ANNALS OF THE ROYAL OBSERVATORY, EDINBURGH. VOL. I

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649056507

Annals of the Royal Observatory, Edinburgh. Vol. I by Ralph Copeland

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

www.triestepublishing.com

RALPH COPELAND

ANNALS OF THE ROYAL OBSERVATORY, EDINBURGH. VOL. I

Trieste

ANNALS

OF THE

ROYAL OBSERVATORY, EDINBURGH.

VOL. I.

EDITED BY

RALPH COPELAND, Ph. D., F.R.S.E., F.R.A.S., ETC.,

ASTRONOMER ROYAL FOR SCOTLAND AND PROFESSOR OF ASTRONOMY IN THE UNIVERSITY OF EDINBURGH.

PUBLISHED BY AUTHORITY OF HIS MAJESTY'S GOVERNMENT.

GLASGOW:
PRINTED BY JAMES HEDDERWICK & SONS;
AND
SOLD BY OLIVER & BOYD,
BOOKSELLERS TO HIS MAJESTY FOR SCOTLAND.

1902.

Price, Eight Shillings.

CONTENTS.

PREFACE.

THIS volume, the first of the Annals of this Observatory, contains four papers contributed by members of the staff of the former Observatory of Lord Crawford at Dun Echt and of the Edinburgh Royal Observatory.

The first two papers, by Dr. L. Becker, now Professor of Astronomy in the University of Glasgow, contain the results of an endeavour to turn to account the relatively large aperture of the Dun Echt Transit Circle by determining the positions of such faint objects as nebulæ or certain small stars in the immediate neighbourhood of the Pole, which for the greater part are beyond the reach of smaller meridian instruments. The observations of nebulæ embodied in the first paper, apart from their value as a contribution to our knowledge of the positions of a selection of the more symmetrical of these bodies, afford the materials for an interesting comparison between the personal equations of different observers. The chief value of the second paper will probably eventually centre in its accurate determination of the position of the celestial pole at the epoch of the observations.

The paper by Mr. J. G. Lohse contains an account of a new double image micrometer invented by him, and of the observations made with it. The instrument consists of a small heliometer, with a Barlow lens in front, attached to the eye-end of a refracting telescope. The chief advantage of this instrument over Airy's double image micrometer will be found in the fact that the object-glass of the heliometer here intercepts a broad cylinder of parallel rays, whereas in Airy's micrometer the separation of the images takes place near the apex of a cone. This change is advantageous in two most important respects: the loss of light is much less than in the older instrument, and the value of the scale is almost absolutely uniform in all parts of the field. The actual instrument employed had only one outstanding deficiency—viz., a want of chromatic compensation. To improve the micrometer in this respect, the Barlow lens would require to be specially designed to suit the individual character of the object-glass of the telescope. The instrument permits of combining the optical grasp of a large refractor with the measuring accuracy and other advantages of the heliometer. Moreover, there seems to be no reason why the apparatus should not be adapted to a reflector, as the slight displacements of the speculum would cause no serious inconvenience.

The original observations for these three papers were made at Dun Echt, but the final reductions were completed after the whole outfit of the Dun Echt Observatory was presented to the Edinburgh Royal Observatory through the generosity of Lord Crawford.

The paper by Dr. J. Halm—"Contributions to the Theory of the Sun"—contains the main results of his theoretical researches into the causes of the periodicity of solar phenomena. Brief accounts of the chief principle upon which this new solar theory is founded have already appeared in the *Astronomische Nachrichten* and in *Nature*. The present paper deals with the application of this extremely simple principle to the explanation of some of the more prominent dynamical phenomena exhibited on the surface of the sun, and shows that several important but hitherto unsolved questions within the domain of solar physics may be satisfactorily answered from the point of view advocated in these researches. The Crawford Library of this Observatory, with its extensive collection of works and papers on the subject, afforded invaluable assistance in Dr. Halm's investigations.

RALPH COPELAND.

ROYAL OBSERVATORY,
EDINBURGH, *February* 1902.

OBSERVATIONS OF 217 NEBULÆ MADE WITH THE TRANSIT CIRCLE AT DUN ECHT OBSERVATORY.

BY L. BECKER, PH.D.,

Late Assistant at Lord Crawford's Observatory, Dunecht.

THE bulk of these observations, which I began at the suggestion of Dr. Copeland, were made between September, 1886, and May, 1889, during eight months of each year. After the closing of the Observatory in the autumn of 1889, some supplementary observations were added during one lunation in 1890, and during three others at the beginning of 1891. Altogether there are 840 observations of 217 nebulæ; 12 objects were observed once and 46 twice, thus leaving an average of 4·6 observations to each of the remaining 159 nebulæ.

