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Reports on the observation of the Stars
in the Northern Heavens up to the Ninth Magnitude
Pulkova (Fundamental Stars).

Since the last Report T. J. S. 12 S. 284 the following mention is to be made of the portion of Zone-work undertaken by the Pulkova Observatory. The provisional Catalogue of the positions in R.A. and Declination of the principal Pulkova stars determined for the place agreed upon was placed at the disposal of the Zone Committee in the spring of last year, and as the Members of the Astronomical Society are aware has been ^{was} first by Prof. Auwers for the insertion of the correction to the preliminary places of the Pulkova Principal Stars (T. J. S. 13 S. 205-213). Although the above mentioned Pulkova Catalogue determined for 1865 is not final the corrections to be made (proceeding it may be from the somewhat difficult determination of the Equinoctial Point which has been derived from Newcomb) must be so trifling that the figures obtained by Prof. Auwers from the examination of the final Pulkova positions will have to be changed in scarcely any case 0.01 sec. S and 0.1 .

Of the list furnished only a few of the observations generally appointed remain unused. For the determination of the Declinations, those up to 50° declination, also the lower Culminations have been used; For the Right Ascension this has been done up to 60° declination. The whole Right Ascension system has been made homogeneous in so far as the systematic difference which exists in varying amounts for the observer usually present, permits, also for both ^{the} methods of observation adopted, and for the different declinations, and the

whole Catalogue was reduced to the mean of both methods of observation. A comparison of the upper and lower culminations collectively made later shews also that the variable part of the systematic correction founded on the Newcomb Catalogue of Fundamental Stars amounts to not more than the hundredth part of a second in the maximum.

After the corrections adopted by Prof. Auwers for the principal stars were obtained, the Pulkova positions of the Supplemental Stars (V.J.S. Vol. 3) were computed a second time in order to make them correspond with the present list of the Pulkova principal stars. For this reason the positions contained in the second Part of ~~the~~ VII. Vol. of the Pulkova observations require to be corrected in Right Ascension only for the changed Hour correction, as the very important systematic difference between the different observers relating to the Right ascension system of the Transit Instrument had already been satisfactorily reviewed for stars near the Pole. But in Declination not only have the Equator Points to be changed but the systematic difference between the new Pulkova or Argelander A-g system and the Meridian Circle must be redetermined. Prof. Auwers has the list thus revised for the corrections to the supplementary stars which have also been published in the Vol. XIII of the V.J.S. pp. 214-219. For a few stars, a still further investigation of which seems desirable, Mr. Romberg has reduced positions from new observations with the Meridian Circle.

It only remains to mention that the computations for Right Ascension have been made by myself, those for Declination by Dr. Nyren

Pulkova ^{28 June} 10 July 1879

A. Wagner.

Kasan. (80° - 75°).

For the whole zone 80° - 75° (the last degree not included) the reduction of the observations has been made by two persons independently for greater security from errors of computation. The printing must be deferred until the completion of this check-computation. Up to the present time two degrees 78° - 80° have been completely worked, and are ready for the press; they will form the first Vol. of the Kasan Zone Observations. The apparent places of the Stars and an extract of the mean positions (for the Epoch 1875.0) for each star will also be given. For the remaining three degrees, between 78° & 75° declination all the observations have been reduced to the middle wire; the last degree (75° - 76°) excepted, all the refractions and reductions have been reckoned to the beginning of the year. The first volume will go to press in September of this year.

The observations are still going on: soon the gaps still left in the last degree (75° - 76°) will be filled up.

Kasan, June 1879.

Observer P. Ponski.

Dorpat (75° - 70°).

