Remarkable region north of θ Ophiuchi.—This is one of the most remarkable regions that I know of in the sky. It exhibits a wonderful amount of small and singularly sharp detail, such as could scarcely occur in a background of stars alone. It therefore suggests the presence of a nebulous background. See *Astrophysical Journal*, ix., for March 1899.

The Yerkes Observatory:
1911 February 15.

Bright Clock Stars—Night versus Day.

By W. G. Thackeray.

(Communicated by the Astronomer Royal.)

The question has been often asked as to what is the difference between the transit of a star observed in the daytime and the same star observed at night, and therefore whether the stars observed at the beginning and end of a twelve-hour group of clock stars are strictly comparable. There are several sources of possible error:

1. Diurnal variations in the level or azimuth.
2. Difference of magnitude equation.
3. Variation between the daylight and artificial illumination of the spider webs.
4. A faulty value of the aberration constant.

The difficulty is to find material which shall not be spread over too long a period of time, yet shall suffice to determine small quantities. The twelve stars selected for the discussion were chosen as sufficient to detect any possible error depending on R.A.; in fact, when one says chosen, it is a case of Hobson's choice, for among the limited number of stars that are available, some get few or no observations both by day and night.

The observations used extend from the year 1853 to 1906, and they have been grouped in periods (except for the first) corresponding with the Greenwich Catalogues.

The first period, 1860, depends on results spread over the years 1853–1867, which were taken from the new results depending on 12-hour groups (*M.N.*, lxxi. p. 182), and as Procyon was not used in this discussion there are no results for this period for that star. The results given under the headings of the other dates depend on the difference between the mean places given in the ledgers for the dates corresponding to the period when each star was observed by day or by night. As a general rule the observations were well within their respective zones, so that there were few cases where doubt arose as to whether they might have been observed by daylight or artificial light. The first table gives the differences of R.A. taken Night minus Day arranged in order of R.A. The second table gives the same differences arranged in order of N.P.D. The third table gives the number of observations made in the day and at night on which the quantities Night minus Day depend.

TABLE I.

Name of Star.	Approx. R.A.		Approx. N.P.D.	Night minus Day.					Mean.
	h	m		1860.	1872.	1880.	1890.	1900.	
				s	s	s	s	s	s
β Androm.	1	4	54°9		+ '019	- '013	- '008	- '027	- '011
Aldebaran	4	30	73°7	- '024	- '021	- '041	- '022	- '024	- '026
Rigel	5	10	98°3	- '060	- '038	- '035	- '021	- '047	- '040
α Orionis	5	50	82°6	- '006	- '009	- '050	- '022	- '035	- '025
Castor	7	28	57°9	+ '003	+ '048	'000	- '027	'000	+ '004
Procyon	7	34	84°5		- '003	- '037	- '017	- '028	- '020
Pollux	7	39	61°7	- '035	+ '027	- '027	- '024	- '018	- '020
Regulus	10	3	77°5	- '013	+ '012	- '015	- '032	- '028	- '015
Spica	13	20	100°6	- '036	- '012	- '016	- '012	- '027	- '020
Arcturus	14	11	70°3	- '043	- '017	- '020	- '008	- '013	- '024
α Lyrae	18	34	51°3	+ '017	- '017	- '005	- '005	- '009	- '004
α Aquilæ	19	46	81°4	- '015	- '054	- '059	- '037	- '030	- '037
Mean				- '022	- '008	- '024	- '019	- '024	- '020

TABLE II.

Name of Star.	Approx. R.A.		Approx. N.P.D.	Night minus Day.
	h	m		
				s
α Lyrae	18	34	51°3	- '004
β Androm.	1	4	54°9	- '011
Castor	7	28	57°9	+ '004
Pollux	7	39	61°7	- '020
Arcturus	14	11	70°3	- '024
Aldebaran	4	30	73°7	- '026
Regulus	10	3	77°6	- '015
α Aquilæ	19	46	81°4	- '037
α Orionis	5	50	82°6	- '025
Procyon	7	34	84°5	- '020
Rigel	5	10	98°3	- '040
Spica	13	20	100°6	- '020
Mean				- '020

TABLE III.

Number of Observations.

	1860.		1872.		1880.		1890.		1900.	
	Day.	Night.	Day.	Night.	Day.	Night.	Day.	Night.	Day.	Night.
β Androm.	...	...	38	23	44	44	104	79	65	80
Aldebaran	46	37	58	46	27	35	90	60	100	58
Rigel	38	42	43	30	34	31	58	36	74	64
α Orionis	51	28	69	20	32	25	89	43	107	63
Castor	28	8	36	21	36	33	83	40	94	51
Procyon	...	...	78	56	59	23	118	38	164	56
Pollux	53	20	82	33	62	21	114	55	163	71
Regulus	51	17	63	59	39	22	90	52	91	58
Spica	66	50	154	98	83	69	89	40	137	59
Arcturus	72	18	106	58	108	16	190	56	217	54
α Lyrae	44	23	83	118	87	103	143	118	166	83
α Aquilæ	57	22	58	53	48	37	82	93	86	113
Totals	506	265	868	615	659	459	1250	710	1464	810

Seeing the small quantity representing systematic error and the large accidental errors involved in the observations, it seems reasonable to assume that the mean difference $-0^s.020$ has been constant throughout the life of the transit circle as the average difference between a night and a day observation, though when arranged in order of N.P.D. the stars above 60° N.P.D. appear to give consistently smaller results. Any effect of variation in the level error could be but small, as the maximum change takes place about 6 o'clock.

