7·26	A0n	−29	*d*	4	W	SB
	189779	19 56·6	+29 37	8·2	B2	− 5	*c*	3	W	IS −18·1*b*
	+29°3871	19 59·4	+29 40	8·5	gK4	− 9·2	*b*	3	W	—
	190360	19 59·5	+29 38	5·68	dG8	−46·2	*b*	4	WV	—
	190403	19 59·7	+29 42	6·84	gG5	−12·1	*b*	3	W	—
	+29°3875	19 59·8	+29 46	8·3	A8n	−13	*c*	4	W	—
	190513	20 0·2	+30 15	8·16	gF0	−18	*c*	4	W	—
65	+29°4283	20 57·6	+30 9	8·5	dF5	+ 4·9	*b*	4	W	—
	200390	20 58·1	+30 8	7·81	A2n	−23	*c*	4	W	—
	200631	20 59·5	+30 41	7·81	gK0	−14·5	*b*	4	W	—
	+30°4307	21 0·5	+30 31	8·3	gK0	−23·1	*b*	4	W	—
	+30°4314	21 1·6	+30 24	8·5	A0n	− 6·4	*b*	3	W	—
	+29°4307	21 1·6	+29 49	8·3	gM5	−13·8	*b*	3	W	—
	201194	21 2·9	+30 12	7·51	B3n	−19	*c*	8	DW	—
66	209206	21 56·5	+30 15	8·66	A8n	− 0·1	*b*	4	W	—
	209440	21 58·3	+30 17	8·21	A3	+ 4·5	*b*	4	W	—
	209484	21 58·7	+29 44	7·01	B9	− 6·7	*b*	15	DSW	—
	209516	21 58·9	+30 30	8·2	A1	+ 3·4	*b*	4	W	—
	209517	21 58·9	+29 33	7·39	B9n	+ 1·9	*b*	11	DW	—
	§209745	22 0·6	+29 24	8·7	dF8	−25·2	*b*	3	W	—
	209964	22 2·0	+30 5	8·71	dF3	+13·5	*b*	3	W	—
	210060	22 2·6	+29 49	7·41	gK2	− 9	*c*	3	W	—
67	217888	22 58·8	+30 32	8·1	A2	0	*d*	4	W	SB
	218043	22 59·8	+30 45	6·78	dF2	− 6·5	*b*	7	DW	—
	218199	23 1·0	+30 11	8·26	gG7	− 6·7	*b*	8	DW	—
	218301	23 1·8	+30 5	8·01	A5n	− 3	*c*	5	W	—
	218300	23 1·8	+30 29	8·4	gK0	− 4·1	*b*	3	W	—
	218454	23 3·1	+29 54	7·46	gK4	−20·3	*b*	7	DW	—
	+29°4867	23 3·4	+29 40	8·5	gK0	+ 3·6	*b*	4	W	—
	+30°4885	23 3·9	+30 19	9·0	A8	+ 1·6	*b*	4	W	—
68	1213	0 11·4	+15 17	8·24	gF0	− 4·1	*b*	3	W	—
	*1352	0 12·6	+15 47	7·44	dF5	+ 7·9	*b*	6	W	—
	1450 A	0 13·5	+15 26	8·8	dF4	+10·7	*b*	3	W	—
	1450 B	0 13·5	+15 26	9·0	dF4	+10·7	*b*	4	W	—
	1563	0 14·8	+15 42	6·77	gG8	+19·7	*b*	9	VW	—
69	8110	1 15·4	+15 11	7·53	dG6	+ 8	*c*	3	W	—
	8248	1 16·7	+15 17	7·49	dF4	+ 3·5	*b*	3	W	—
	8249	1 16·7	+14 40	8·3	dG2	+10·4	*b*	3	W	—
70	14597	2 16·4	+15 5	7·94	A0n	+36	*d*	5	W	SB
	14610	2 16·5	+15 33	8·1	dF1	−21	*c*	4	W	SB
	14887	2 19·0	+15 4	7·79	dF0	−39	*c*	5	W	SB
71	20086	3 8·6	+15 12	7·34	A3n	+17	*c*	5	W	—
	*20512	3 12·9	+14 49	7·69	dG4	+10·9	*b*	3	W	—

https://doi.org/10.1017/S0251107X00032557 Published online by Cambridge University Press