After careful revision the following stars-plate observations are still to be made of the zone of stars up to the 9th magnitude inclusive, from 70° - 75° North declination:

Hour. No of obs. to be made

0	4
1	18
2	141
3	152
4	158
5	33
6	76
7	14
8	15
9	10
10	0
11	2
12	0
13	0
14	26
15	22
16	108
17	92
18	42
19	0
20	0
21	0
22	0
23	7

Total 920

Far more than half of the determinations have been reduced to the beginning of the year 1875 and it was expected the publication of the results could be commenced this year; but in consequence of another change in the office of Observer at the Dorpat Observatory the printing must be delayed. Since the beginning of the zone observations at Dorpat three observers at this observatory have been called one after the other to more extended fields of usefulness from which has resulted a great loss of time in making the observations, and the final reductions have suffered various delays, but we hope to conclude the observations with the next year and to be able to present the first volume of the zone observations to the Astronomical Society at their next meeting.

Dorpat 2^d (14) August. 1879.

L. Schwarz.

Christiania (40° - 65°).

Since the last Report (in 1877), ten supplementary zones have been observed, with the exception of a few deficient stars in earlier zones, as the reduction shewed, or for nicer determination if the previous observations did not agree satisfactorily, or on account of a number of stars ~~lost~~ ^{with the East Circle} at which were observed ⁱⁿ the Lower culmination only. These ten zones include 379 observations (zone-stars 319, Comparison stars 60). The sum total of our observations reached thus far 1879 July 1. 11123, namely the Zone Stars 9523, Fundamental Stars 1600.

The number of zones is 267, of these 241 or 90 prob

Have been reduced, and for the greater part have been by means of the places of the Supplementary Stars and a few Principal Stars determined in Pulkova communicated in Vol. IX of the V. J. S. The differences being no means insignificant between these and the positions in the Vol. XIII. finally fixed upon for reduction by the Zone-Committee (averaging for the stars used by us $0^s.0496$ in Right Ascension and $0^s.356$ in Declination without ~~re-examination~~ regard to the sign) must evidently be reviewed with every precaution.

Christiania 1879 July 6.

C. Pearnley.

Gotha ($65^{\circ}55'$).

With regard to the Report on the Observatory at Gotha in the 14th No. of the Quarterly Notices p. 136 & 137 I have to communicate briefly as follows:—

The Zone observations were long since concluded with zone 651.

The reduction of the original observations as well as the redetermination of the transits and of the apparent Declinations of the stars is at the present time carried through for the following portion of the work:—

Zone 1—80: 1869 August 30 to 1870 April 7.

" 121—188: 1871 March 5 to 1871 October 5.

" 496—563: 1877 July 31 to 1878 February 18.

The insertion of the mean places for 1875.0 has also

been taken in hand, and will be ready simultaneously with the redetermination of the reductions.

Many observations are in course of reduction the repetition of which for various reasons seems desirable. These will be contained in a separate book; at present the number amounts to about 250.

So long as the Helsingfors Transit Instrument is at my disposal I see no reason for being sparing of the repetition of observations, and therefore we place all the stars which for any reason appear to be less exactly observed in the list of stars to be reexamined; these will be so far as possible observed and reduced as zone stars. The reduction to 1875.0 is made from the table of reduction for a breadth of zone from 10 degrees upward.

On the exactness of my observations I have now and then arranged ^{my} preliminary investigations by occasional computation of single stars.

I had before found the probable error of an observation in A.R. (- 3 wires) = 0.08 , in Declination = ± 0.30 , from 95 stars. Subsequently 68 stars. (Comparison stars for the Comet 1861 II. Astr. Nach. 2241) gave ± 0.069 and ± 0.33 . Of the 38 stars which occur in the Zones 130 and 131, observed at the Lower Culmination ^{in Helsingfors}, I found ± 0.156 and ± 0.24 .

Those observations made by my former assistant at Helsingfors, Dr. W. Fabricius on those evenings when I was prevented from observing, appear to be less exact in Right Ascension than mine.

The errors peculiar to the Microscope inclusive of the special errors of division (?) are derived from the determination of the value of the circumference of the screw.

