



# History of the Royal Observatory (now SAAO)

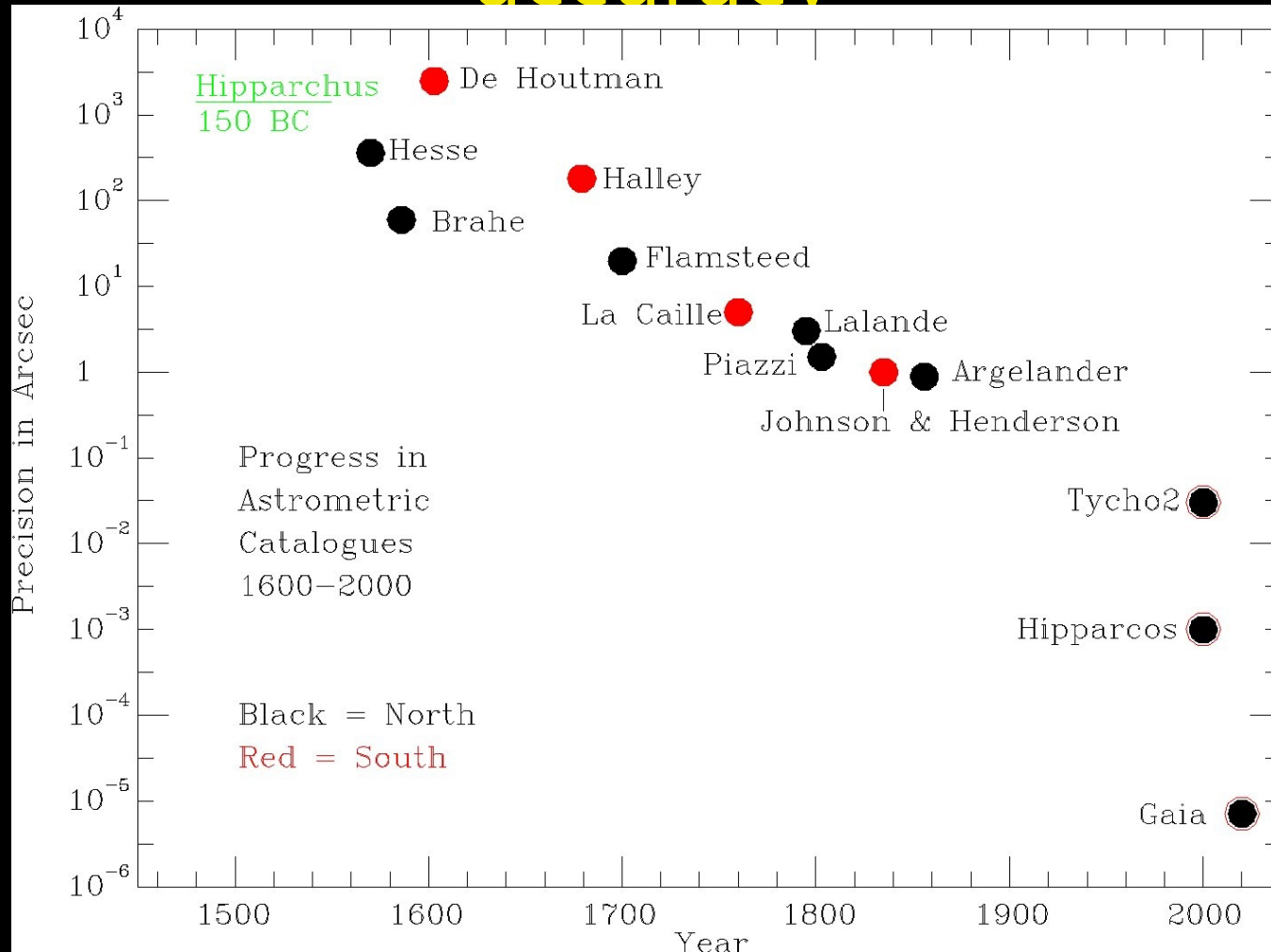
Ian Glass (SAAO)

SAAO History Symposium 2018

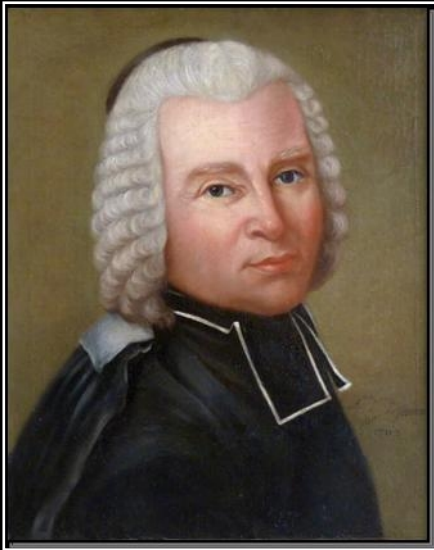
# Foundation of the Royal Observatory (198 years ago)

- Early 1820 – The Board of Longitude in London and others pressured for the formation of an observatory at the Cape “for the improvement of practical astronomy and navigation”
- Accurate star catalogues and a time service required
- 1820: progress through various committees
- 20 October 1820: Legally proclaimed
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- 12 August 1821: Fallows arrives at Cape
- 1825-1828 construction of Main Building

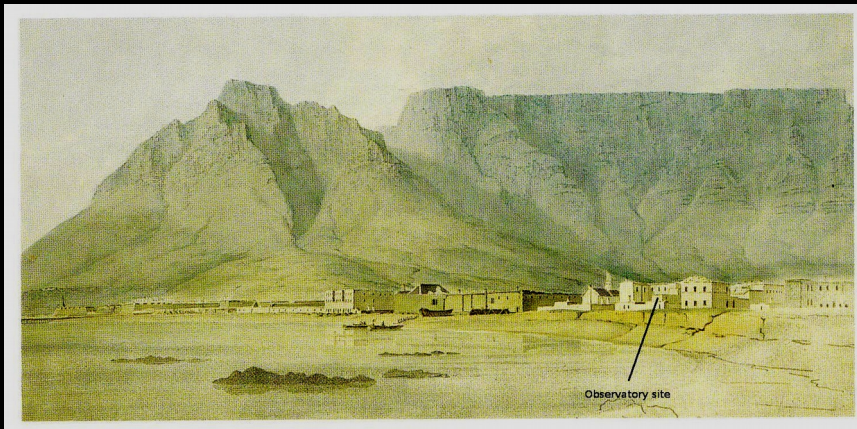
# “Improvement in practical astronomy” meant progress in star positional accuracy



# First serious astronomer at Cape



- Nicolas-Louis de Lacaille, Royal Academy of Sciences, Paris
- Visited Cape Town 1751-1753
- Observatory on the foreshore of Roggebay, on corner of present-day Waterkant St and St George's St
- Measured positions of stars, parallaxes of planets etc
- Radius of the earth via "Arc of the Meridian"

