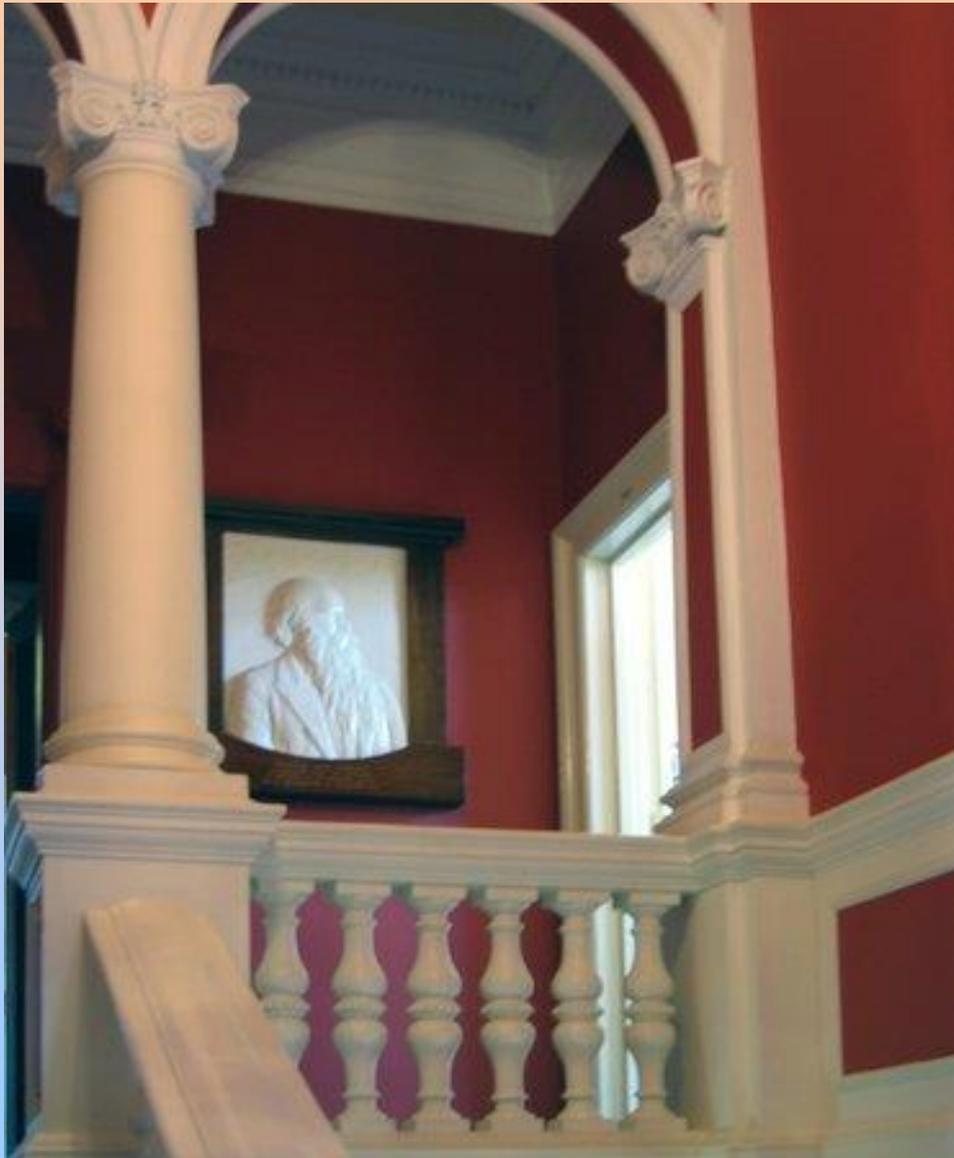


Ralph Copeland (1837-1905)



Keen traveller, skilled observer

- 1853-58 Australia: gold rush, worked on sheep farm
 - started astronomy with a small telescope
- 1858-64 Manchester: locomotive engineer,
 - set up observatory with fellow apprentice
- 1865-69 University of Göttingen, PhD
- 1869-70 Second German North Polar expedition
 - geodetic observations, measured arc up to $75^{\circ} 11'$
- 1871-74 Lord Rosse's observatory at Birr Castle
 - 1874: Mauritius – transit of Venus
- 1876-88 Lord Crawford's observatory at Dun Echt
 - 1882: Jamaica - transit of Venus
 - 1883: Puno on Lake Titicaca - site testing
 - 1887: Pogoste, Russia – solar eclipse
- 1889-1905 Royal Observatory Edinburgh
 - 1896: Vadsö, Finmark – solar eclipse
 - 1898: Ghoglee, India – solar eclipse
 - 1900: Santa Pola, Spain – solar eclipse

Ralph Copeland's family

Ralph Copeland was born on 3rd of September 1837, at Moorside Farm, Woodplumpton in Lancashire, son of Robert and Elizabeth Copeland.

Robert Copeland, grocer, of Blackburn, married Elizabeth Milner in Kirkham, 1828

Soon moved from Blackburn to Woodplumpton, Robert now a farmer.

Robert Copeland died November 1840 in his 44th year

1841 Census Woodplumpton

Elizabeth Copeland, 40, Farmer, Y [= *born in County*]

Mary do, 15, Y

Lawrence do, 5, Y

Ralph do, 3, Y

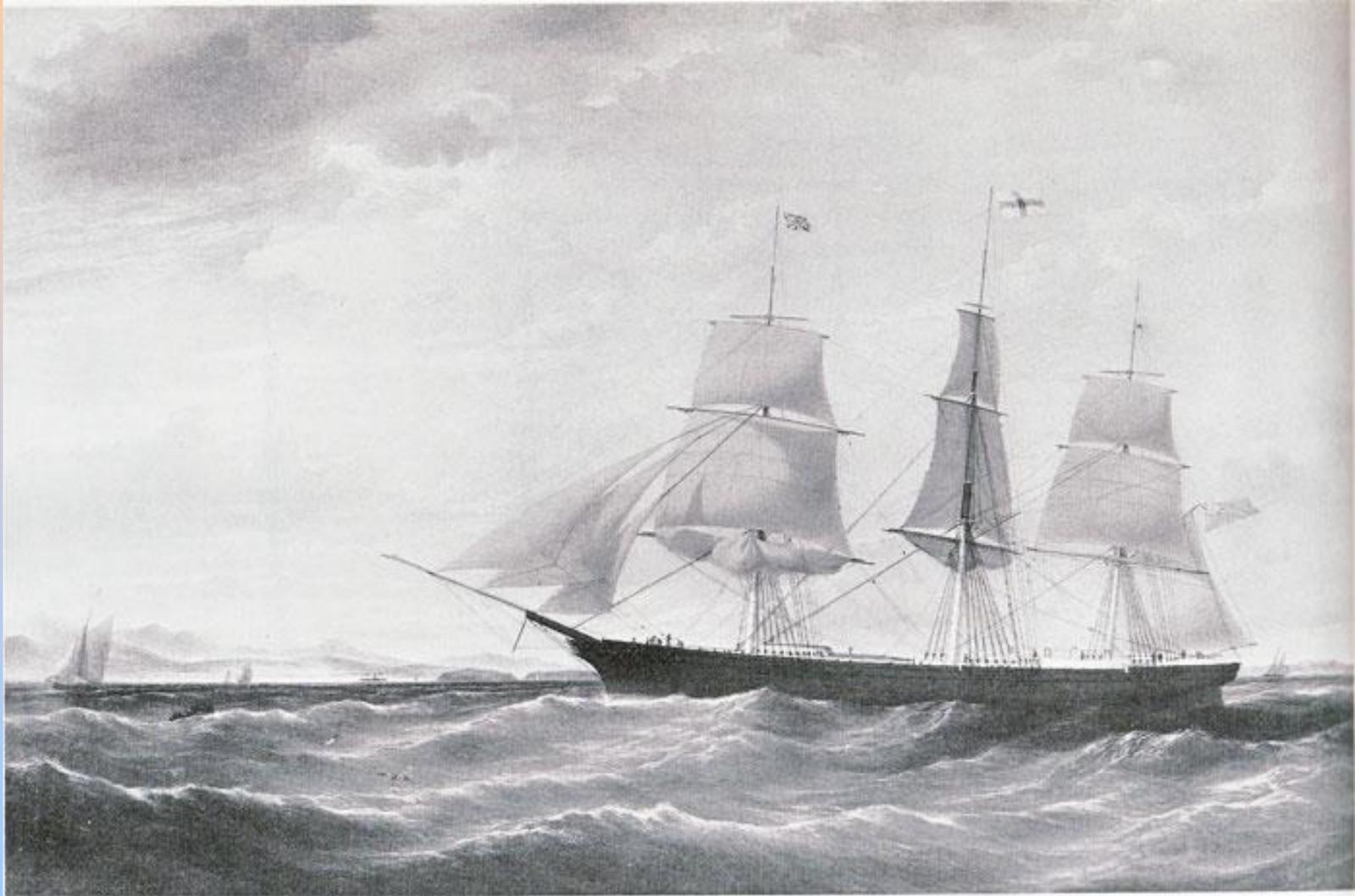
Mary Milner, 70, Ind, Y [*probably Elizabeth's mother*]

Jessie Jackson, 20, F.S. [*farm servant ?*]

Education: First instruction from handloom weaver, then age 8 to grammar school at Kirkham (obituary) - but 1851 Census: Ralph, 13, is boarding (with 2 others) with Thomas Hayes, Vicar of Bracewell, Skipton



1853 July, Liverpool: Copeland (age 18)
embarked on the Star of the East for Australia



Star of the East, length 237 ft (painting by J Heard, National Maritime Museum)

From a letter home from one of the passengers on the same voyage

"I'm sure if our ship had been worked as she ought to have been ... instead of 75 days to Melbourne, she would have done it under 60 days.