Area	No.	α 1900 h. m.	δ 1900 ° ′	m	Sp	V	Q	Pl.	Obs.	Remarks
72	26380	4 5·2	+15 42	7·17	A1n	+10·5	*b*	3	W	—
	26911	4 10·1	+15 9	6·35	dF3	+36·9	*b*	14	DSW	—
	+15°604	4 10·2	+15 34	9·2	gK0	+55·9	*b*	3	W	—
	27371	4 14·1	+15 23	3·86	gG9	+38·5	*a*	29	VLWB	—
	27459	4 14·9	+14 52	5·27	A8n	+36·2	*b*	20	VYW	—
73	34636	5 13·9	+15 41	7·9	A2n	− 7	*c*	4	W	—
	34792	5 14·9	+14 57	8·24	B9n	+18	*c*	4	W	—
	34811	5 15·0	+15 32	7·7	A5n	+29	*d*	4	W	SB
74	44033	6 14·4	+14 41	6·02	gM0	+33·3	*b*	9	DW	—
	44415	6 16·6	+14 44	8·3	cF2–G0	+42·0	*b*	13	W	RS Ori
	44414	6 16·6	+14 55	8·44	gG0	+19·3	*b*	3	W	—
75	56714	7 13·1	+14 32	7·7	B9	+31	*d*	4	W	SB
	56888	7 13·8	+15 22	8·3	A8	+ 5·3	*b*	3	W	—
	57049	7 14·5	+15 21	6·47	A0	+13	*c*	12	DVW	—
	+15°1544	7 15·0	+15 5	9·0	gG9	−41·7	*b*	3	W	—
	57496	7 16·4	+14 49	8·64	gG2	+25·8	*b*	3	W	—
	57675	7 17·2	+14 28	8·3	gF4	+32·1	*b*	3	W	—
76	69809	8 13·6	+14 30	8·2	dG0	+17·1	*b*	3	W	—
	70319	8 16·2	+14 39	7·89	gK0	+72·6	*b*	3	W	—
	70421	8 16·8	+15 19	8·5–9·2	gM6	+ 3·9	*b*	7	W	Z Cnc
	70594	8 17·7	+15 37	8·4	A2	−16·1	*b*	3	W	—
77	§79096	9 6·9	+15 24	6·40	dG7	+45·4	*b*	4	W	—
	79319	9 8·3	+14 37	8·9	R6	+ 4	*b*	4	MiW	—
	§79554	9 9·7	+15 22	5·57	gK1	+25·6	*b*	8	DW	—
	79726	9 10·6	+14 33	8·3	dG1	−44·9	*b*	3	W	—
78	89396	10 13·9	+15 10	8·5	gK5	+53·7	*b*	3	W	—
	89774	10 16·5	+15 29	6·10	B9	+ 8·7	*b*	11	VW	—
79	*98354	11 13·7	+14 49	6·65	dF7	+24·8	*b*	10	DW	—
	§+15°2325	11 17·2	+15 0	9·4	dK0	+20	*c*	4	W	—
	98883	11 17·7	+14 52	8·34	gK1	−30·3	*b*	3	W	—
	99088	11 19·1	+14 27	8·1	dF7	+22·0	*b*	3	W	—
80	106661	12 10·9	+15 28	5·08	A2n	+10·1	*b*	33	YAWV	—
	106888	12 12·5	+15 0	8·1	dF8	0	*c*	3	W	—
	106949	12 12·8	+15 35	8·3	dF6	+ 7·8	*b*	3	W	—
	107170	12 14·3	+15 7	6·68	gG9	+25·4	*b*	3	W	—
	107288	12 15·0	+14 25	6·94	gK0	+ 8·7	*b*	3	W	—
81	115478	13 12·3	+14 12	5·45	gK5	−25·5	*a*	8	LW	—
	115539	13 12·7	+14 18	7·29	gG4	− 8·4	*b*	3	W	—
82	125180	14 12·7	+15 44	6·05	gM3	−10·4	*b*	8	VW	—
	125504	14 14·7	+15 23	8·1	gK5	−18·9	*b*	4	W	—
83	135264A	15 9·1	+14 50	8·44	dF6	+29·5	*b*	4	W	—
	135264B	15 9·1	+14 50	9·2	dF8	+28·6	*b*	4	W	—
84	145743	16 7·5	+14 48	8·7	gG9	−47·3	*b*	4	W	—
	145772	16 7·6	+14 49	8·1	gK4	+34·7	*b*	4	W	—
85	155967	17 9·7	+14 42	8·1	dF2	−15·8	*b*	6	LW	—
	§156014	17 10·1	+14 30	3·48	gM5	−32·5	*a*	44	LBCWVS	—
	§156015	17 10·1	+14 30	5·39	dF8	−36·7	*a*	28	W	—
	156144	17 10·8	+15 2	8·29	gG7	−17	*c*	4	W	—
	156342	17 11·9	+14 47	8·0	dG0	−62·9	*b*	5	W	—
	156431	17 12·5	+15 24	8·3	A4	−19	*c*	4	W	—
	156432	17 12·5	+14 48	8·44	dF7	−43	*c*	4	W	SB
	156483	17 12·7	+15 18	8·3	A0	−15·8	*b*	3	W	—

https://doi.org/10.1017/S0251107X00032557 Published online by Cambridge University Press