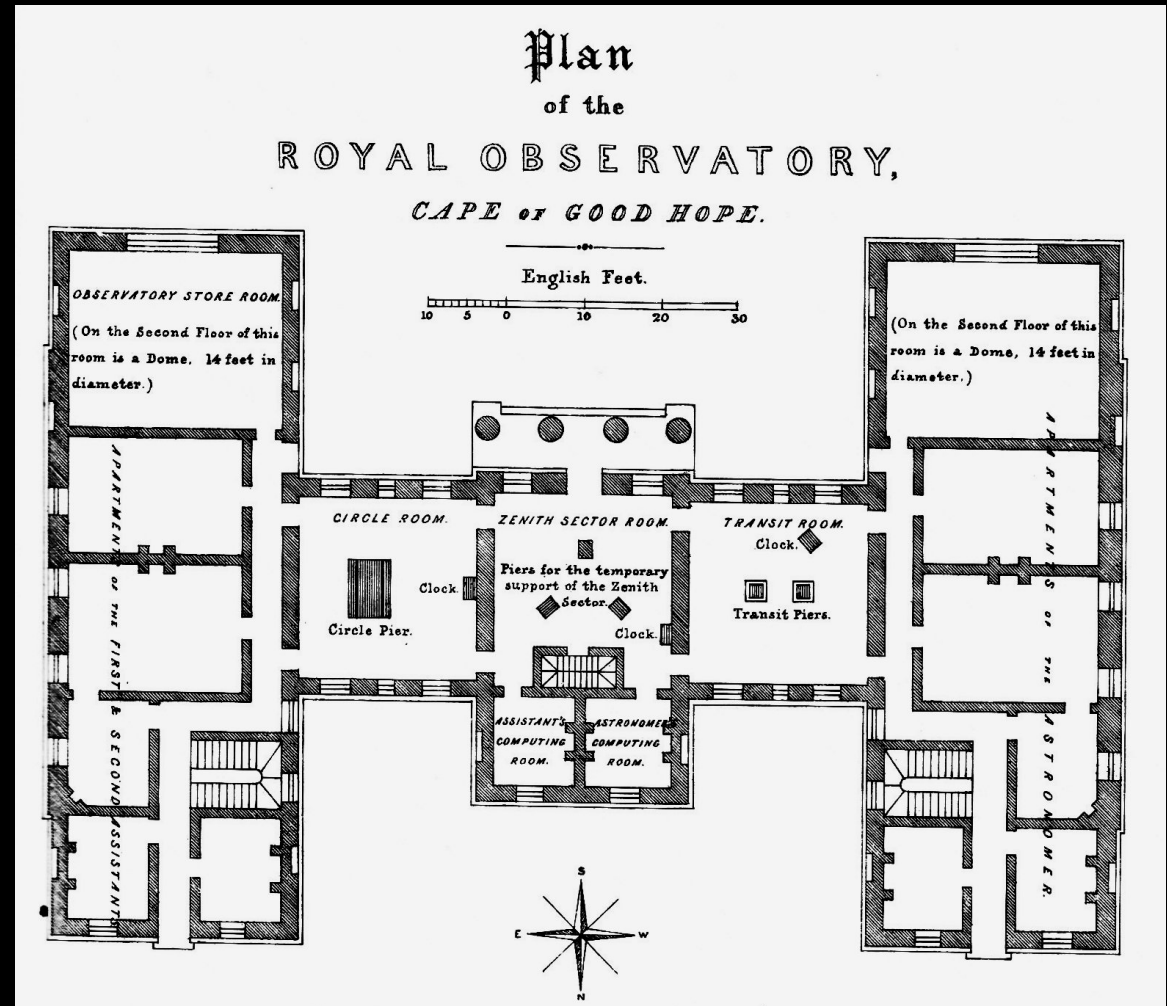


# R.O. Cape - State of the Art - 1828

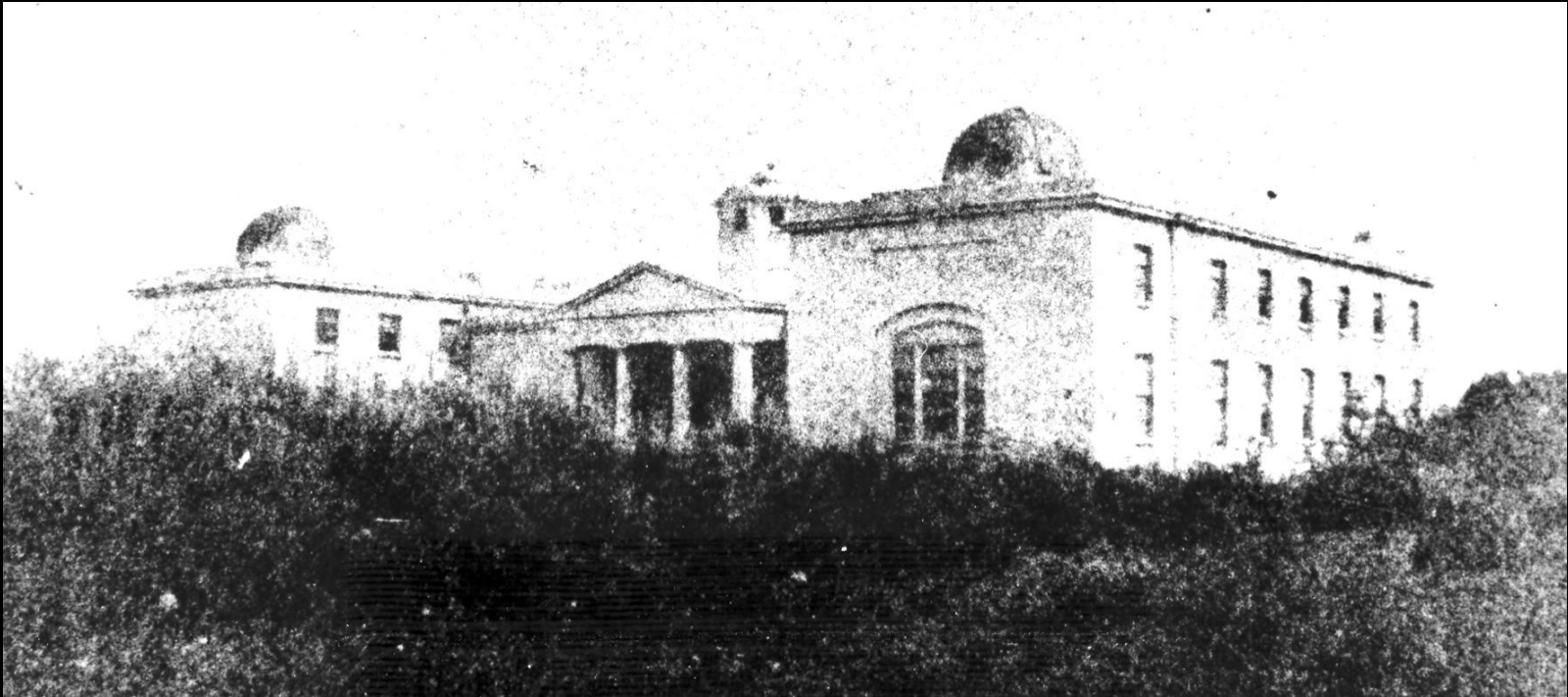


Rev. James Fallows F.R.S.