I shall never want you to step your foot on board an emigrant ship, unless in the 1st cabin, for all the places of iniquity my eyes ever beheld, an emigrant ship is the worst, men and women packed indiscriminately together, married couples and young girls, and I am sure some of the girls will have cause to remember the STAR OF THE EAST. "

Public Records Office of Victoria: Index to Unassisted Inward Passenger Lists to Victoria 1852-1923:

“COPELAND RALPH SEP 1853 STAR OF THE EAST”

Victoria Gold Rush: 1851, gold discovered at Ballarat, then Bendigo Creek. In 1851 and 1852 Charles Dickens, published in his “Household Words” a stream of useful information about the goldfields and prospects for active young Britons in Australia. In 1852 alone, 370,000 immigrants arrived in Australia. The number of new arrivals to Australia was greater than the number of convicts who had landed in the previous seventy years.

Copeland went to Omeo, ~ 250 mi. NW of Melbourne, where gold was found in 1851.



“sheeps caves” Oriental Claims, Omeo

Public Records Office of Victoria: Index to Unassisted Inward Passenger Lists to Victoria 1852-1923:

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Copeland worked in diggings for a while - terminated by a shot wound in the leg (Fanny’s autobiography). Then on a sheep farm run by “a hefty amazon called Mother Brown”, where he developed an interest in astronomy. His mother sent out a small telescope and some books.



“sheeps caves” Oriental Claims, Omeo

Copeland's Return: Outward passenger lists:

COPELAND RALPH 26 SULTANA JUN 1858 LIVERPOOL

observed Donati's comet on route

Family life:

1859 Dec 26th, Ralph Copeland of Gorton married his cousin Susannah, daughter of the Rev. Richard Milner B.A., of Gill.

1861Q1 Elizabeth Copeland was born in Gorton

1861 Census: Susannah and her daughter Elizabeth recorded as staying with her uncle, Richard Milner, and family, at Parsonage Cottages, Barnoldswick, Skipton

1864 Baptism: 24 Feb 1864 St Mark, Gorton, Lancs, John Herschel Copeland - of Ralph Copeland (Engineer) & Susanna; but the baby died late in 1864.



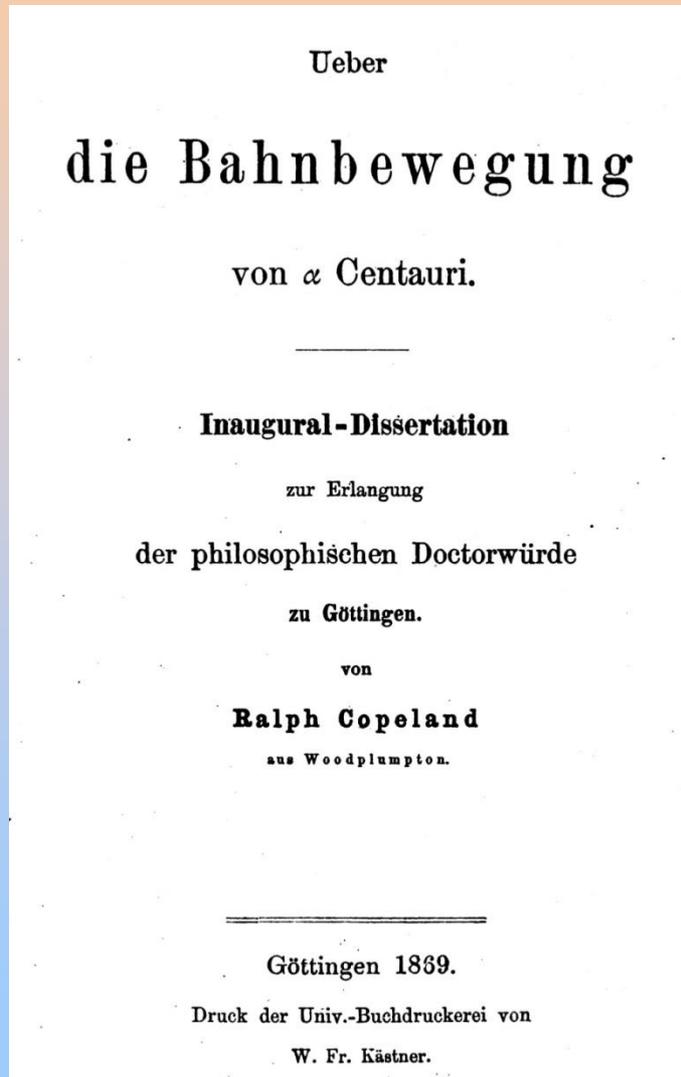
Volunteer apprentice at
Beyer-Peacock Locomotive
Engineers, Gorton, Manchester

With fellow apprentice Fred Holloway (and others?) set up an observatory with Cooke 5" telescope to continue astronomy. First published observation in 1863: lunar occultation of κ Cancri.

1865-69 at University of Göttingen



1865-69 at University of Göttingen



Family life

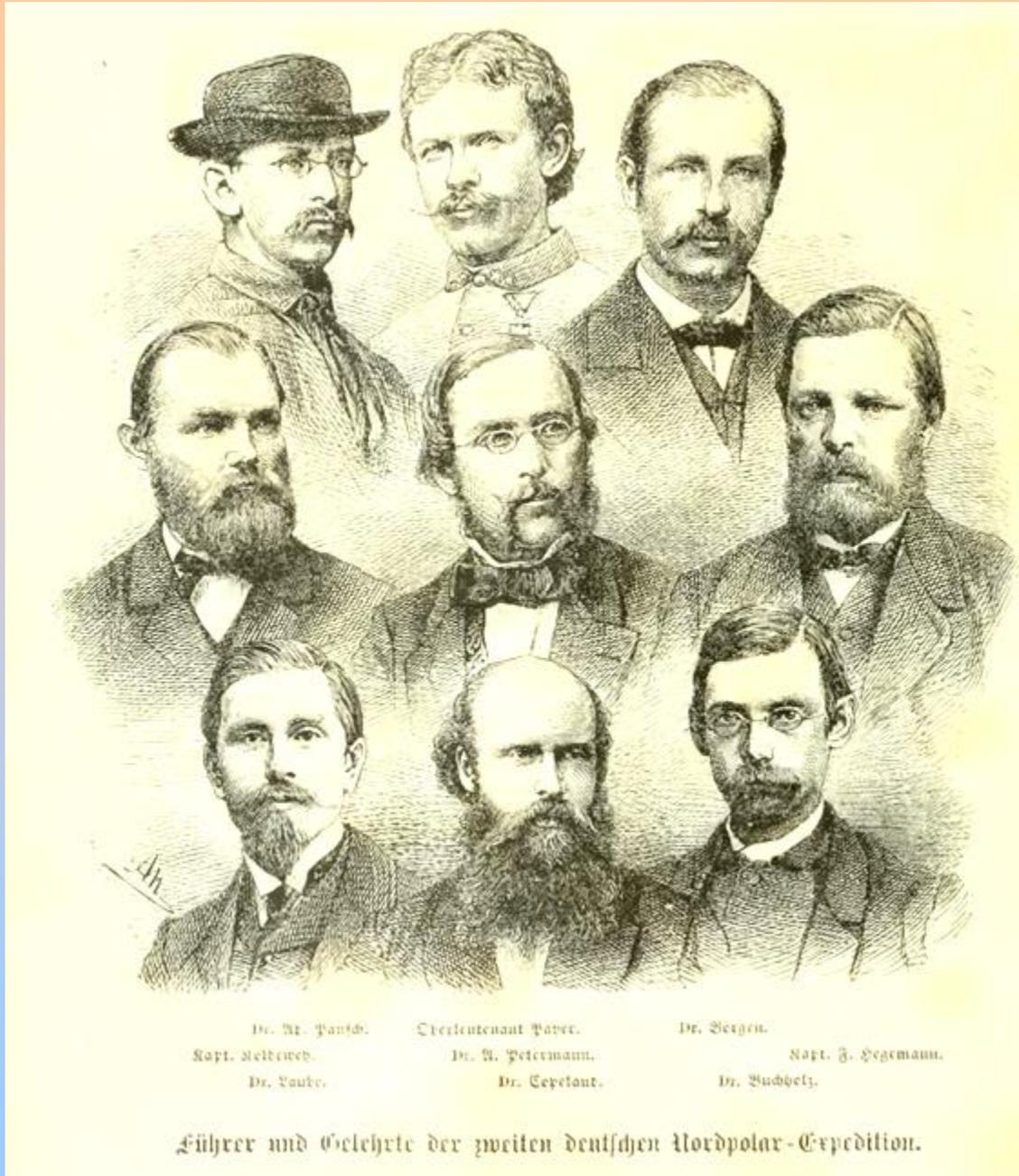
Family moved to Göttingen 1865

second son, Richard Ralph Copeland
was born on 11 July 1866;

Ralph's wife Susannah died in
November 1866.