The quantity $-0^s.020$ implies that the observations of R.A. made in the day-time are later than those made at night-time by $0^s.020$, which may be accounted for as a shift of the spider webs of the nature of a collimation error. The illumination of the wires of the transit-circle up till 1908 was regulated by an annulus, but since that date a system of central illumination has been instituted. A comparison made between the two systems of illumination, by taking two clock stars each night under the old system of illumination, has shown that the clock error derived from transits with the annular system is $0^s.022$ later than the clock error derived from transits with the new central system. As the central system is of much the same character as daylight illumination, it appears that the difference in R.A. between the stars observed in the day-time can be explained by a shift in the spider webs due to the system of the illumination.

There would thus be little or nothing left over for magnitude equation. What one would expect would be that, the action of daylight on the bright stars being to diminish their brilliancy, a transit taken by day would tend to be the same as that of a fainter star, namely later, or the R.A. would be bigger; but on the other hand the value of aberration used in the N.A. for these years is probably $0''.06$ small, and Professor Turner has pointed out (*Observatory*, vol. xxiii. pp. 70, 71), that the adoption of the N.A. star places without second differences is equivalent to taking too small an aberration value by $0''.05$. The resulting correction for aberration would be in the direction of making the daylight transits too early; if these two corrections absorb one another, it can only be that the magnitude equation of bright stars observed in the day as compared with the same stars observed at night is very small, and can have no injurious effect on 12-hour groups of clock stars.

From Table III., giving the number of observations for day and night respectively, it will be seen that nearly two-thirds of the observations of the bright stars are made by day, and therefore the places of the bright stars in the Greenwich Catalogues require on an average a correction of $-0^s.020 \times \frac{2}{3}$ or $-0^s.013$ to reduce them to the system of night observations.

*Observations of Comets made at the Royal Observatory,
Greenwich, in 1909-1910.*

(Communicated by the Astronomer Royal.)

The following positions were obtained from photographs taken with the 30-inch reflector and the astrographic 13-inch refractor at the Royal Observatory, Greenwich. The plates were measured with the astrographic micrometer. Six reference stars were, as a rule, measured with the comet, their positions being derived from the catalogues of the Astronomische Gesellschaft. As the mean places of the surrounding stars were used, the positions given are referred to the equator and equinox of 1909.0 or 1910.0, and are automatically corrected for the part of the aberration arising from the Earth's motion. They are not corrected for parallax or the part of the aberration arising from the comet's motion.

The mean places for 1909.0 or 1910.0 may be obtained by applying the corrections for parallax and Earth's aberration, and antedating for the light-time.

Log Parallax Correction = log Parallax Factor - log Δ .

Comet c 1909 (Halley).

Date and G.M.T. 1909.					R.A. 1909.0.			Log Parallax Factor.	Dec. 1909.0.			Log Parallax Factor.	Corr. for Earth's Aberration.	
													R.A.	Dec.
					h	m	s		°	'	"		s	"
Sept.	d	h	m	s	h	m	s							
	9	15	9	34	6	17	52.45	-9.514	+17	12	2.2	+0.756	-0.43	+2.3
	9	15	45	29	6	17	52.71	9.465	17	12	1.6	0.740	0.43	2.3
	19	15	23	16	6	19	4.37	9.437	17	8	10.5	0.734	0.20	2.3
	23	14	52	41	6	19	1.31	9.463	17	6	34.5	0.740	0.10	2.3
	23	15	54	16	6	19	1.10	9.329	17	6	34.0	0.717	-0.10	2.3
Oct.	6	13	18	57	6	16	10.63	9.517	17	1	33.6	0.758	+0.23	2.2
	6	13	44	0	6	16	10.25	9.485	17	1	33.2	0.747	0.23	2.2
	8	13	18	30	6	15	17.97	9.507	17	0	50.1	0.755	0.29	2.1
	8	13	53	24	6	15	17.28	9.457	17	0	49.1	0.739	0.29	2.1
	19	12	42	24	6	7	46.01	9.488	16	57	14.4	0.749	0.59	2.0
	21	14	10	12	6	5	45.67	9.269	16	56	35.9	0.712	0.64	2.0
	25	12	47	2	6	1	19.10	9.430	16	55	21.8	0.734	0.75	2.0
	25	13	6	14	6	1	18.14	9.391	16	55	21.4	0.727	0.75	2.0
Nov.	5	12	30	20	5	44	2.02	9.328	16	50	33.6	0.719	1.04	2.0
	5	12	52	36	5	44	0.10	9.258	16	50	32.8	0.713	1.04	2.0
	10	12	9	32	5	33	22.76	9.301	16	46	35.0	0.717	1.15	2.1
	10	12	32	29	5	33	20.81	9.221	16	46	36.8	0.711	1.15	2.1
	22	10	56	24	4	59	30.20	-9.274	16	25	58.3	0.718	1.36	2.7
	30	11	54	35	4	29	58.71	+7.221	15	56	11.4	0.706	1.40	3.1
Dec.	1	9	45	6	4	26	20.29	-9.283	15	51	43.0	0.724	1.40	3.2
	3	9	3	24	4	18	16.07	-9.357	+15	41	11.7	+0.733	+1.39	+3.3