Fallows



# Royal Observatory – first photograph



Royal Society of  
Edinburgh

The oldest photograph of any observatory anywhere.

One of a set of “calotypes” taken by C. P. Smyth in 1842 -

# Royal Observatory, Cape – Observing shutters (“chases”)



# Manuel Johnson - St Helena



Discovered the large proper motion of  $\alpha$  Cen - 3.6" per year. Informed Thomas Henderson at the Cape about it.



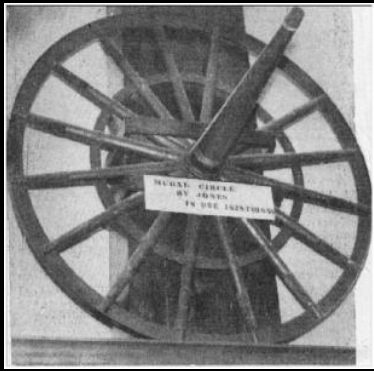
# Thomas Henderson

(of whom we have no certain picture)

- His Majesty's Astronomer March 1832-May 1833
- Observed Alpha Cen intensively in view of high PM
- Made first successful observation of a parallax
- Did not publish his result immediately
- He made his announcement 11 January 1839 but had lost priority to Bessel.
- However, they remained good friends!
- Henderson obtained for Alpha Cen the value  $1.16 \pm 0.11$  arcsec (True value 0.77 arcsec).

# First major achievement: The first ever measurement of the distance to a star

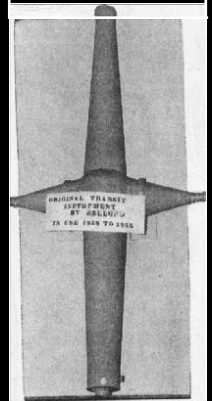
## Mural Circle



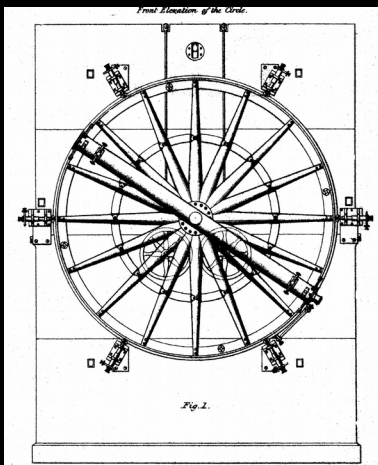
Cutting -SAAO

- Instruments used by Thomas Henderson to measure the distance to a star (Alpha Centauri). He used the earth's orbit as a survey baseline.
- L & R: photos of original instruments.
- L & R below: Similar instruments of the period.

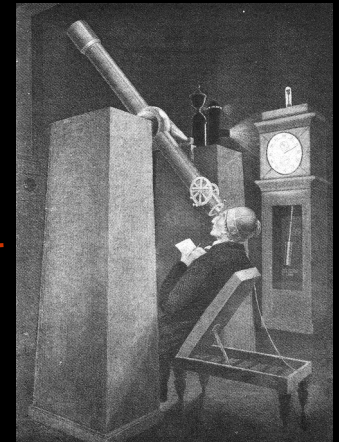
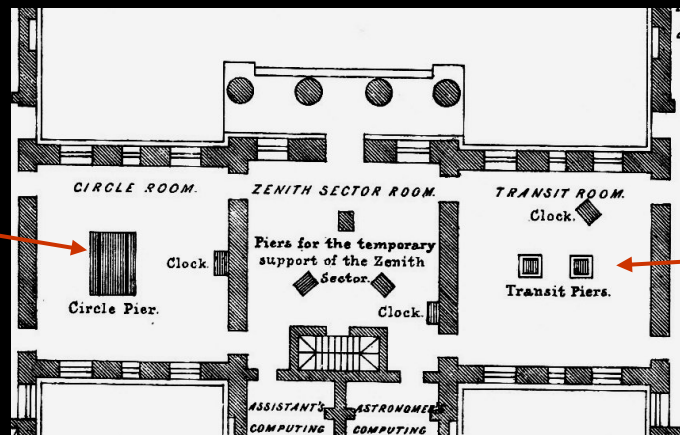
## Transit



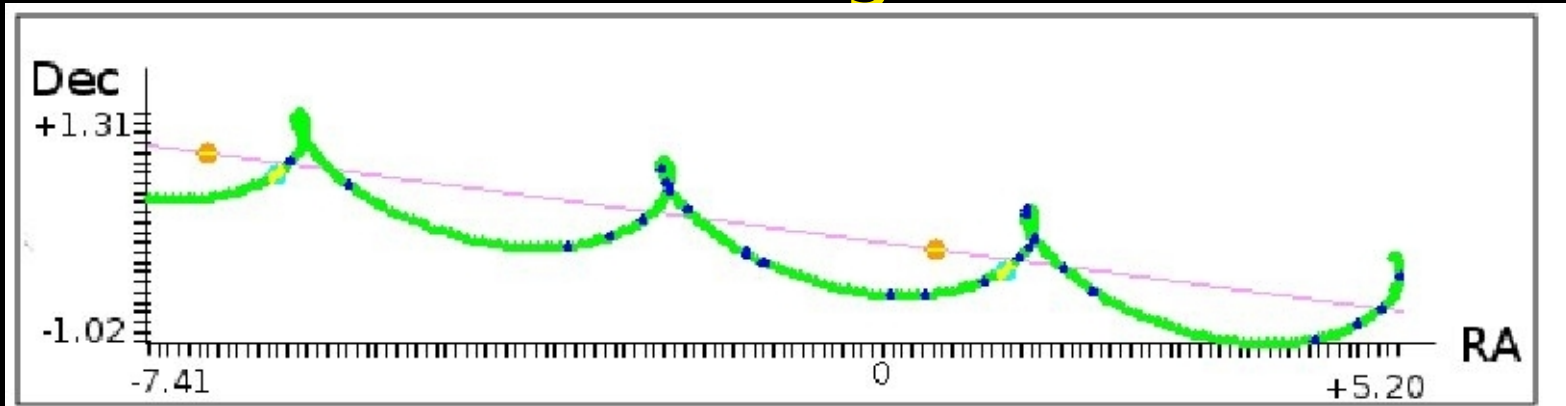
Cutting -SAAO



Pearson (1824)



# Proper Motion and Parallax - the apparent movement of stars against the background



The apparent and actual movement of the nearest star, Proxima Centauri, as determined from the Hipparcos satellite.