In 1868 Copeland moved into the
observatory – who looked after his
children ? (in Göttingen, both
grandmothers were dead)

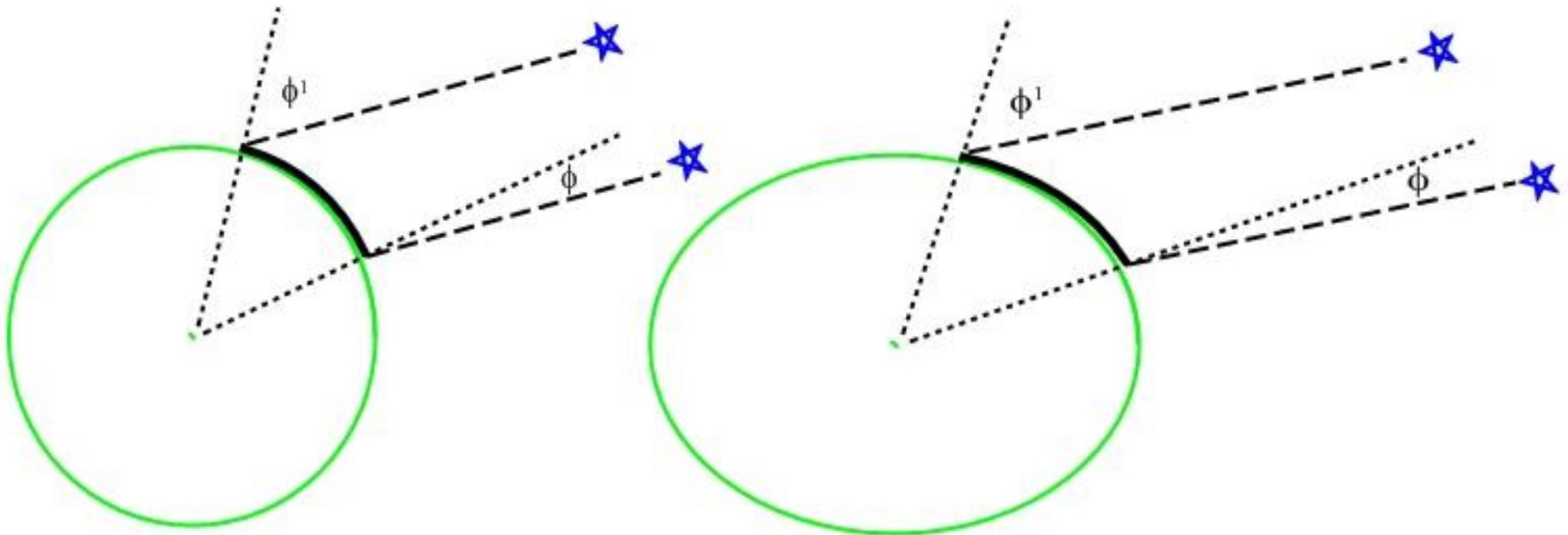
Copeland in his early 30s (middle front row)



Senior officers and scientists on the second German Polar Expedition (1869-70)

- Reconnaissance for geodetic survey; length of degree at high latitude
- Two ships: Germania, purpose built, reinforced for over-wintering in ice; and Hansa, support and stores, to return before winter
- departed 15 June 1869 to Sabine Island, East coast of Greenland latitude $75\frac{1}{2}^{\circ}$

Shape of the Earth major pre-occupation of 18-19th century astronomers

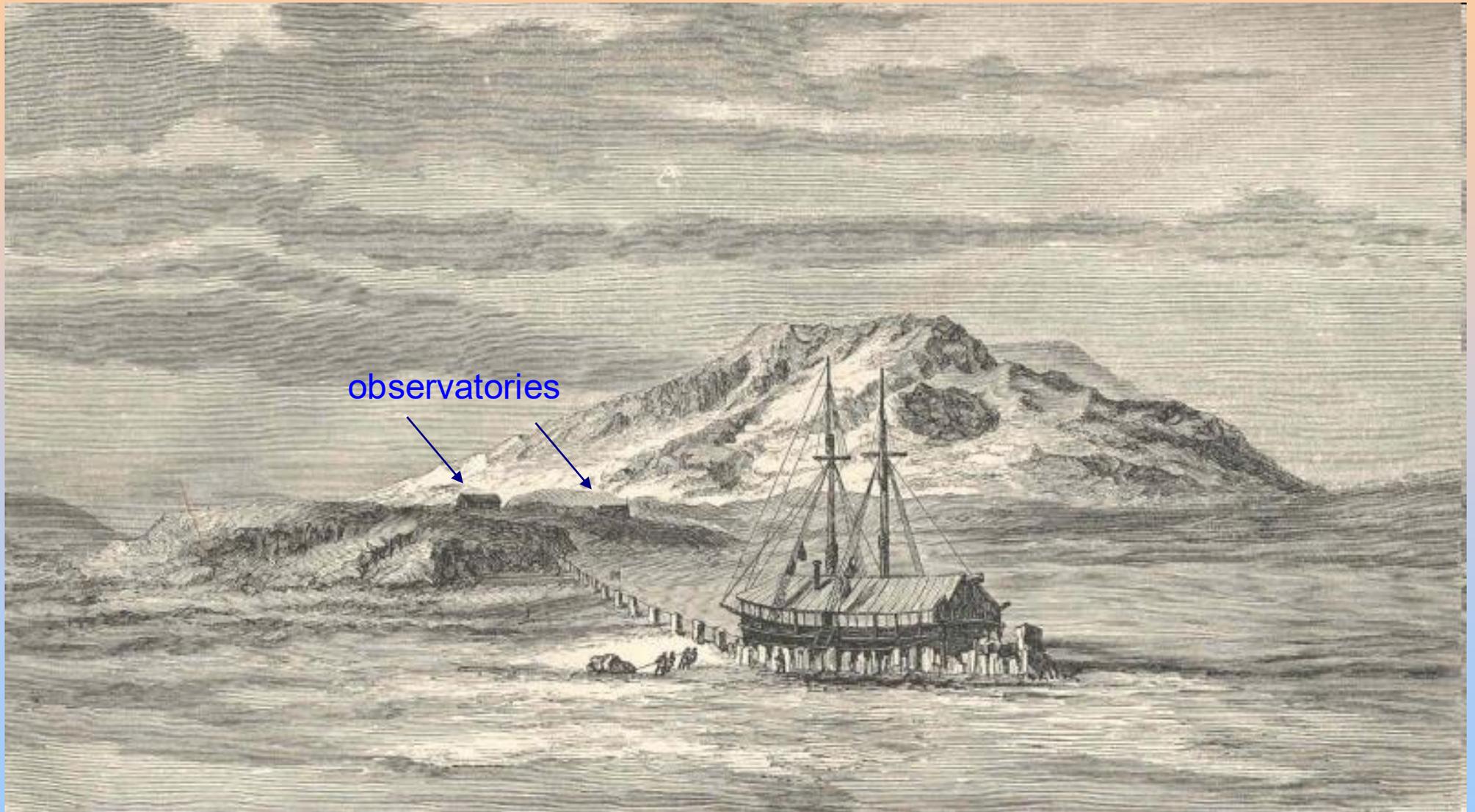


Flattened Earth, longer arc for the
same difference in latitude, $\phi^1 - \phi$

The Germania, in the ice



Germania secured for winter at Sabine Island



Sabine Island off the coast of Greenland



Greenland Sea

Svalbard

Longyearbyen

Storfjorde

Sabine
Island

Germania-Hafen

Obs

Image IBCAO
Image Landsat

Google earth

© Im
Image La
Image U.S

76°21'44.81" N 1

sledge expedition Oct 27 – Nov 4 to Clavering Island, discovery of Tiroler Fjord



London: Scamper, Low, Martin, Dow & Beale, 185. New York

Deep-snow travelling



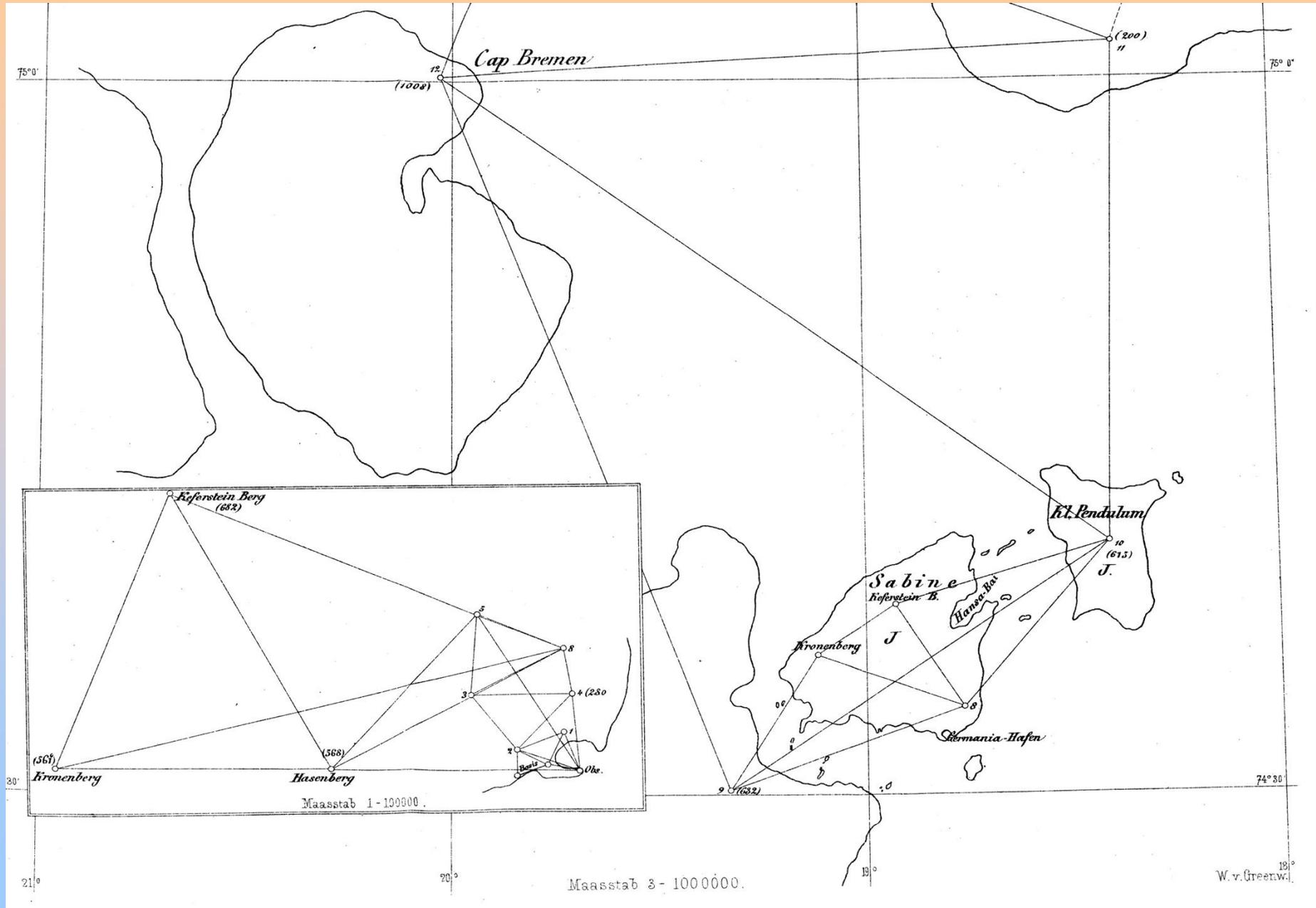


March 6: Børgen was returning to the ship after observing an occultation, when he was attacked by a bear, which started carrying him off ...