During the three periods of 8 months from 1886 to 1889 there were 96 suitable nights; of these 35 nights yielded each less than 5 observations of nebulæ, 31 nights from 5 to 10, and but 3 nights more than 20. The last months of 1887 count as exceptionally bad, with only 6 observing nights up to January.

It ought to be stated that from the outset the removal of the instruments to a more favourable locality was imminent, and that for this reason some desirable alterations of the instrument were not attempted. This refers especially to the illumination of the wires, which was unsatisfactory, and to the object-glass (aperture 215 mm.), which was covered with yellowish stains.

In Table I. the single positions are collected. Those obtained in the first season, September, 1886, to April, 1887, were observed by the eye-and-ear method. There were 27 transit wires and three declination wires, two of the latter being close together at a distance of 1′ south of the third, which was the one employed. This set of transit wires was replaced in August, 1887, by a frame with only 7 wires, and 2 declination wires were removed, because the nebulæ could be seen only with the greatest difficulty within the wire system. After November, 1887, I chronographed the transits over these 7 wires. Between the two kinds of observations I find the following systematic difference, if only the positions observed on at least 2 occasions by each method are taken into account.

$$\text{II.}-\text{I.} = -\ 0^{s}{\cdot}262 \sec\delta \text{ (76 observations)} - 1''{\cdot}9 \text{ (74 observations)}$$

or excluding the very large and very faint objects:—

$$\text{II.—I.} = -\ 0^{s}{\cdot}233 \sec\delta - 1''{\cdot}8 \text{ (68 observations).}$$

The observations made from September, 1886, to April, 1887, have been corrected by the latter values before being combined with the later results. The mean values are given in the final catalogue (Table III.) which therefore refers to the system of the chronographed observations.

The accuracy of the results is represented by the following probable errors of one chronographed observation.

$\Delta\alpha\cos\delta = \pm\ 0^{s}{\cdot}15$ $\quad\Delta\delta = \pm\ 1''{\cdot}9$ for 154 nebulæ.
$\pm\ 0{\cdot}36$ $\quad\pm\ 5{\cdot}4$ for 35 nebulæ; very large or very faint objects.

A comparison of the positions resulting from my chronographed observations with those given in the more recent catalogues of nebulæ will be found in Table II. From this Table I deduce the following systematic differences and probable differences:—

	No Observations Excluded.					Very Large and Difficult Objects Excluded.				
	Systematic Difference.			Probable Difference.		Systematic Difference.			Probable Difference.	
	$\Delta\alpha\cos\delta$.	$\Delta\delta$.	No.	$\Delta\alpha\cos\delta$.	$\Delta\delta$.	$\Delta\alpha\cos\delta$.	$\Delta\delta$.	No.	$\Delta\alpha\cos\delta$.	$\Delta\delta$.
Schmidt . . . —B	$+0^{s}{\cdot}40$	$+0''{\cdot}9$	40	$\pm0^{s}{\cdot}25$	$\pm2''{\cdot}8$	$+0^{s}{\cdot}35$	$+0''{\cdot}5$	36	$\pm0^{s}{\cdot}24$	$\pm2''{\cdot}4$
d'Arrest (Leipzig) . —B	−0·02	+1·9	59	0·42	7·6	−0·01	+2·0	52	0·37	7·3
d'Arrest (Copenhagen)—B	+0·35	+3·0	172	0·69	9·4	+0·35	+2·6	138	0·73	9·4
Rümker . . —B	+0·45	+2·0	34	0·39	4·0	+0·36	+0·6	25	0·32	3·7
Schönfeld I. . . —B	−0·03	+1·6	82	0·23	2·8	+0·00	+1·0	69	0·22	1·8
Schönfeld II. . . —B	+0·26	+2·4	86	0·21	3·2	+0·28	+1·9	67	0·18	2.5
Schultz . . . —B	+0·27	+1·6	{110 / 109}	0·29	2·6	+0·27	+0·9	{88 / 87}	0·17	1·7
Auwers . . . —B	+0·41	+2·5	15	0·18	1·9	+0·35	+2·3	13	0·16	2·0
Vogel I., II. . . —B	+0·23	+1·2	63	0·21	2·5	+0·26	+0·7	54	0·19	2·2
Engelmann . . —B	+0·42	+3·1	47	0·20	2·9	+0·41	+3·1	46	0·20	2·5
Engelhardt . . —B	+0·43	+1·1	46	0·25	3·4	+0·38	+0·8	39	0·22	2·5
Porter . . . —B	+0·28	−1·5	16	0·29	3·5	+0·29	+0·4	13	0·32	2·5