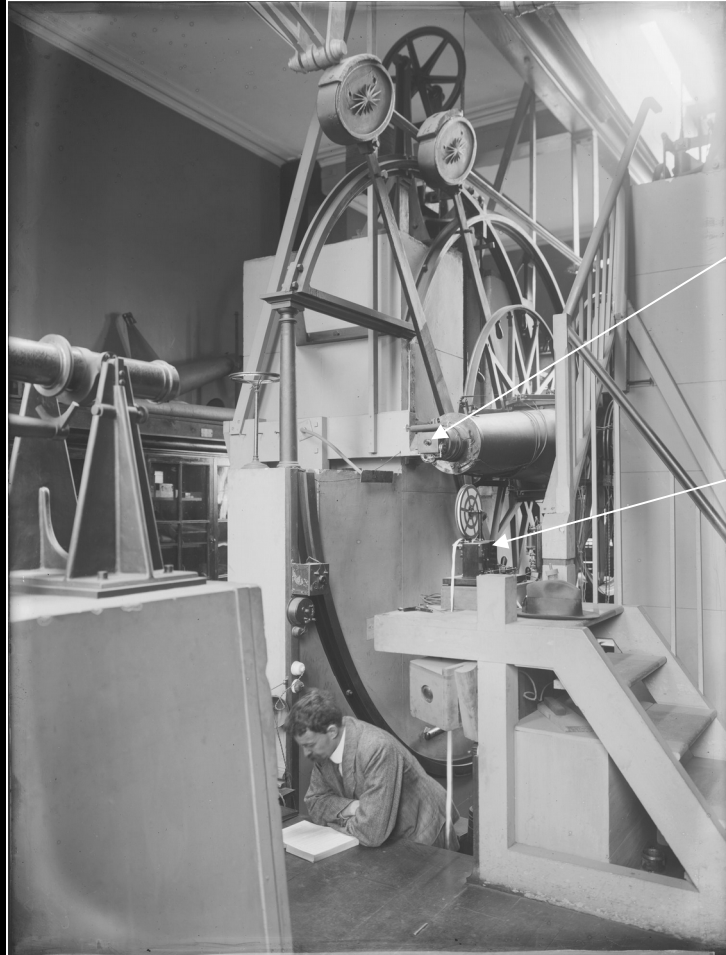
Proxima moves around a small parallax ellipse once per year, but the ellipse itself is moving because of proper motion at about 3.85 seconds of arc per year in R.A. and 0.8 seconds per year in Declination

The amplitude of the parallax is less than one second of arc or less than 1 part in 1,296,000 of a complete circle.

# Airy Transit Circle at Cape (1855-1950)



Installed by  
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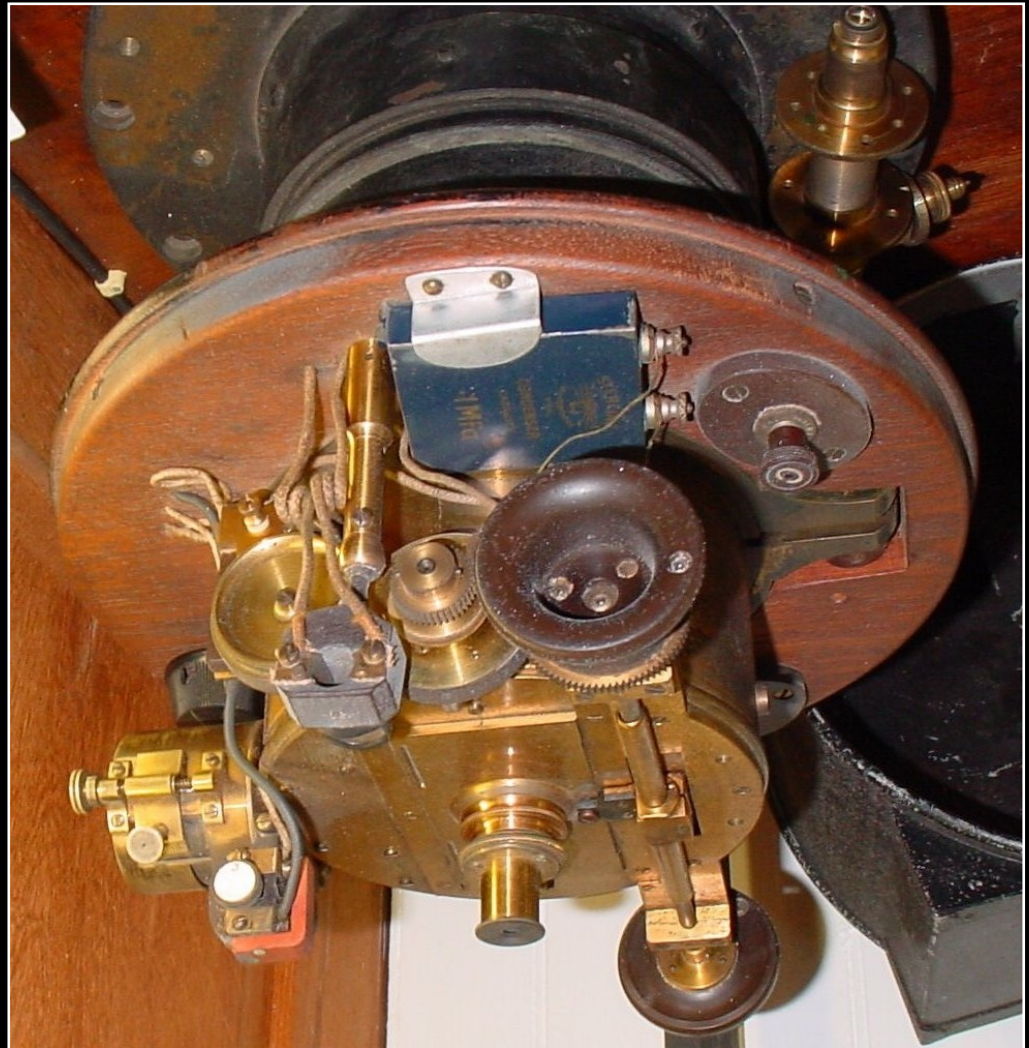


Eyepiece

Chronograph

# Airy Transit Circle - Eye End

- Now in SAAO  
Astronomical  
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# Airy Transit Circle - Chronograph

- Paper tape was marked with time signals.
- When the observer pressed a button, another mark was made.