Geodetic survey (part)

Shannon Island

75°



Börgen, Vierteljahrsschrift der Astronomischen Gesellschaft VI (1871) ← 88 km →

Copeland Observatory, South Orkney Islands

named after Copeland by 1902-4 Scottish National Antarctic Expedition



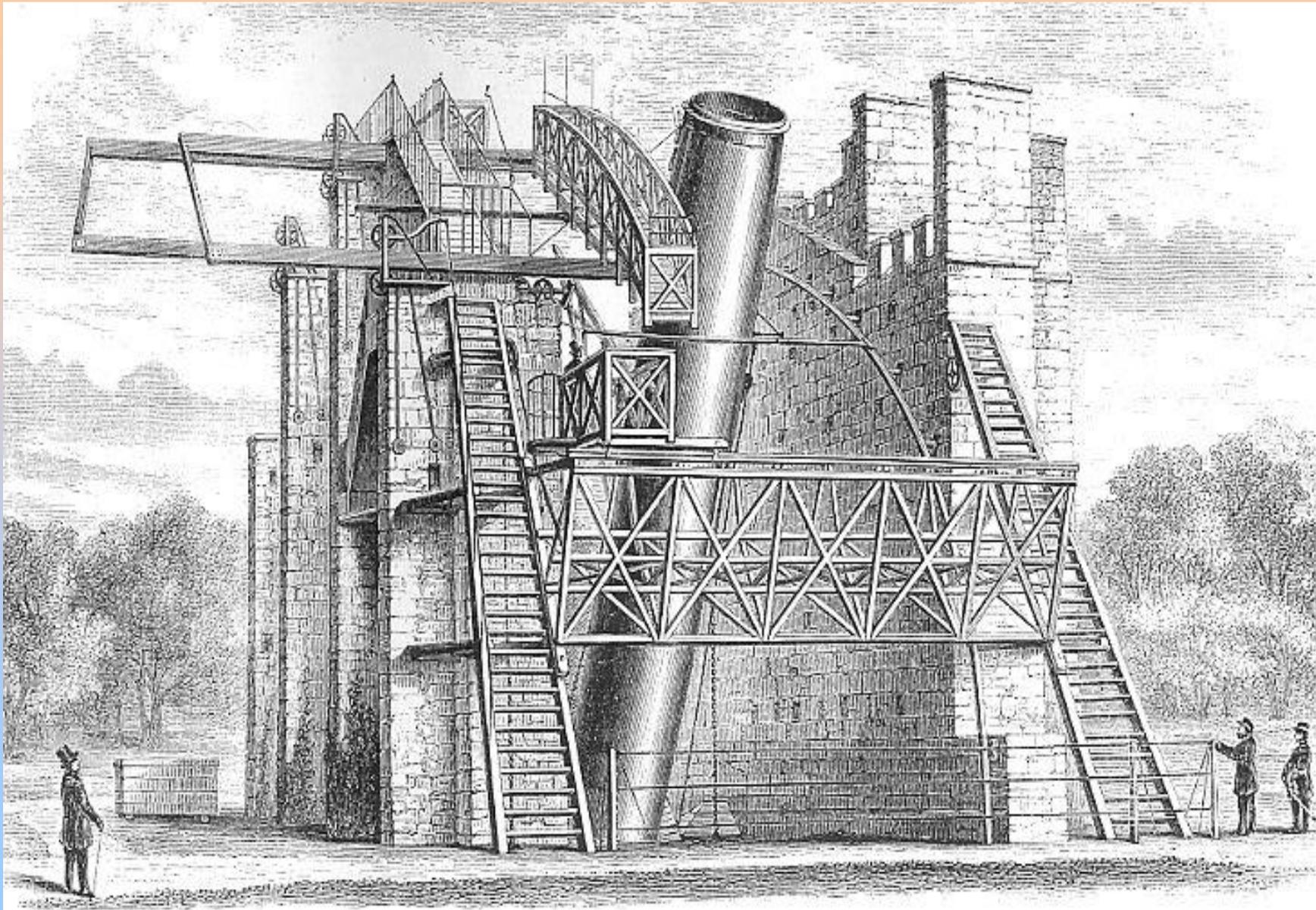
This 2.1m x 1.5m (7ft x 5ft) wooden hut was erected on Laurie Island in the South Orkney Islands ($\sim 60^\circ$ S) to house the equipment with which meteorologist Robert Mossman made his terrestrial magnetic observations during the 1902-4 Scottish National Antarctic Expedition.

1871-1874: Copeland assistant at Birr Castle

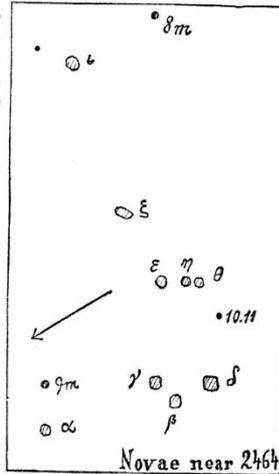


Watercolour: Henrietta Crompton

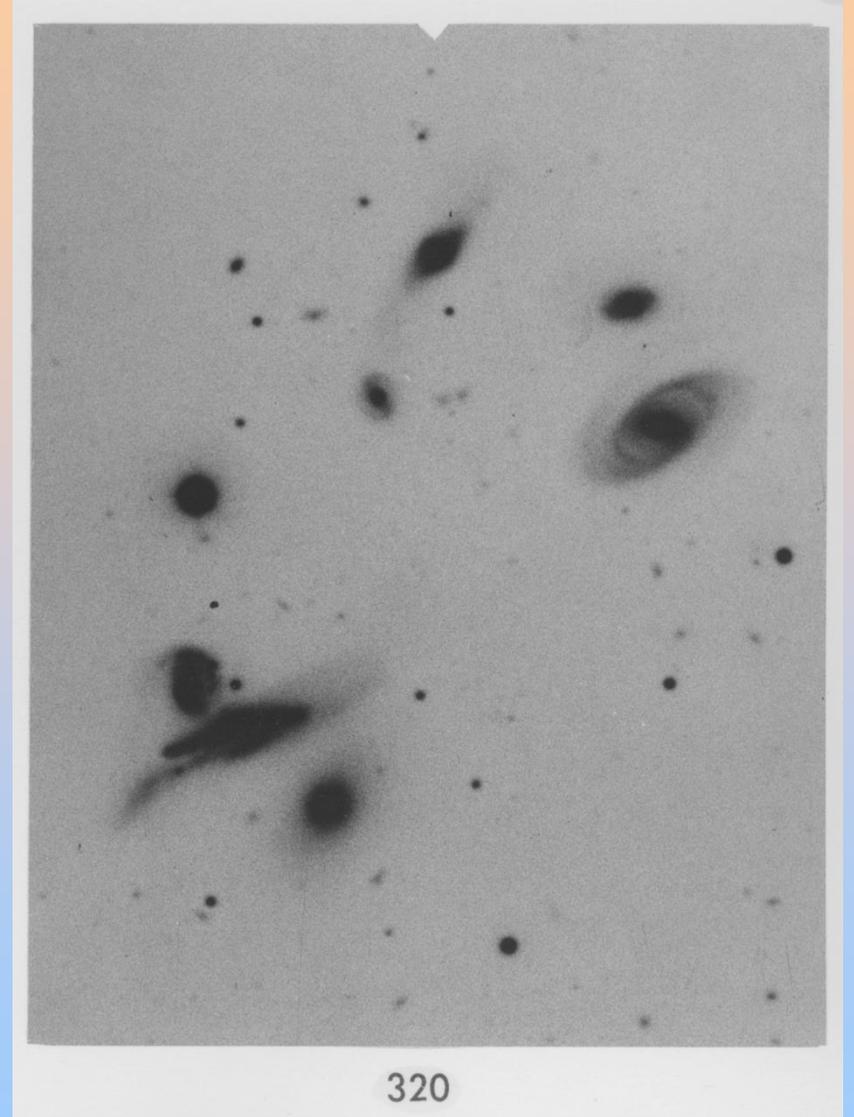
“Leviathon of Parsonstown”