Area	No.	α 1900 h. m.	δ 1900 ° ′	*m*	*Sp*	*V*	*Q*	Pl.	Obs.	Remarks
87	179785	19 8·8	+14 46	7·44	gK4	−29·7	*b*	6	WLV	—
	179786	19 8·8	+14 26	7·78	gM2	+35·3	*b*	3	W	—
	180080	19 10·0	+15 11	8·29	A0	−19·4	*b*	5	W	—
	180243	19 10·7	+14 54	7·80	A0	−27	*c*	4	W	SB
	180262	19 10·8	+14 54	5·69	gG7	−25·1	*b*	7	W	—
	231014	19 11·2	+15 2	9·0	dG6	+ 4·0	*b*	3	W	—
	231039	19 12·0	+15 10	8·9	dF4	−14·3	*b*	3	W	—
	181120	19 14·1	+15 30	7·74	A0	−22	*c*	4	W	—
88	192126	20 8·2	+15 3	8·49	gK0	− 3·6	*b*	3	W	—
	192145	20 8·3	+15 48	7·57	dF4	+ 5·2	*b*	3	W	—
	192425	20 9·7	+14 54	4·96	A2n	−23·0	*b*	15	LYWV	—
	192686	20 11·0	+15 8	8·54	A0p	−13·1	*b*	4	W	—
	192954	20 12·6	+15 33	7·34	cA2e	−18·4	*b*	20	WDSMd	—
	193097	20 13·4	+15 42	8·6	gK5	+32·2	*b*	3	W	—
89	201640	21 5·8	+14 50	8·1	gK3	+10·4	*b*	3	W	—
	201706	21 6·2	+15 2	9·19	dG0	+11·4	*b*	4	W	—
	201751	21 6·5	+15 27	8·7	gK1	−13·9	*b*	3	W	—
	202017	21 8·2	+15 10	8·09	dF7	−68·8	*b*	5	W	—
	202128	21 8·8	+15 34	6·20	A3n	−29·6	*b*	16	VSW	—
90	211286	22 11·0	+14 56	8·6	dF5	+ 5	*c*	4	W	—
	211341	22 11·3	+15 31	8·2	dF4	+ 6·9	*b*	4	W	—
	211733	22 14·1	+15 45	6·91	A3n	−27·3	*b*	12	SDW	—
	+15°4618	22 14·2	+15 26	8·8	gG6	−18·8	*b*	4	W	—
	211800	22 14·6	+15 3	7·19	gM1	− 0·5	*b*	3	W	—
	211837	22 14·9	+15 40	8·6	A8n	+13	*c*	4	W	—
	+15°4622	22 15·1	+15 19	9·0	sgK3	−21·6	*b*	3	W	—
91	219738	23 13·1	+15 4	8·2	dF8	−52·3	*b*	3	W	—
	220078	23 15·8	+14 31	7·55	A6n	−15·6	*b*	4	W	—
	*220373	23 18·1	+15 31	8·6	dG0	+ 4·6	*b*	3	W	—
92	5520	0 51·9	− 0 5	8·04	dF3	+ 9	*c*	4	W	—
	5543	0 52·1	+ 0 51	8·0	dF2	+ 0·8	*b*	3	W	—
	5544	0 52·1	− 0 12	7·71	gK0	−13·2	*b*	3	W	—
94	18145	2 49·7	− 0 28	6·70	gG6	+ 5·9	*b*	3	W	—
	18175	2 50·0	+ 0 3	7·23	gK1	−33·5	*b*	4	W	—
	18369	2 52·0	+ 0 3	6·72	A5n	− 4	*c*	4	W	—
96	+0°873	4 45·7	+ 0 24	9·2	dF8	+103·2	*b*	3	W	—
	30812	4 45·7	− 0 16	7·35	gK0	− 8·8	*b*	3	W	—
	−0°789	4 46·6	− 0 15	8·5	gK0	+30	*c*	4	W	SB
97	40446	5 53·7	+ 0 32	5·25	A1	+34	*c*	14	LVYW	SB
	40635	5 55·0	− 0 31	7·7	B9n	+31	*d*	4	W	SB, 2 spectra
98	*49933	6 45·7	− 0 25	5·83	dF2	−14·7	*b*	8	W	—
	50209	6 47·1	− 0 10	8·28	B8ne	+ 4	*d*	11	WD	IS −15*d*
	50583	6 48·8	− 0 11	7·83	B9	+22·7	*b*	5	W	—
99	65158	7 52·3	− 0 21	7·03	A2	+31·9	*b*	3	W	—
	*65277	7 52·9	− 0 32	8·3	dK5	− 4	*c*	4	W	—
	§	7 52·7	− 0 22	9·6	Ne	+25	*c*	2	W	Em −6*c*; MSB No. 32
100	*75596	8 45·8	− 0 17	8·58	dF7	+36·5	*b*	3	W	—
	76082	8 48·9	− 0 14	8·43	gK1	+58·7	*b*	4	W	—
101	85904	9 49·9	+ 0 17	8·1	gM4	+30	*c*	4	W	SB
	85990	9 50·5	− 0 39	8·1	gK0	+ 1·1	*b*	3	W	—
	86135	9 51·5	+ 0 0	8·3	gK5	− 6·9	*b*	3	W	—