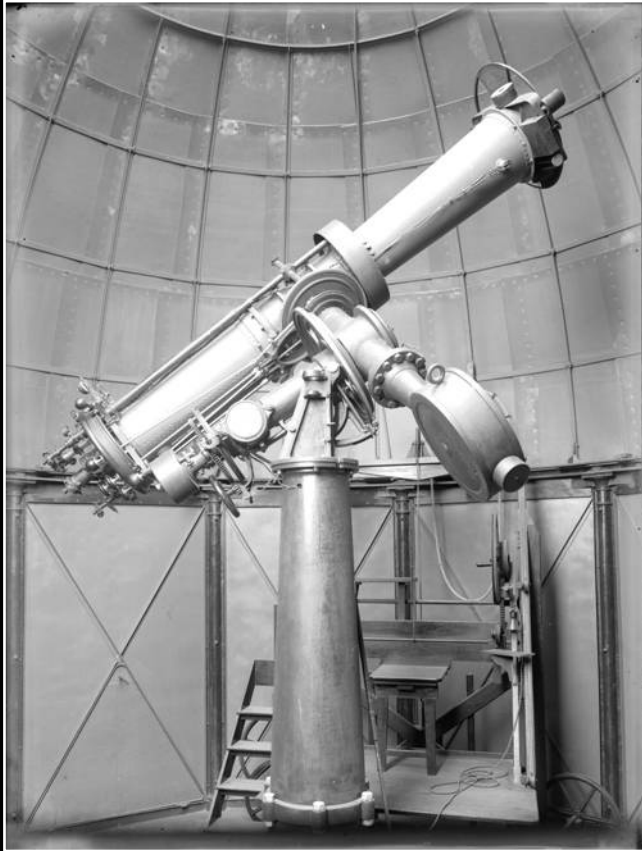


# Royal Observatory Staff 1879



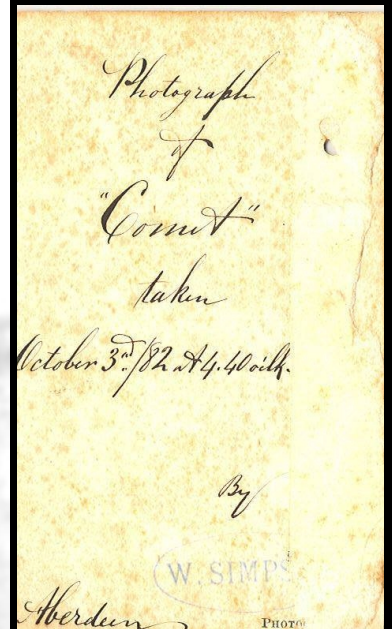
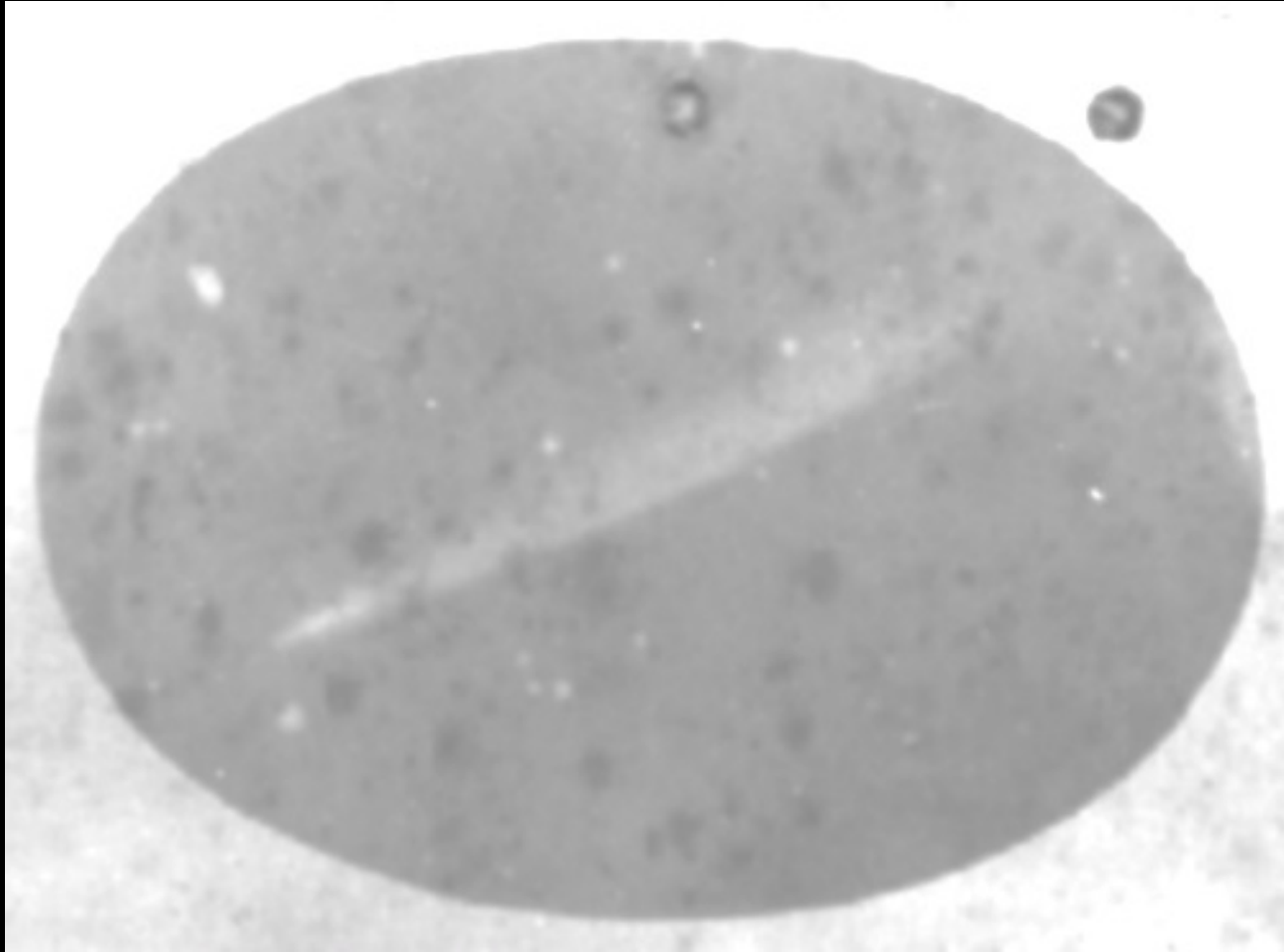
David Gill (HMA 1879-1907) was a consummate instrumentalist and innovator.