G. C.	h. & H.																																																				
Novae	...	<p>1874, Feb. 9. Set for 2464. Found a neb [ε], p B, 1 b M, * in Pos. 23° 8, Dist. 109'' 3, another [η] p F, same * Pos. 5° 5, Dist. 71'' 7. Third neb p [γ], p B, e L, glb M, E 90° ±, same * in Pos. 100° 4, Dist. 148'' 4. The * has a very red * 8·9m in Pos. 153° 3, Dist. 526'' 8 [or 17° 08 f, 470'' 6 s. * 8·9m=B. D. + 22°, 2380]. None of the 3 neb have Nucl.</p> <p>1874, Mar. 18. Found a neb [ι], p B, S, R, smb M, Nucl. not stellar. * 8m Pos. 81° 6 Dist. 161'' 2 * 12m 207·4 63·0 * 9m from * 8m 303·9 671·0 [or 40° 20 p 374'' 5 n]</p> <p>Neb [α], F, S, R, from * 9m 322·5 78·1 [* 9m is=B. D. + 22°, 2377].</p> <p>1874, April 5. Group of neb measured from a * 10·11m.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Pos.</th> <th>Dist.</th> </tr> </thead> <tbody> <tr> <td>v F, R [θ]</td> <td>177° 6</td> <td>61'' 9</td> </tr> <tr> <td>p B, p L [η]</td> <td>187·8</td> <td>80·7</td> </tr> <tr> <td>p B, R, cbM [ε]</td> <td>201·5</td> <td>114·2</td> </tr> <tr> <td>F, L, E 45° + [ζ]</td> <td>182·9</td> <td>237·3</td> </tr> <tr> <td>p B, p S, R [δ]</td> <td>314·8</td> <td>116·2</td> </tr> <tr> <td>p B, p L, R [β]</td> <td>294·5</td> <td>160·7</td> </tr> <tr> <td>p B, p L, R [γ]</td> <td>278·0</td> <td>153·5</td> </tr> </tbody> </table> <p>1874, April 14. p B, S, R, cbM [ι], no stellar Nucl. Pos. Dist. * 13m 199° 7 62'' 7 * 8·5 (reddish) 80·6 162·6</p> <p>1876, Apr. 13. Group of 6 neb sketched [θ, η, ε, γ, β, δ], ε to *, Dist. 118''. [The annexed diagram has been constructed from all the measures. Adopting the place for the red * as given in the Bonn Observations, vol. 6, we find the following positions for 1860·0 :—</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td>α</td> <td>11^h 28^m 37^s·54</td> <td>67° 30' 1''·9</td> </tr> <tr> <td>β</td> <td>28 53·54</td> <td>28 21·2</td> </tr> <tr> <td>γ</td> <td>28 54·01</td> <td>29 3·7</td> </tr> <tr> <td>δ</td> <td>28 58·14</td> <td>28 5·9</td> </tr> <tr> <td>ε</td> <td>29 0·98</td> <td>31 11·0</td> </tr> <tr> <td>ζ</td> <td>29 3·35</td> <td>33 24·8</td> </tr> <tr> <td>η</td> <td>29 3·55</td> <td>30 43·6</td> </tr> <tr> <td>θ</td> <td>29 4·28</td> <td>30 29·6</td> </tr> <tr> <td>ι</td> <td>29 9·66</td> <td>37 46·2</td> </tr> </tbody> </table> <p>d'Arrest's nova=2464, 11^h 29^m 16^s, 67° 24' 12'', which he only saw once and a second time searched for in vain, has therefore not been seen. None of the above novae are included in the Suppl. to the G. C., as the * 8·9m has only a short time ago been identified by means of the * 9m 11' np]. (V. obs.)</p>		Pos.	Dist.	v F, R [θ]	177° 6	61'' 9	p B, p L [η]	187·8	80·7	p B, R, cbM [ε]	201·5	114·2	F, L, E 45° + [ζ]	182·9	237·3	p B, p S, R [δ]	314·8	116·2	p B, p L, R [β]	294·5	160·7	p B, p L, R [γ]	278·0	153·5	α	11 ^h 28 ^m 37 ^s ·54	67° 30' 1''·9	β	28 53·54	28 21·2	γ	28 54·01	29 3·7	δ	28 58·14	28 5·9	ε	29 0·98	31 11·0	ζ	29 3·35	33 24·8	η	29 3·55	30 43·6	θ	29 4·28	30 29·6	ι	29 9·66	37 46·2
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Copeland's Septet



Hickson 57: (200-inch)

1874 moved to University Observatory at Dunsink - observed with the transit circle.

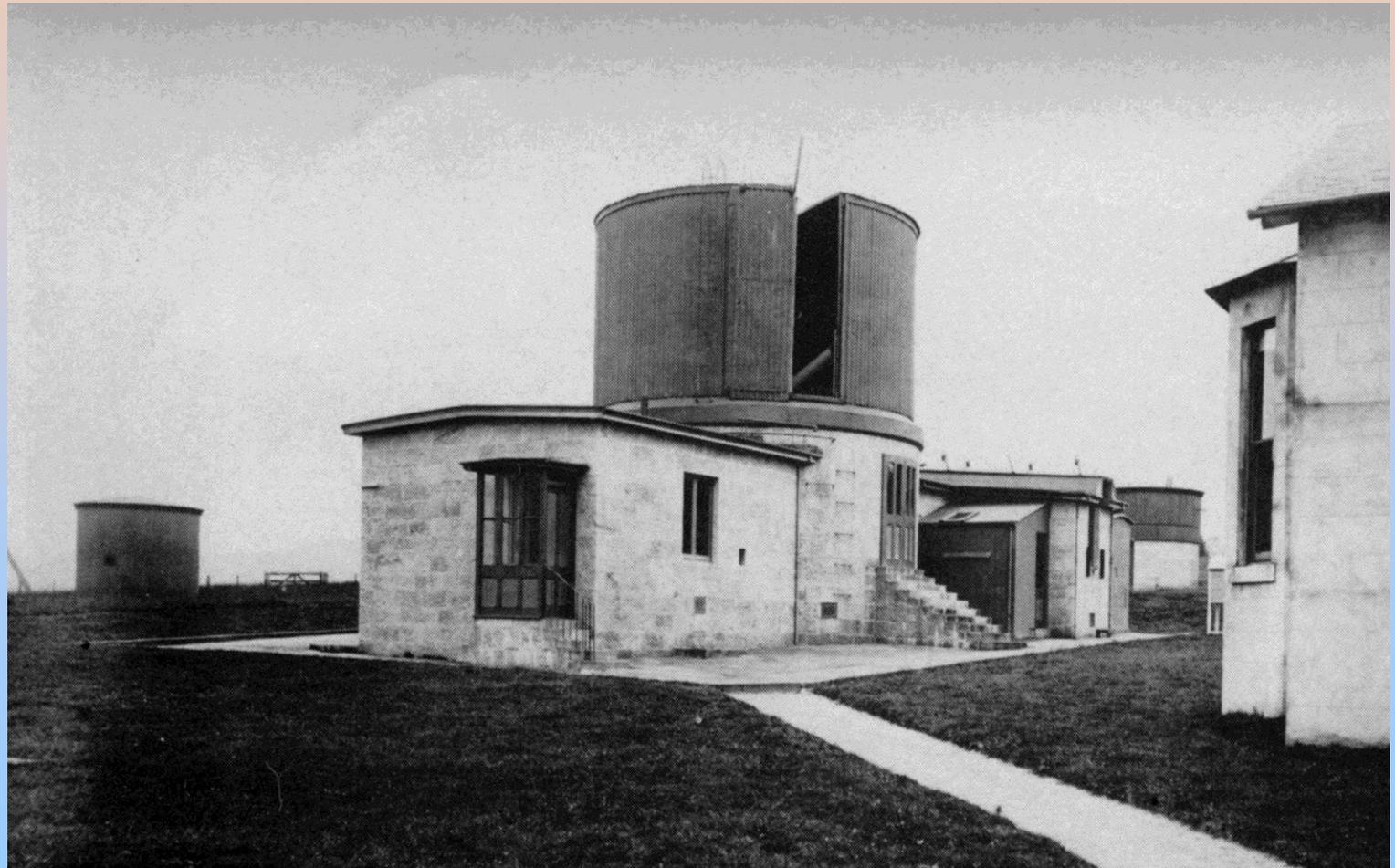
1874 accompanied Lord Lindsay to Mauritius to observe transit of Venus (December), called in at Trinidad in South Atlantic, where Copeland discovered great tree ferns, now *Cyathea Copelandii*.

1876 summer he moved to Lord Lindsay's observatory at Dun Echt



Copeland at Dun Echt Observatory 1876-89

Successful private observatory “second only to Greenwich in the United Kingdom” established and maintained by Lord Lindsay at Dun Echt, Aberdeenshire, from 1871.



Three domes,
library on the R.

COPERNICUS,

An International Journal of Astronomy.

EDITED BY

RALPH COPELAND, Ph. D.,

AND

J. L. E. DREYER, Ph. D.

VOL. III.