I find from a number of Zones taken at random,

14 for each observer, the following values for the probable error of a declination-reading + error of the dividing-line - correction:-

Kabritius	± 0.208
Levänen	± 0.226
Wrijen	± 0.199
Donner	± 0.196

These figures as well as the probable error of the resulting declination indicate that the error of the dividing-line has been determined with exactness and also that my assistants have used great care in the reduction. The Right Ascension in general take a lower place as to exactness, except perhaps the observations at Lower Culmination taken in Gotha to which I have applied no —

I have a great desire to publish the original observations in extenso as I fully share the views on this subject expressed in the Programme for the publication of the zone observations. Whether I shall obtain the very considerable funds necessary for this purpose I cannot yet say, though I have reason to hope.

I cannot omit this opportunity of expressing my warmest thanks to Mr Oberst von Plänckner who took an active part in the work of reduction, and who assisted afterwards in the necessary revision.

Very particularly also do I feel myself indebted to the Royal Academy of Science at Berlin which made it possible by a generous donation, for me to appoint an assistant for the preparation of the catalogue.

Gotha 23 July 1879

A. Krueger.

Bonn (50°-40°)

In the two last yearly reports on the proceedings of the Bonn Observatory, the substantial progress made in the zone-work and also the changes effected in the apportionment of the work since the Meeting at Stockholm have been brought to the notice of astronomers. Hence it appears that the greater part of the stars to be observed have been nearly completed; The single observations numbering nearly 5000 yet remaining are however ^{so} unfavorably divided with reference to R.A. that ^{completion} their requires a relatively _____ greater expenditure of time than the earlier observations. While the hours 8 to 14 have been almost entirely observed, _____ the remaining observations are unusually close upon each other where before nearly throughout comparison stars were observed.

Under these circumstances the shortest possible desirable duration of an observation is extended by the necessity of two microscope readings to pretty wide limits.

In this ~~review~~ ^{weather for} and in consideration of the abnormal conditions of the ^{weather for} past year it cannot be wondered at if the gain in number of observations since the last Meeting is relatively less. In all there were observed 4840 stars, of which 775 Comparison-stars, viz 1700 zone-stars and 240 Comparison-stars by Dr Seligie and 2365 zone-stars and 535 Comparison-stars by myself.

To the statement of the reductions in the last Annual Report I can add that the zones from S^o 523, with the final places of the Fundamental Catalogue for the Comparison-stars have been computed, and that the zero-point of their earlier zones have been corrected for the corresponding corrections. On an average this correction of the zero-point keeps within a hundredth place in R.A. and the corresponding

tenk in declination, while the sometimes very large correction of the single comparison-star places apparently contribute to the closer agreement of the zero-point deduced from them with the collective amount of the zero-point. The reductions have been so far carried through that now, when the Emperor again interests himself in the work we may dare to hope for the completion within a few weeks of the observations and of their final reduction.

Bonn 2 August 1879.

Fr. Deichmüller.

Lund. ($40^{\circ}-35^{\circ}$)

After the zone $+40$ to $+35^{\circ}$ had been undertaken by the Observatory at Lund in pursuance of the resolution taken at the Meeting at Stockholm, and the Reichstag had granted the necessary funds, the observations were begun on the 10th September 1878.

It was originally intended that Dr Linsedt should undertake the superintendence of this work. On his removal to Dorpat I took charge of the work in order that no interruption might occur. My observations began on the 7th April of this year and continued until June 11 when a previously arranged pause intervened on account of a telegraphic determination of Longitude between Copenhagen & Lund.

In giving a brief account of the method employed I will remark that I had in view exclusively the plan which was introduced after I undertook the work, ^{and} which ^{not very significantly} differs ^{one} entirely from the original, ^{one} but not greatly from

Our zone numbers nearly 11000 stars which are to be observed in accordance with the programme there will then be necessary about 25000 observations. Thus far about 3000 have been made, of which 1200 were made by Linsedt, the remainder by myself. That the number of observations has not increased is explained partly by the exceedingly unfavorable weather and partly by the above-mentioned change in the observing-staff, both which circumstances occasioned a suspension of observations from the 10th of December until the 2^d of April.