# Gill's heliometer at the Cape





# Comet of 1882: photo by W. Simpson of Aberdeen, Cape



Lens borrowed from Mr Allis,  
photographer of Mowbray



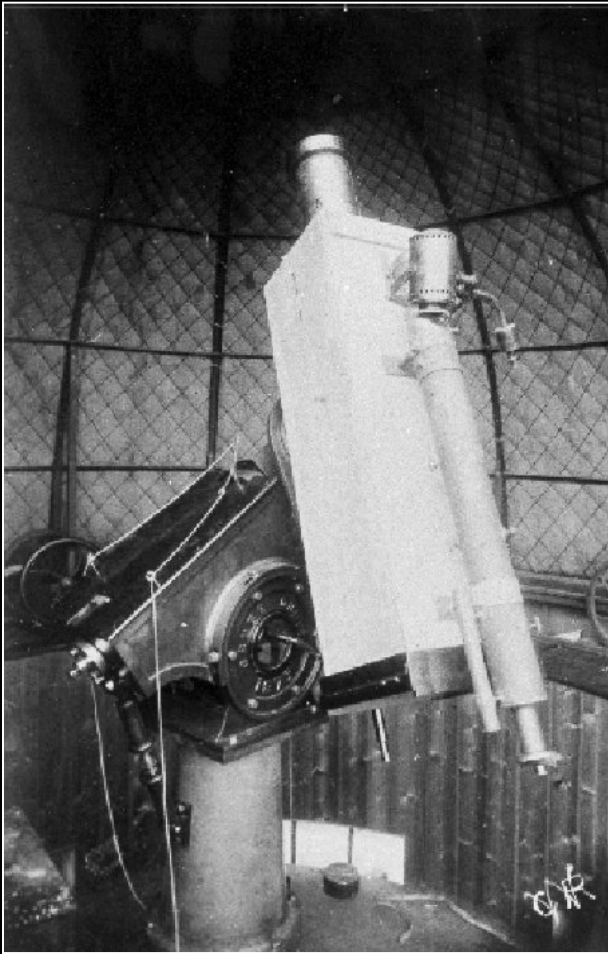
# Picture of Comet by Gill (1882)