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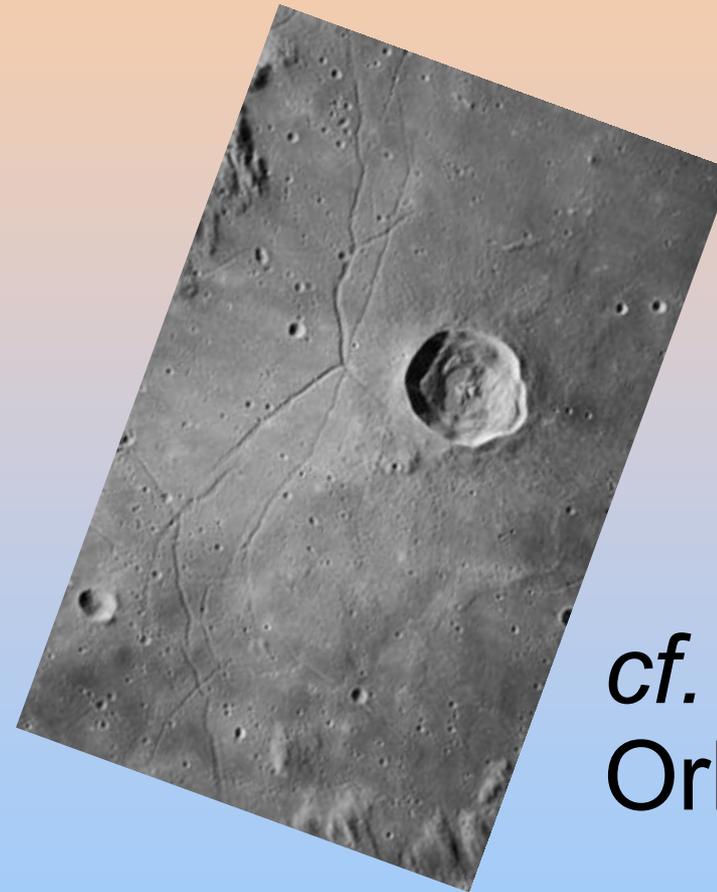
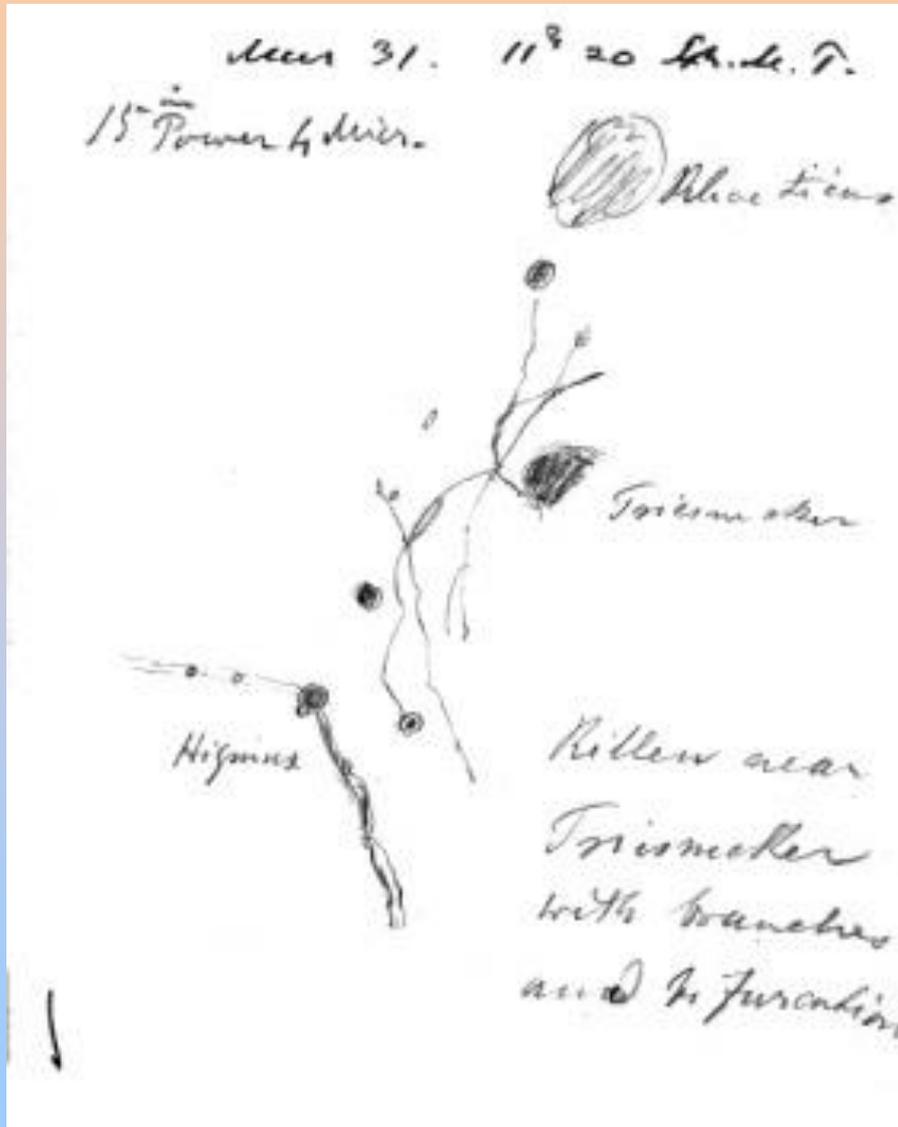
GÖTTINGEN: ROBERT PEPPMÜLLER, WEENDERSTRASSE 50.

1884.

Copeland at Dun Echt

- 1877-79 spectroscopy of Nova Cygni 1876 (Q Cyg) studying its evolution
 - 1879 spectroscopy of γ Cas
 - reduction of the Mauritius transit of Venus observations
 - observed motions and spectra of numerous comets
 - 1881 founded COPERNICUS (but not financially viable).
 - 1882 observed sodium D lines in Comet Wells – a first
 - observation of lunar features
- mostly observed with 15-inch

Dun Echt, 1877 sketched lunar features: rills near Triesnecker crater (using 15")



cf. Lunar
Orbiter 4

Copeland family in the Astronomer's House



The 1881 Census recorded at Observatory Ho Dunecht:

Ralph Copeland, Head, 43, Astronomer, Anna Bertha Theodora Copeland, Wife, 33, b. Germany

Elizabeth Copeland, Daughter, 20: Fanny Susannah Copeland, Daughter, 8,

Paula Theodora Copeland, Daughter, 4; Theodore Benfy Copeland, Son, 2

Also Henry James Carpenter, (a "computer" trained at Greenwich for analysing transit observations) and his son, and a cook and a housemaid.

Copeland's 1882-83 expedition

Observed 1882 transit of Venus from Jamaica

extended trip to test suitability of Quito (high altitude) for astronomy

Took meteorological instruments, Vogel spectroscope, 6" refractor (not equatorial mounting, too heavy for mules)

- reached Guyaquil (for Quito) - but country in revolution,

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- so continued to Mollendo, received a permit to cross the Chilean blockade.

Travel on the Cordillera Railway to Puno

Copeland described his travels in the Deutsche Geographische Blätter:

rail to Arequipa

– where railway engineers transformed a 6-inch lathe into a “very fair” equatorial mounting for his telescope

then Vincocaya (14360 ft) and Puno on Lake Titicaca

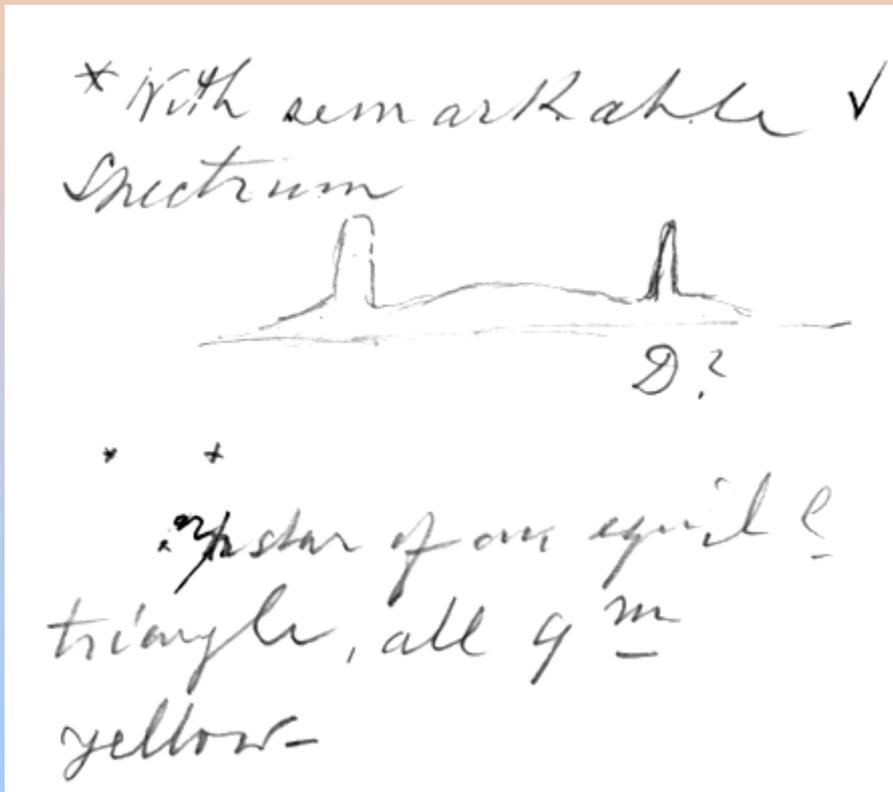


Copeland's spectroscopic observations

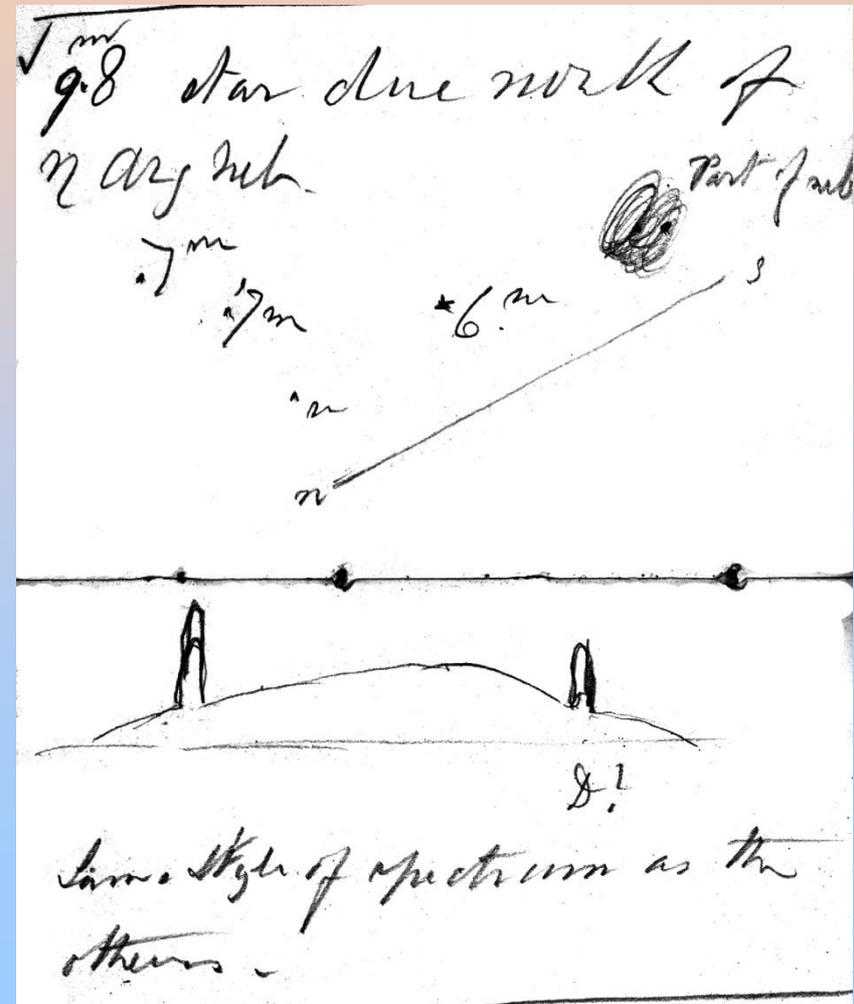
(mostly very poor weather – rain, cloud, thunder ...
meteorological and astronomical report in COPERNICUS)