Area	No.	α 1900 h. m.	δ 1900 ° ′	*m*	*Sp*	*V*	*Q*	Pl.	Obs.	Remarks
102	94808	10 51·6	− 0 37	8·1	A5	− 9·7	*b*	3	W	—
	94864	10 52·0	+ 0 14	6·87	dF4	+ 3	*c*	3	W	—
103	103341	11 48·9	− 0 29	8·5	gG7	+11·9	*b*	3	W	—
	103486	11 49·9	+ 0 0	8·3	gF2	0	*c*	4	W	SB
105	*118036	13 29·2	+ 0 12	7·36	dK1	− 2·2	*b*	3	W	—
	*118330	13 31·2	− 0 25	7·04	dF6	+17·3	*b*	4	W	—
	118526	13 32·4	+ 0 17	8·5	gF0	+14·7	*b*	4	W	—
106	129230	14 36·3	+ 0 32	8·14	gG7	+22·6	*b*	3	W	—
107	139137	15 31·4	− 0 14	6·51	dF5	−23	*c*	5	W	SB
	139308	15 32·3	− 0 33	8·1	gK1	−24·7	*b*	4	W	—
	*139590	15 33·9	+ 0 0	7·63	dF9	−27·5	*b*	3	W	—
	139840	15 35·3	− 0 35	8·3	gG9	− 4·9	*b*	3	W	—
	140122	15 36·9	+ 0 46	7·39	A7	+ 3	*c*	5	W	SB
109	161201	17 39·1	+ 0 25	8·13	dF4	−33·9	*b*	4	W	—
	161304	17 39·7	− 0 5	8·53	B9n	−11	*c*	6	W	—
110	§171978	18 32·5	− 0 24	5·80	A3	+10	*c*	7	WV	—
	172327	18 34·5	+ 0 3	8·23	gK0	−12·1	*b*	3	W	—
	172651	18 36·3	+ 0 28	7·83	gK3	+13	*c*	4	W	—
	172829	18 37·2	+ 0 3	9·08	gK5	+18·9	*b*	4	W	—
	173160	18 38·8	− 0 19	7·9	A0	−24	*c*	4	W	SB
	173371	18 39·8	− 0 29	6·80	B8n	−18·2	*b*	4	W	—
	173514	18 40·6	− 0 23	8·3	B9n	−12·4	*b*	4	W	—
111	§184700	19 30·6	− 0 26	9·1	dG2	−21·8	*b*	3	W	—
	*184768	19 30·9	− 0 7	7·9	dG4	−14·1	*b*	6	W	—
	184767	19 30·9	+ 0 2	7·13	A1	−17·6	*b*	3	W	—
	185090	19 32·4	− 0 22	7·43	A8n	+ 7·5	*b*	3	W	—
	185297	19 33·3	+ 0 7	7·38	A3n	+ 3	*c*	5	W	—
112	196758	20 34·3	+ 0 8	5·39	gG9	−42·7	*b*	7	LW	—
	197409	20 38·4	+ 0 7	8·68	A2	−19·2	*b*	4	W	—
	*197623	20 39·8	− 0 4	7·43	dG1	−71	*c*	5	W	—
113	206058	21 34·4	− 0 30	6·80	dF7	−28	*c*	6	W	SB
	206404	21 36·8	− 0 6	7·67	dF6	+17·2	*b*	3	W	—
	206660	21 38·5	+ 0 5	7·06	gG8	−29·9	*b*	3	W	—
114	215093	22 37·7	− 0 17	6·91	dF2	−16	*c*	4	W	—
	*215110	22 37·8	− 0 6	8·0	dG4	− 9·0	*b*	3	W	—
	215129	22 37·9	+ 0 41	6·90	A3	− 6	*c*	6	SW	—
115	222455	23 35·6	− 0 8	7·68	gK4	− 2·2	*b*	3	W	—
	222860	23 39·2	+ 0 10	8·03	dF8	+ 4·7	*b*	3	W	—
	223029	23 40·9	− 0 17	8·2	dF3	−32·5	*b*	4	W	—
	223096	23 41·5	− 0 1	7·35	gG7	+ 0·8	*b*	3	W	—
116	1015	0 9·4	−14 59	6·96	dF8	− 0·5	*b*	3	W	—
	1037	0 9·6	−15 22	6·89	sgG8	−29·8	*b*	3	W	—
	1051	0 9·7	−14 44	6·86	A8	− 8·5	*b*	3	W	—
	1195	0 11·2	−15 2	8·6	dF5	+22·5	*b*	3	W	—
117	7920	1 13·7	−13 56	8·1	cK2	+14·0	*b*	3	W	—
	8142	1 15·7	−14 25	7·01	gG4	+ 8·1	*b*	5	W	—
118	14284	2 13·4	−14 35	8·08	gM6	+27·6	*b*	3	W	—
	14692	2 17·1	−14 44	7·41	A8n	+ 6·0	*b*	4	W	—
119	19934	3 7·1	−15 19	7·90	gG5	+35	*c*	4	W	SB
	20268	3 10·4	−14 12	7·46	gG5	+26	*c*	3	W	—
	20622	3 14·0	−14 37	7·93	sgK2	+84·3	*b*	4	W	—