# Dallmeyer Portrait lens

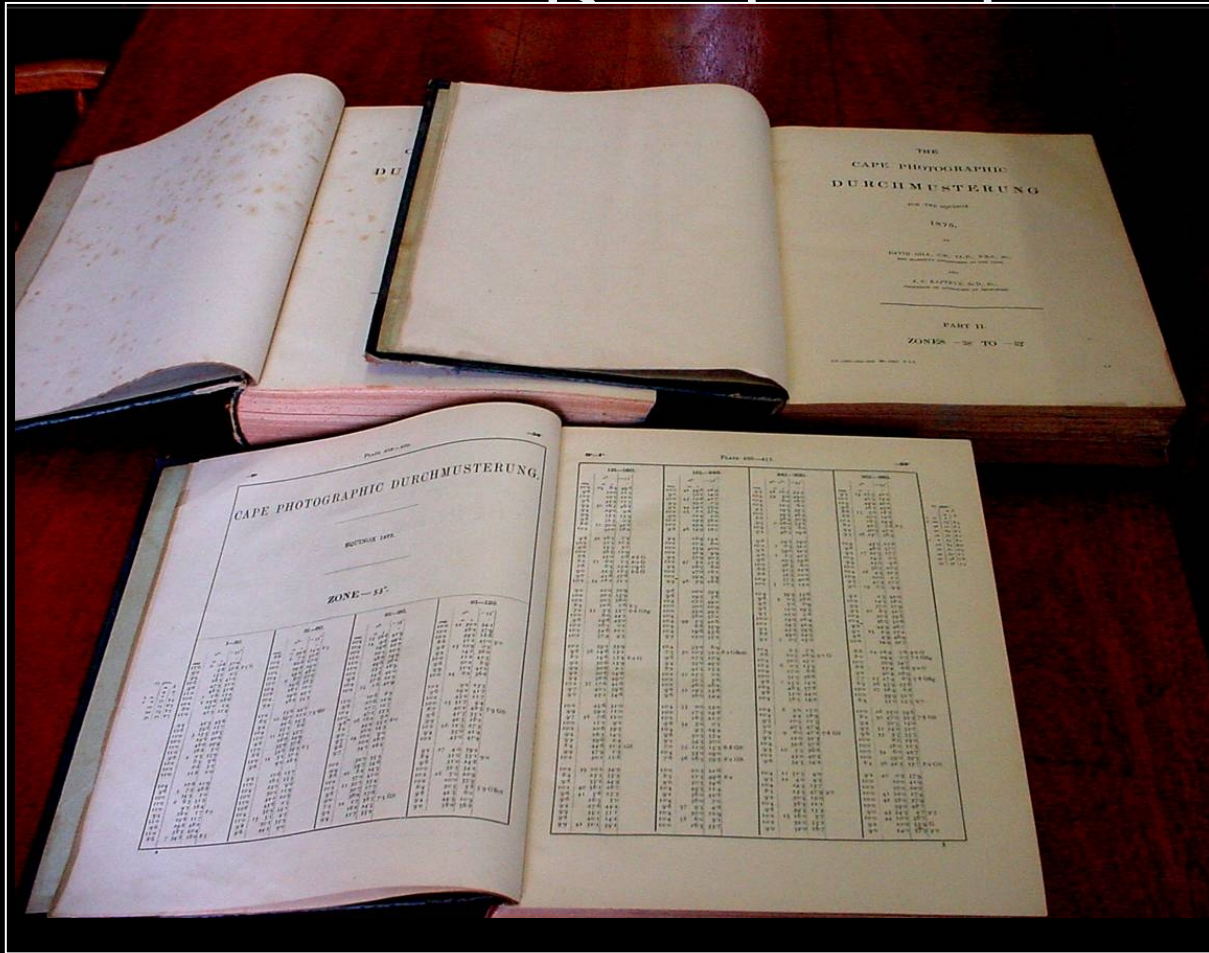


# Gill's first Sky Survey Camera (1886)



Mounted on the "Wind Tower" – demolished 1966

# First Catalogue of Stars by Photography: The Cape Photographic

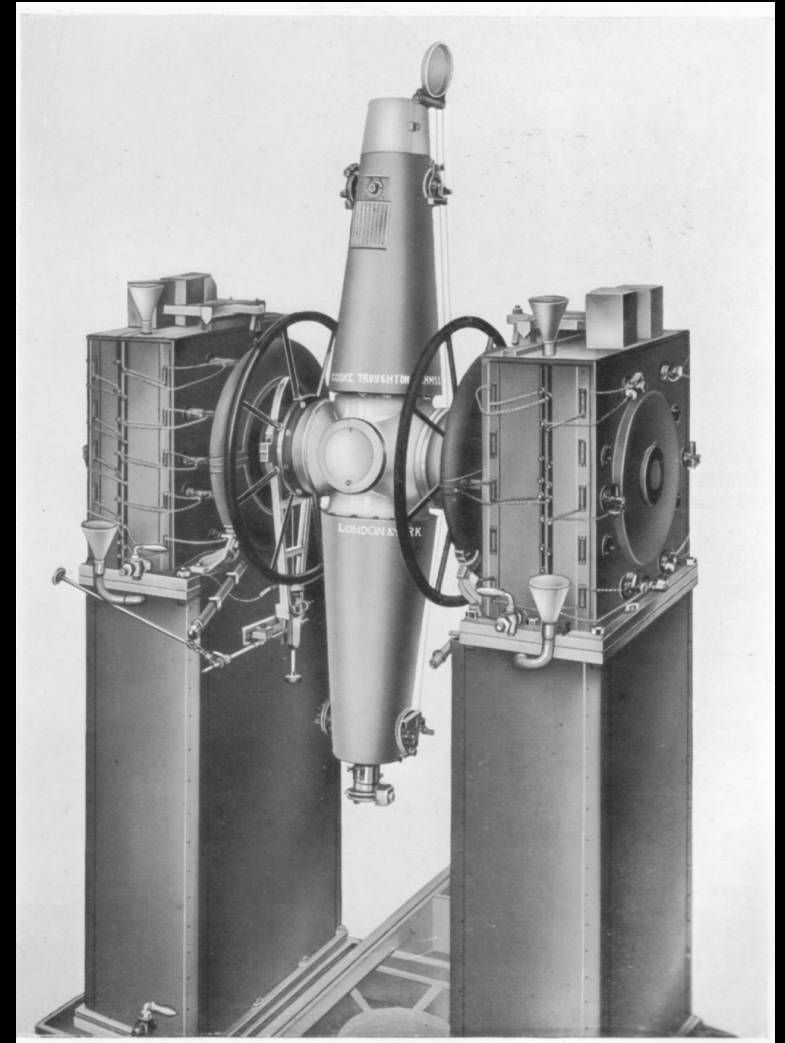


Jacobus  
Kapteyn:  
“wijsheid is  
beter dan  
robijnen”

454875 stars! (Gill and  
Kapteyn)

# Gill Reversible Transit Circle (1901)

Many innovations - widely copied



# Gill Reversible Transit Circle (RTC)





# R.T.A. Innes joins Royal Observatory

- Analysed CPD data and found a star that Kapteyn had thought was missing – turned out to have high proper motion. Now called Kapteyn's star!

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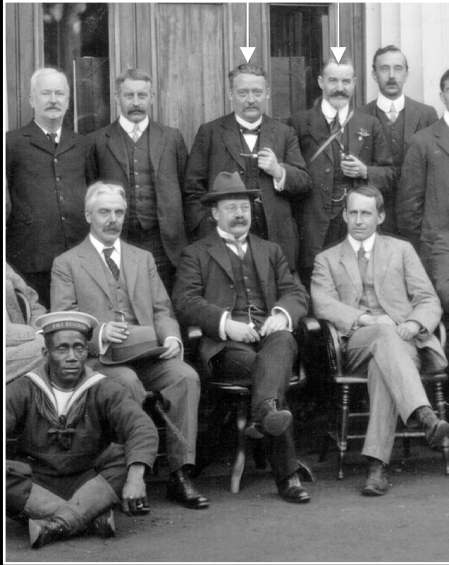


# Some other achievements of Sir David Gill

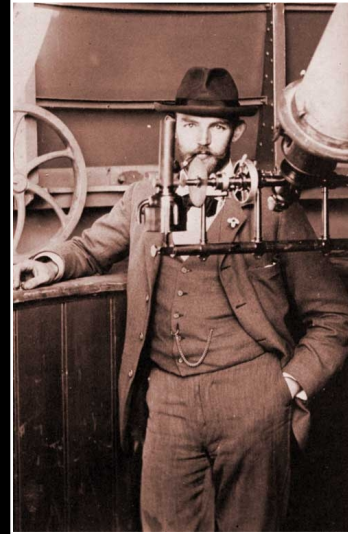
- Determined the distance from the earth to the Sun
- Made geodetic surveys
- Fixed the border between South Africa and South West Africa – was trusted by both German and British governments
- Was an extremely successful instrument designer, whose transit circle was copied decades after his time.

# Research astronomers at the Royal Observatory 1890-1915

Halm Lunt



JKE Halm (stellar dynamics)  
J.Lunt (Europium)



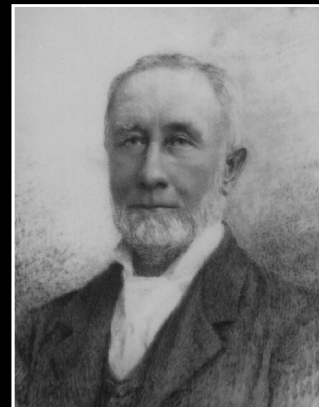
Willem de Sitter (expanding  
Universe)



J. Franklin-Adams (all-sky survey)



Innes (later discovered nearest star)



McClean (spectroscopy)  
Oxygen in stars



JGEG Voûte (photogr. parallaxes)  
Proxima lowest luminosity known

# Jacob Halm Chief Assistant(1907-1927)



- First explanation of what is now called a “P-Cygni Profile”
- Suggested that star velocities follow a Maxwellwellian distribution
- First proposal of stellar mass-luminosity relation
- Developed quantitative law for reciprocity failure in photography
- First determination of ratio of total to selective absorption in space “R”

# Latter years of Royal Observatory



RH Stoy



AWJ Cousins



J Churms



DS Evans

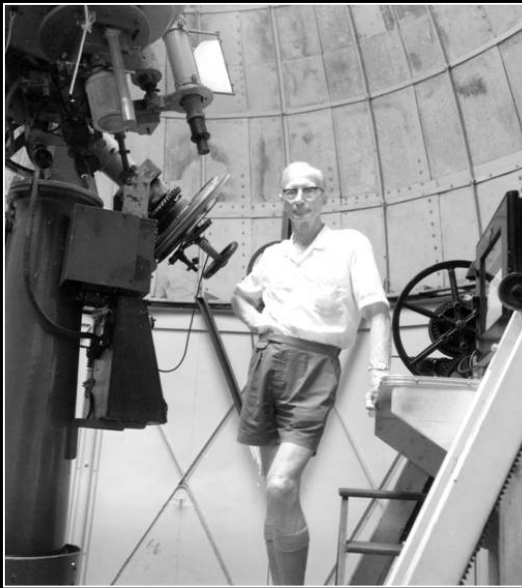
Stoy – agitation for new location

Cousins – precision photometrist

Churms – Co-discoverer of Uranian rings

DS Evans – pioneer of high-speed photometry

# AWJ Cousins (1903-2001)



Pioneer of precision photoelectric photometry - inter alia essential to distance scale of Universe