- modified spectroscope so as to be able to read scale
- planned to observe η Argûs (η Car) but didn't have chart (relied on finding one in library in Quito!), could not find η Argûs with his spectroscope by its distinct spectrum
- but found γ Argûs (γ Vel) spectacular blue, yellow lines “incomparably the most brilliant and striking in the whole heavens.” (not familiar with Wolf-Rayet spectra)
- decided to undertake spectroscopic sweeps searching for more stars with similar bright-line spectra

From his 'sweeps', Copeland found another five Wolf-Rayet stars: WR 14, 23, 42, 52, 79 - also measured wavelengths of the 'bright' lines in three W-R stars getting excellent agreement with modern values



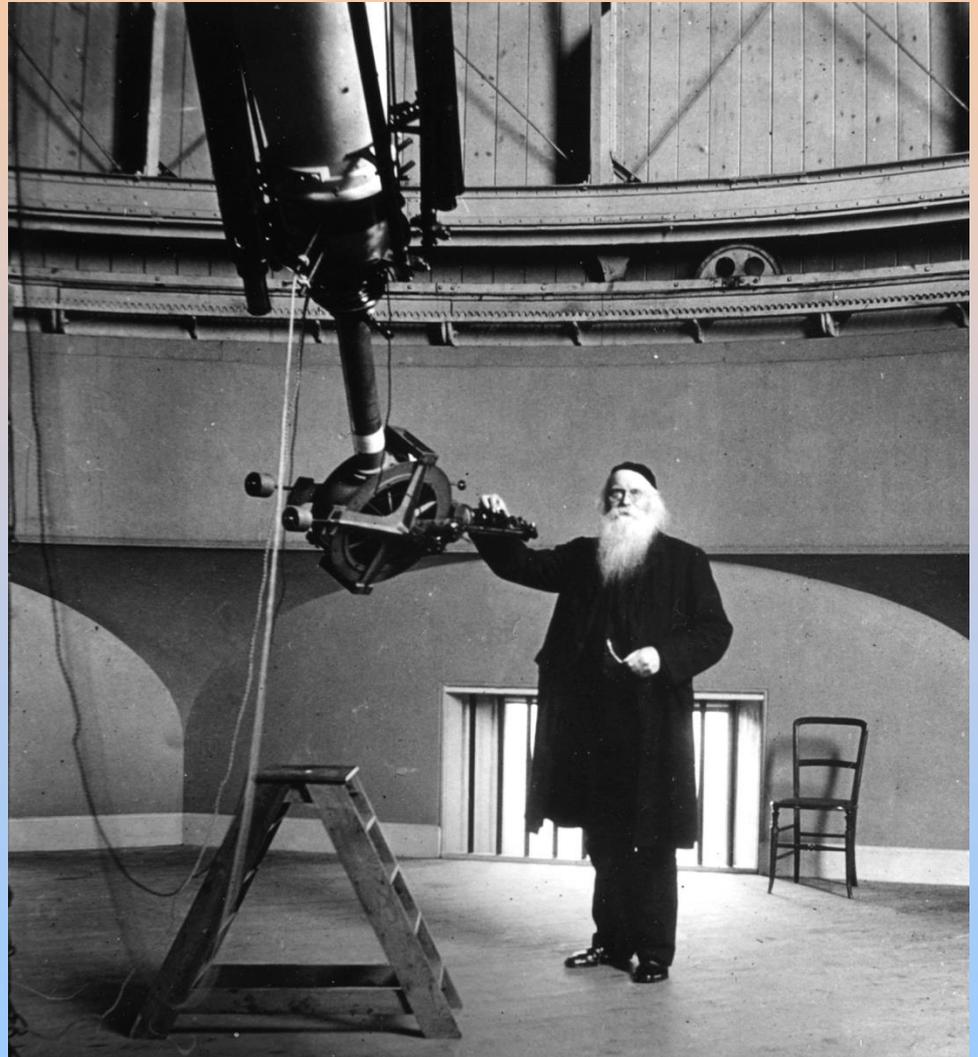
WR 52 and WR 23



In 1886 a new spectroscope (Cooke) was acquired for the 15-inch refractor at Dun Echt

Using this, Copeland observed the D_3 helium line in Orion, seen first in the Sun, then in Wolf Rayet stars (in Peru).

Copeland with the Cooke spectroscope and 15-inch refractor, after transfer to the new Royal Observatory



1888 – Lord Lindsay gifted his astronomical instruments and library at Dun Echt to form a new Royal Observatory
1889 January – Copeland became Astronomer Royal for Scotland and Regius Professor.



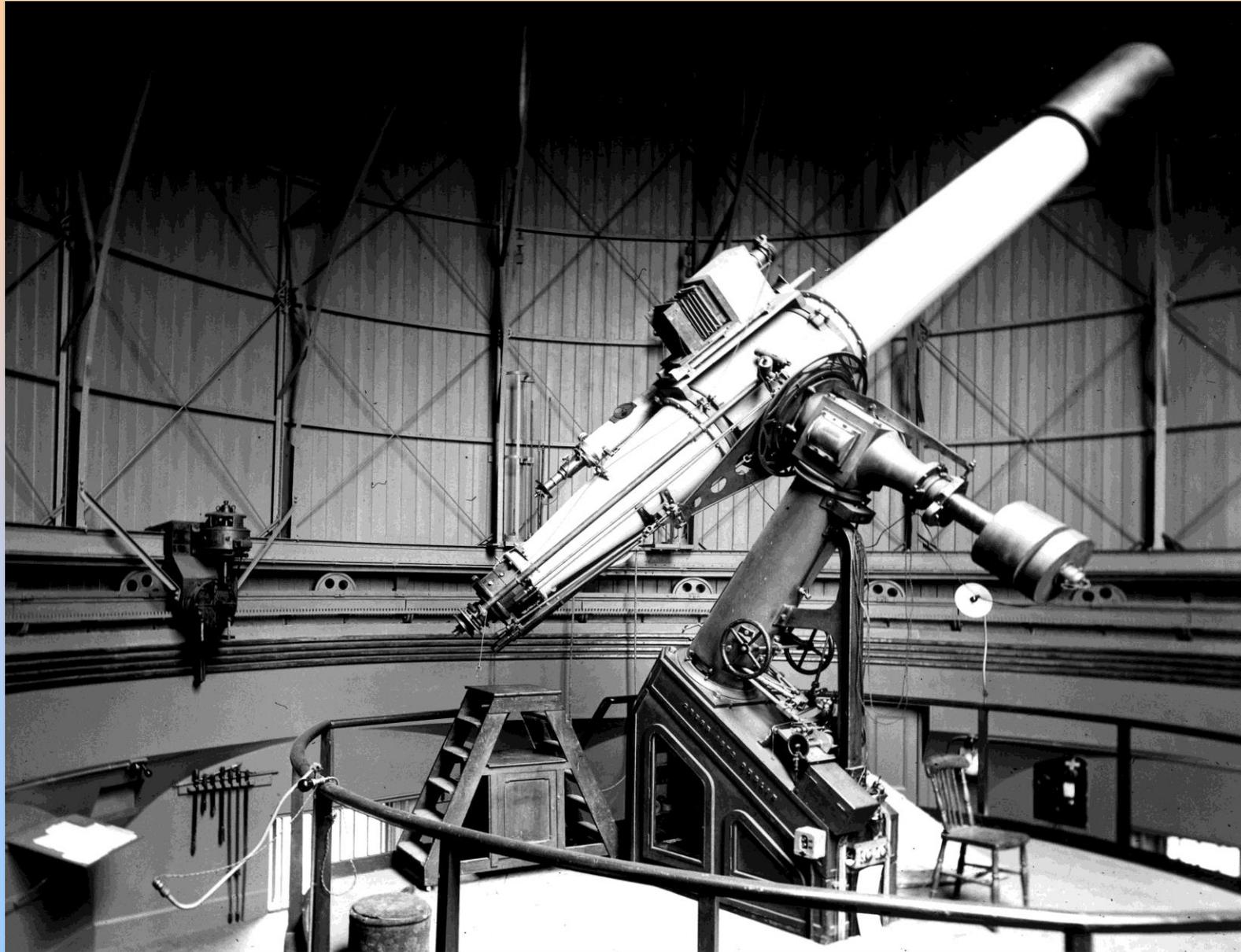
Copeland moved to Astronomer Royal's official residence at 15 Royal Terrace