Four observers take part in determining the places of the zone-stars. I sit at the telescope and observe the transit, usually over four wires, give the declination places and estimate the brightness of the stars. The passage over the wires and magnitudes of the stars, as well as remarks on the color etc, are noted down by the assistant (an Astronomical student) stated near the clock, and he gives me the seconds of the clock as well as the number of the wire at which I am to begin. The Observatory Assistant, Candidate Engström directs the telescope to the star to be observed, and reads off one microscope while the Castellan of the Observatory reads the opposite one. In this way fifty stars in every zone-hour can be observed.

The Fundamental stars are observed by myself alone, and over all the wires, and read from four microscopes.

For the determination of the Azimuth two Polar stars in declination 89° - 76° are observed on every evening when not prevented by clouds one at the upper, the other at the lower culmination.

The collimation-error is determined from time to time by one collimator in both positions of the circle. The collimator is not used to control the unchanged place of the Equator-point, as it cannot be levelled and one cannot rely upon its unchanged position for an interval of several hours. But no danger to the satisfactoriness of the observations is hereby introduced since the changes in the Equator Point as in the Constants of the Meridian circle especially occur very slowly, and during a night's observing are almost entirely null.

The reduction of the observations is more than half completed. I reduce the observations of the Fundamental stars, derive the instrumental Constants and compute the tables for reduction to 1875.0. Candidate Engström reduces the entrance on the wires of the zone-stars to the middle wire, takes the mean value of the microscope-readings and makes the interpolations in the tables for reduction to 1875.0.

Moreover we have thought it possible to secure greater accuracy in the observations than that indicated in the programme of the zone-commission. A third observation is considered requisite if the two observations of one and the same star vary more than 0.2 and 2.0 respectively.

Lund. 29 July 1879.

A. C. Dunér.

Leipzig ($15^{\circ}-10^{\circ}$ and $10^{\circ}-5^{\circ}$).

To the reports submitted two years ago, I can add that the reduction of zone $+10^{\circ}-+15^{\circ}$ is advanced so that after the final positions Anhalt-stars have been obtained the reductions can be concluded. The right ascensions are already almost all reduced, and referred to the mean Equinox of 1875.0, and there are now only the corrections on account of the changed places of the Anhalt-stars, and a small correction on account of the Struve-precession-constant which is now to be determined from the beginning (?), to be taken in hand. I had ~~had~~ the auxiliary table computed with the Bessel-constant Precession because I thought the Zone Commission had decided for this value.

The zero-points for the derivation of the declinations are also in part computed, and as I have now the requisite force at liberty as the work on the Transit of Venus approaches a conclusion I hope soon to ^{have completed} be ready for the reduction of the zone $+10^{\circ}-+15^{\circ}$ to be able to publish this zone.

The other zone undertaken from $+5^{\circ}-+10^{\circ}$ is in hand. The star-places have been copied from the Durchmusterung and so arranged that they can be directly observed from the copy. But we have waited in vain more than two months for favorable weather - it is just now changing for the better so that we have been able to begin the work. The observations will be conducted as before: The observer Dr. Weinek sits at the telescope and records after which, the star having appeared I observe the transit over three to five wires, note the declination which I repeat aloud, and Herr Seppig stands at the registering-apparatus, watches it, & takes down the figures dictated as well as any other remarks. We have begun with the hours 19-20 and hope, if the weather continues settled, to obtain about 140 stars every evening in two hours. The strips of paper on which the record is taken are also distributed

The following day, and the registered signals are read
off.

Lipzig 1879 July 31.

C. Bruhns.

Reports on the
Observation of the
Stars in the Northern
Heavens up to the 9th
Magnitude Pulkova.
(Fund. Stars)

1879phaseproj.1816.