https://doi.org/10.1017/S0251107X00032557 Published online by Cambridge University Press

Area	No.	α 1900 h. m.	δ 1900 ° ′	*m*	*Sp*	*V*	*Q*	Pl.	Obs.	Remarks
120	27064	4 11·5	−15 11	8·1	gG9	− 6	*c*	4	W	—
	27325	4 13·7	−14 53	6·90	gG6	+14·9	*b*	3	W	—
	27467	4 15·0	−15 24	8·9	gF0	+22	*c*	4	W	—
121	34527	5 13·0	−15 19	6·74	A0n	+67	*d*	4	W	SB
	34796	5 14·9	−14 52	8·16	dG0	+48·5	*b*	4	W	—
	35041	5 16·7	−14 15	8·0	dG1	− 4·5	*b*	3	W	—
	35042	5 16·7	−14 39	7·21	B8	+21	*c*	4	W	SB, 2 spectra
	35307	5 18·7	−14 55	7·91	gK4	+49·8	*b*	3	W	—
122	43028	6 8·9	−15 21	6·88	gG9	− 3	*c*	3	W	—
	43670	6 12·3	−15 6	7·91	gK3	+38·7	*b*	3	W	—
	44007	6 14·2	−14 48	8·3	sdG0	+166·9	*b*	3	W	—
	44021	6 14·3	−14 59	6·28	gM1	+51·0	*b*	4	W	—
123	56617	7 12·6	−14 40	8·1	dF5	+34·2	*b*	3	W	—
	57435	7 16·1	−14 41	9·1	K2	+133	*d*	1	W	—
124	69371	8 11·6	−15 23	7·30	gK0	+27·8	*b*	3	W	—
	69530	8 12·3	−14 50	7·26	B9n	− 5·2	*b*	3	W	—
	69772	8 13·4	−14 40	8·0	B9n	+27	*c*	4	W	—
125	79752	9 10·7	−14 36	6·23	A0n	+32·4	*b*	3	W	—
	80479	9 14·9	−15 24	5·93	gK4	−29·6	*b*	4	W	—
	80719	9 16·2	−15 11	6·34	dF6	− 1	*c*	4	W	SB
126	89707	10 16·0	−14 59	7·01	dF5	+79	*c*	4	W	—
127	97635	11 9·0	−14 54	8·1	gF0n	+ 7	*c*	4	W	—
128	107149	12 14·1	−15 43	7·80	gM1	+14	*c*	4	W	—
	107642	12 17·1	−15 0	6·67	gK2	+10·3	*b*	3	W	—
129	115467	13 12·2	−15 1	6·74	gG6	+24·2	*b*	5	W	—
	116332	13 17·9	−14 53	8·6	gK5	+30·1	*b*	4	W	—
130	123934	14 5·4	−15 50	5·10	gM3	+17·5	*a*	15	LCW	—
131	136406	15 15·4	−15 1	7·50	gG9	−20·3	*b*	4	W	—
	136407	15 15·4	−15 12	6·11	A8n	+ 5	*c*	5	W	—
132	§145777	16 7·6	−14 57	10·7	R5	+15	*c*	3	W	—
	146254	16 10·2	−14 36	6·10	A0n	− 8	*c*	5	W	—
	146543	16 11·7	−15 5	7·41	A8n	+ 6	*c*	5	W	SB
	146850	16 13·3	−14 38	6·06	gK4	−42	*d*	3	W	SB
133	156115	17 10·6	−15 6	6·75	gM0	− 8·2	*b*	3	W	—
	156461	17 12·6	−15 41	7·18	sgG3	+20·0	*b*	3	W	—
134	167246	18 9·2	−15 25	7·30	gK1	−17·5	*b*	4	W	—
	167838	18 11·9	−15 28	6·64	B4	− 5·5	*b*	14	LW	IS −11·4*b*
135	180928	19 13·3	−15 42	6·28	gK4	−17·8	*b*	6	W	—
	181058	19 13·8	−14 20	8·3	gG6	+33·9	*b*	3	W	—
136	192031	20 7·7	−15 43	8·6	dG8	+22·6	*b*	3	W	—
	192700	20 11·1	−15 29	7·76	gK2	−21·3	*b*	3	W	—
	193102	20 13·4	−14 36	7·41	gK0	−47·8	*b*	3	W	—
137	201707	21 6·2	−14 53	6·44	gF0n	−39·2	*b*	3	W	—
	202495	21 11·1	−15 14	8·0	A1n	− 9	*c*	4	W	—
138	210705	22 7·1	−14 42	6·17	dF1	+15·2	*b*	3	W	—
	211234	22 10·6	−14 56	8·05	gK3	−20	*c*	4	W	SB
	211380	22 11·5	−15 10	7·09	dF8	+19·1	*b*	3	W	—
139	219364	23 10·1	−14 33	7·56	dG9	+ 9·0	*b*	3	W	—
	219617	23 12·0	−14 21	8·3	sdA8p	+ 8·0	*b*	8	W	—
	219702	23 12·8	−14 20	6·82	gK2	− 8·6	*b*	6	WL	—