1892 building of new Royal Observatory begun



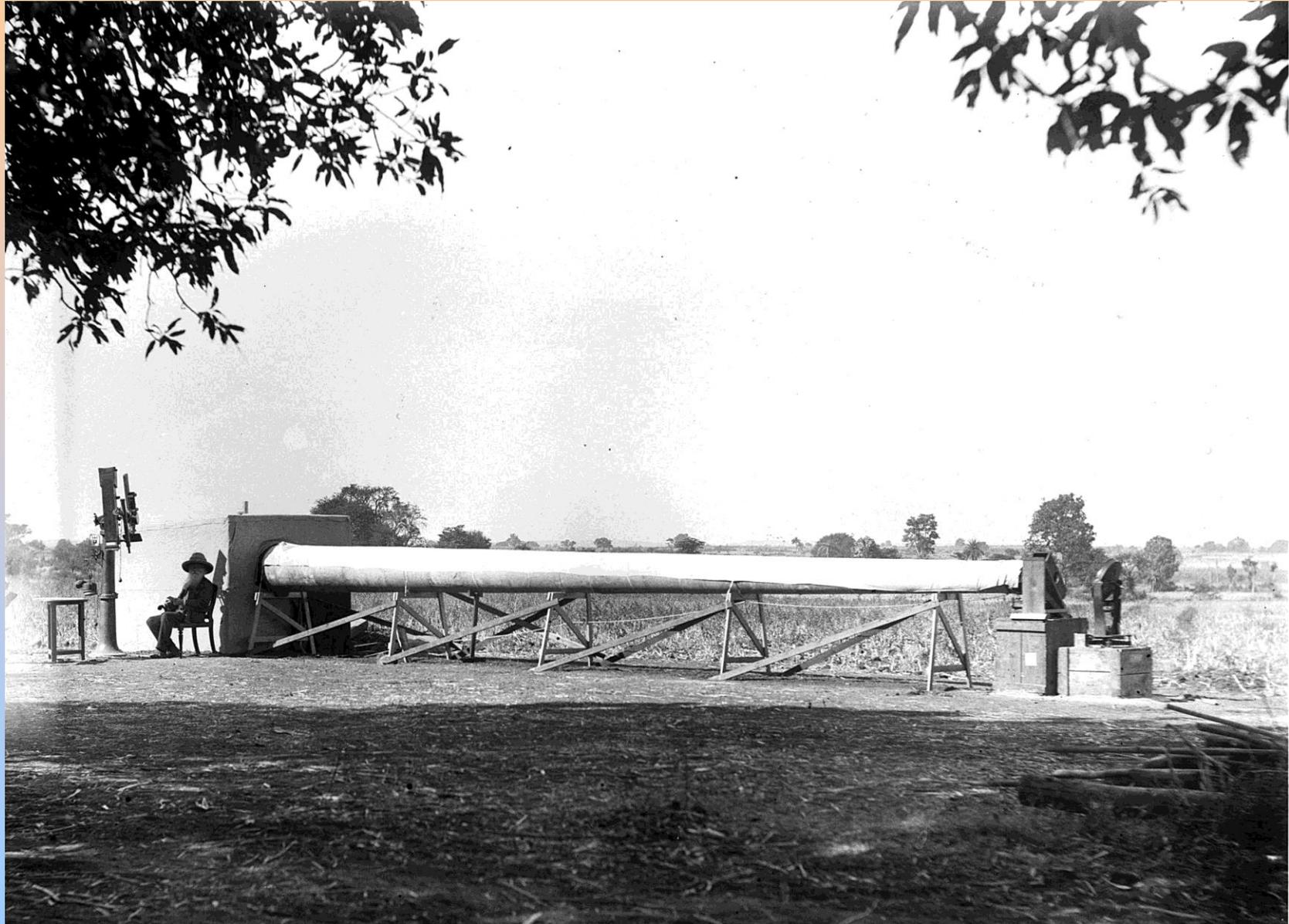
15-inch refractor from Dun Echt at the ROE



New Royal Observatory in 1894 (nearing completion)

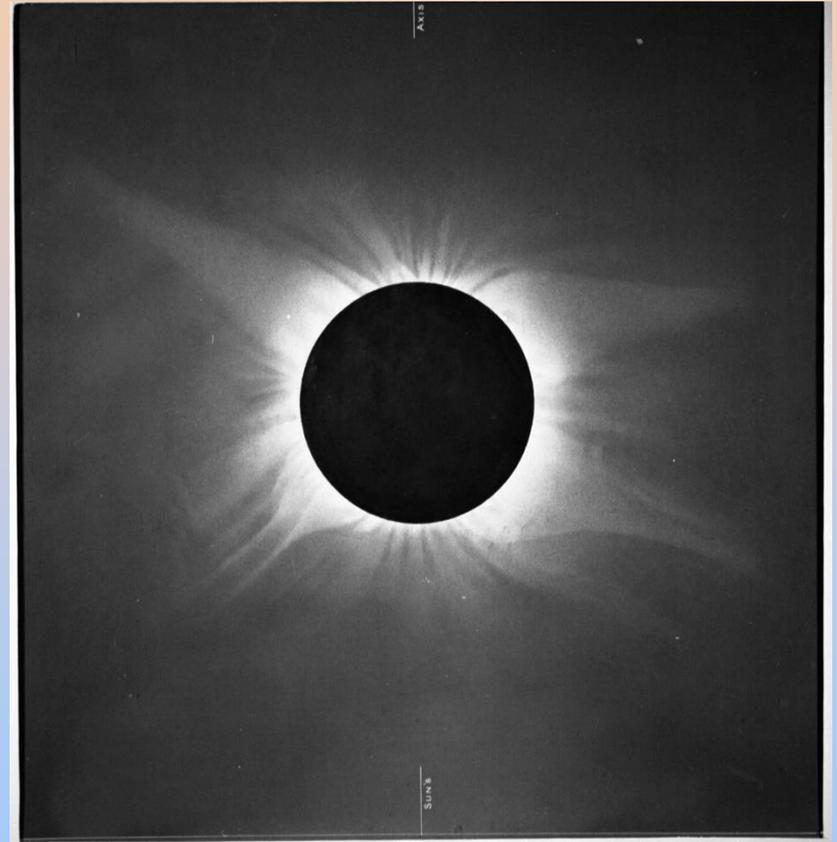
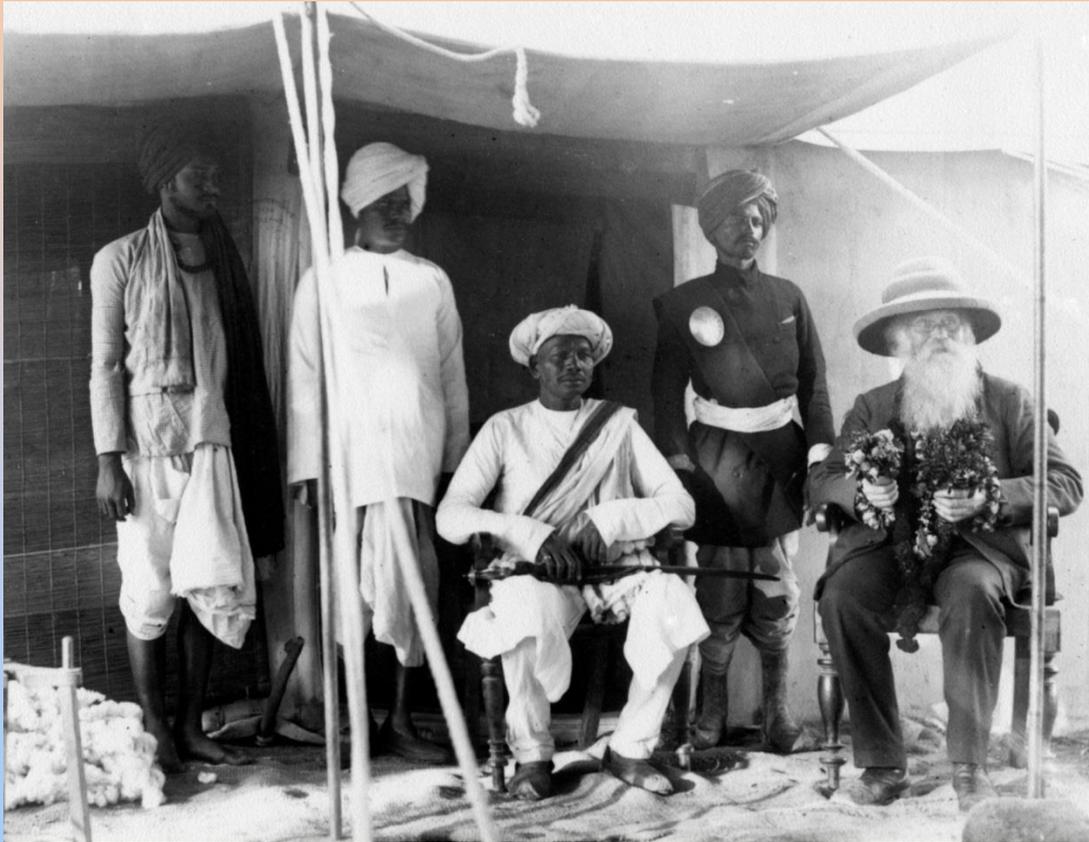


Copeland and 40-ft solar telescope, Ghoglee



camera with moving plate-holder in dark-room (L) and fixed mirror (R)

Solar Eclipse expeditions 1896: Vadsö, Finmark;
1898: Ghoglee, India; 1900: Santa Pola, Spain



Solar Corona: drawn by W. H. Wesley
from photograph obtained by Ralph
Copeland at the Solar Eclipse of 1898

Royal Observatory c. 1920



Astronomer Royal's house in foreground, now named Copeland House