32. SUPPLEMENT TO THE REPORT OF THE COMMISSION

The following publications were not yet inserted in the Draft Report of Commission 32:

The photo-electric colours and magnitudes of 102 stars in Selected Areas 57, 61 and 68 have been published by Joel Stebbins, A. E. Whitford and H. L. Johnson, in *Ap. J* **112**, 469, 1950.

Red and infra-red magnitudes have been determined by G. E. Kron and J. Lynn Smith in the Selected Areas 51, 57, 61, 64, 68 and 71. *Ap. J.* **113**, 324, 1950.

The colour indices of 8848 stars determined by Dr G. A. Tikhov have been published in *Publications de l'Observatoire Central à Poulkovo*, **66**, 1951.

The investigation by Mr Elvius has been published in *Stockholms Observatoriums Annaler*, **16**, nos. 4 and 5, 1951.

The colour indices of 14,000 stars determined at the Abastumani Astrophysical Observatory (see [16]) have been reduced to the international system and the dependence of the colour excesses on the distance will be published by E. K. Kharadze in *Bulletin of the Abastumani Astrophysical Observatory*, no. 12.

Report of the Joint Meeting of Commissions 32 *and* 33

PRESIDENT: Prof. J H. OORT.

SECRETARY: Prof. A. VAN HOOF.

The meeting was held on Friday, 5 September, at 10.30 a.m.

The Chairman expressed the regret, on behalf of the Commission, of the loss of its member Prof. von der Pahlen, and welcomed the new members. He also expressed his regret that Prof. van Rhijn, President of Commission 32, was not present and he asked to be authorized to transmit to him the best wishes of the Commission; this authorization was given.

The Chairman then opened the discussion on the Report of Commission 32 as it appears in the Draft Reports.

The Commission welcomed the undertaking of an atlas of the Selected Areas of the Systematic Plan at the Observatoire du Houga and authorized the Chairman to communicate on this point with M. de Vaucouleurs.

Dr Edmondson informed the Commission that he was planning to observe another hundred K o stars in the S.A. at $\delta = -45°$ with a view to determining their radial velocities and their luminosity criteria. This was in addition to the 681 stars already observed.

Prof. Gratton mentioned that the Cordoba Observatory plans to measure radial velocities for stars with $m < 8{\cdot}0$ in the southern S.A.

The Chairman announced that proper motions had been computed at the Leiden Observatory from a combination of the Radcliffe and Poulkovo Catalogues. The accuracy was $1\frac{1}{2}$ times that of each Catalogue. Publication of these data is not planned for the present at Leiden.

Dr Kharadze presented the following addendum to the Report of Commission 32: The number of stars in Kapteyn Selected Areas, for which the spectral parallaxes have already been determined in the Abastumani Astrophysical Observatory, reaches 250 for types B–A, and exceeds 400 for types G–K. The determinations are being conducted by N. B. Kalandadze and R. A. Bartaya.

On behalf of the Soviet delegation Dr Kharadze made the following recommendation: It seems to be necessary to aim at greater regularity and systematization in the stellar parallax determinations. It is desirable to extend the systematic work of determining the spectral parallaxes of stars, using spectra of small dispersion in Kapteyn Selected Areas. At the same time it seems to be rational to attack first the stars of type B, as the knowledge of absolute magnitudes for these stars might permit a better application of the colour data from the point of view of investigations of light absorption.

Dr F. Becker wants to know whether the Commission judged that it would be useful if the Küstner plates ($f=5$ m., $m_{lim}=13{\cdot}5$), in possession of the Bonn Observatory, were repeated. Dr Heckmann believes that the probable error to be expected would be about $\pm 0''.007$ against $\pm 0''.003$ for the Poulkovo-Radcliffe proper motions, he would like to know Prof. Oort's opinion about the desirability of the undertaking suggested by Dr Becker.

The Chairman thought the repetition certainly to be worth while, but suggested, in order to reduce the amount of work involved, limiting the repetition to the S.A. at low galactic latitudes, where the need for better accuracy is more urgent. Dr H. L. Alden inquired whether the magnitude error could be eliminated from the Küstner plates. Dr F. Becker was unable to give this information, the plates having not then been measured.

Dr Fehrenbach read the following account of the determination of radial velocities by means of the objective prism at the Observatories of Haute Provence and Marseilles:

La mesure des vitesses radiales au prisme objectif a été continuée très activement à l'Observatoire de Haute Provence.

L'équipement actuel (prisme de 15 cm. de diamètre) a été fortement amélioré:

(*a*) le champ a été porté à $3\times4°$ (13×18 cm.) par l'adjonction d'une lame de Piazzi-Smith;
(*b*) les flexions différentielles ont été réduites par une nouvelle monture;
(*c*) l'isolement thermique a été refait.

Les nouveaux clichés sont excellents et nous avons décidé de ne pas continuer la mesure des clichés 9×12 et des premiers clichés 13×18. Une nouvelle machine à mesurer sera terminée à la fin de cette année.

Le service comprend actuellement: 3 astronomes et 2 techniciens (Haute Provence et Marseille), mais il sera étendu.

Le programme comporte la mesure de 15 champs galactiques de longitude compris entre 340° et 190° et les S.A. 8, 9, 19, 24, 40, 49, 64, 74, 87, 98, 110 et en seconde urgence S.A. 18, 23, 25, 39, 41, 50, 63.

On projette de prendre de chaque champ 3 clichés de 2×40 min. de pose et 3 clichés de 2×2^h.

Le programme des champs galactiques est très avancé:

25 clichés de 4 heures. 36 clichés de 80 min. La magnitude limite est de 10 (photographique). Le programme des S.A. est mis en route. En plus, certains des champs très riches en étoiles chaudes sont étudiés.

Une publication de la méthode de mesure des étoiles F à K et des résultats obtenus avec les premiers clichés dans Orion, paraîtra à la fin de l'année.

Equipement en préparation.

Les plans d'un appareil de 40 cm. de diamètre (Observatoire de Haute Provence), et d'un autre de 25 cm. (Observatoire de Bordeaux), sont à l'étude. Les verres des prismes en verre très transparent (fusion en creuset de platine) seront livrés à la fin de 1952.

Une monture spéciale sera mise en fabrication cette année.

Le plus grand de ces instruments aura une distance focale de 4 m. et un champ de $3\times3°$, il permettra d'atteindre la 12–13ème magnitude. On espère que cet appareil fonctionnera à la fin de 1954.

Le service de la Carte du Ciel de l'Observatoire de Paris (M. Paul Couderc) s'occupera d'une partie des mesures de clichés. Un autre service sera mis sur pied à Bordeaux (Mlle Chopinet).

Un service de mesure fonctionne déjà à Marseille (Mme Duflot).

Prof. Lindblad mentioned that spectrophotometric work had been done by Elvius at Uppsala and was being continued.

The Chairman pointed out the list of desiderata for future work, given in the Draft Report under section 11. As this would be a difficult problem to discuss in a large

https://doi.org/10.1017/S0251107X00032557 Published online by Cambridge University Press

meeting he proposed that these problems be referred to the symposium on co-ordination of galactic research, scheduled for 1953.

As there was no further discussion the report of Commission 32 was adopted without alteration.

The Chairman then invited the astronomers present to comment on the Report of Commission 33, he mentioned that he had received additional reports from the U.S.S.R. and Japan, one of which had already been dealt with in the third volume of the Draft Reports.

The Chairman read a note that he had added to the Report since it was printed, concerning Baade's populations I and II.

Only one recommendation had been proposed, by Dr Mohr (cf. section 10 of the Draft Report). The Commission considered that it was too early to decide on definite directions for the new galactic axes proposed.

Prof. Lindblad pointed to work on spectrophotometry of faint stars carried out by Ramberg. A reference to this will be inserted in the list given in section 4 of the Draft Report.

The Report was thereafter unanimously adopted.

The Chairman announced that Prof. Ambartsumian had presented him with two interesting publications: an *Atlas of Regions of the Milky Way*, photographed in Hα, by Shajn and Gase, and an *Atlas of Open Clusters*, by Markarian; he had also received a communication by Father Junkes on 'Empirical Reduction of Distributions of Spectral Type'

The Chairman informed the meeting that a Symposium on co-ordination of galactic research was planned for July 1953 and would probably be held in Groningen. An organizing committee under his chairmanship had already been appointed. This committee would be happy to receive suggestions as to subjects to be treated at this symposium.

Dr Kharadze gave the following account of some recent investigations carried out in the U.S.S.R.:

I. O. A. Melnikov has carried out extensive statistical investigations of the long-period cepheid variables for which the radial velocities and the proper motions are known (*Publications Pulkovo Observatory*, Vol. **64**, 1950).

(1) Constants of the galactic rotation and the zero point of the period-luminosity curve were determined: $A = 17{\cdot}2 \pm 0{\cdot}9$ km./sec./kparsec, $M = -0^{m}{\cdot}5$.

(2) Values of the velocity of solar motion from cepheids for groups at different distances were obtained. It appeared that the velocity increases with distance.

(3) A negative value of the K-term, increasing with distance, was obtained. A division of the part of the K-term due to physical and dynamical causes was made.

(4) Terms of galactic rotation of high orders were obtained, which appeared to be: $r^2Q_1 = -0{\cdot}8 \pm 2{\cdot}0$ km./sec. and $r^2Q_2 = -0{\cdot}2 \pm 2{\cdot}0$ km./sec.

(5) The distance of the Sun from the galactic plane was found to be $z = 31$ parsec.

(6) The zero-point of the period-luminosity curve was determined by means of different methods (for long-period cepheid variables) and appeared to be $-0^{m}{\cdot}5$.

(7) The mean value of the general and selective absorption on the international system was determined to be $a_{pq} = 1^{m}$/kparsec, $E = 0^{m}{\cdot}23$/kparsec.

(8) The law of selective absorption for different wave-lengths was studied (concerning the absorption see report for Commission 23, Draft Reports, Vol. **1**).

II. Short summary of the work by A. F. Torondjadze on stellar motions.

In connexion with his theory of the existence and dissipation of stellar associations, V. A. Ambartsumian advanced a supposition on the process, which is at present taking place, in the origin of stars in groups. General assumptions show that the motions of the young objects must possess some characteristics closely related to the conditions of their origin. From this point of view, special interest attaches to the peculiarities of stellar motions of O–B type stars, these being the chief members of O-associations. The work of A. F Torondjadze ('Peculiarities of motions of O–B type stars and an expansion of stellar associations', *C.R. Acad. Sci. U.R.S.S.* Vol. **74**, 441, 1950) is intended to clarify the possible relations between the characteristics of stellar motions and stellar genesis. From different sources the existence of a number of peculiarities in the motions of the bright O–B stars is inferred, distinguishing the given group of stars from the stars of the general galactic field. The author starts from the natural assumption that the complex of bright O–B type stars is the result of the expansion and dissipation of stellar O-associations. Taking into account that the Galaxy is a stationary system with axial symmetry and is symmetrical in relation to the galactic plane, and assuming that the stars ejected from the associations will move in nearly circular orbits, the author deduced a relation demonstrating the differential field of motion of these stars caused both by the galactic rotation and the process of expansion and dissipation of the stellar associations. A natural and single explanation of the peculiarities in the motions of the bright O–B stars: the large positive K-effect; the discrepancy between values of velocity dispersions and the velocity of the Sun; the distortion of the coefficients A and B of Oort and the longitude of the galactic centre; and the evident tendency to the formation of moving clusters, is obtained.

General parameters, which characterize the differential field of velocity of these stars, are the age T of the considered group of O–B stars and the velocity v of 'ejection' of stars from the associations. An estimate of these parameters was obtained in this work: $T \approx 30\text{–}40 \times 10^6$ years, $v \approx 10\text{–}15$ km./sec.

An account of some further work discussed by M. Kharadze has been given in an addendum to the Draft Report.