Developer of UBVRI standard photometric system

Carried on observing on 18-inch telescope at Royal Observatory site until over 90

The End



# History of the Royal Observatory

(now SAAO)

Ian Glass (SAAO)

SAAO History Symposium 2018

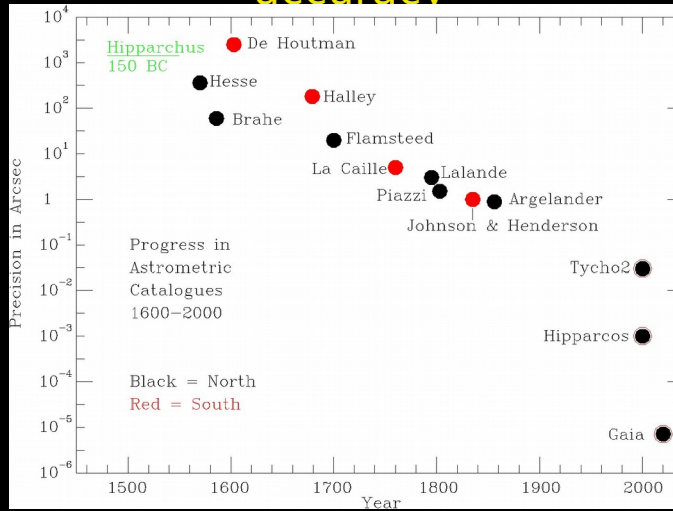


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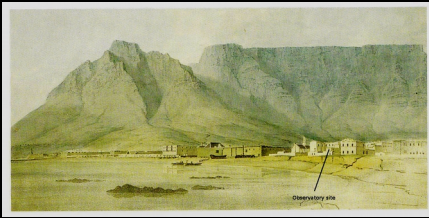
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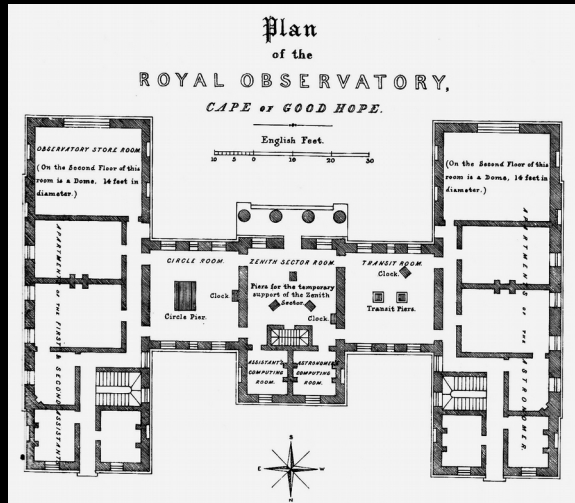


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Fallows



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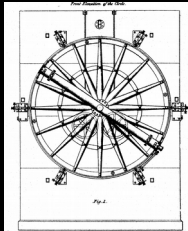


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## Mural Circle



Cutting -SAAO



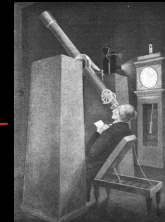
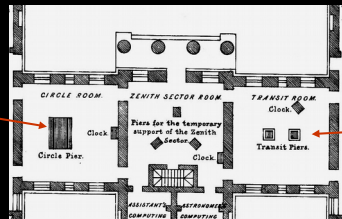
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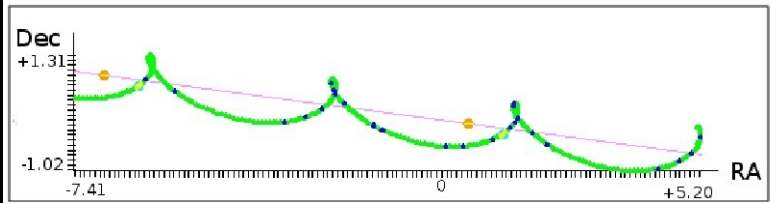
## Transit



Cutting -SAAO



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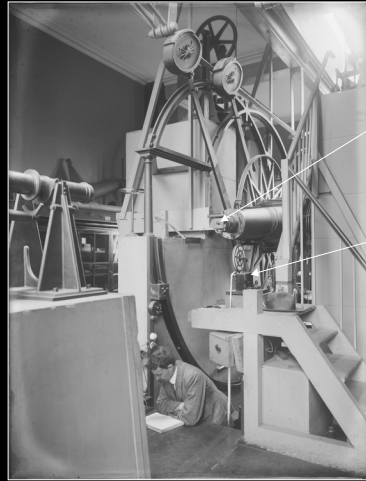
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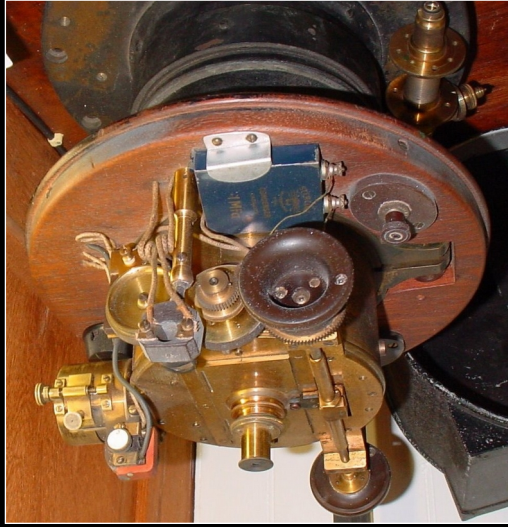


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## Airy Transit Circle - Eye End

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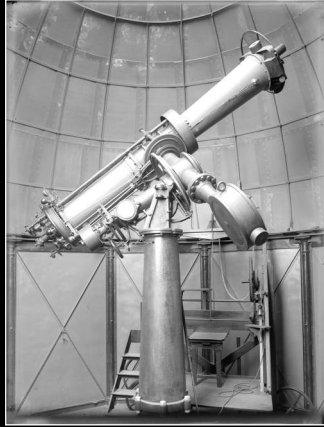
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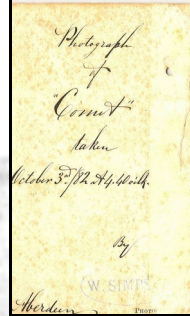
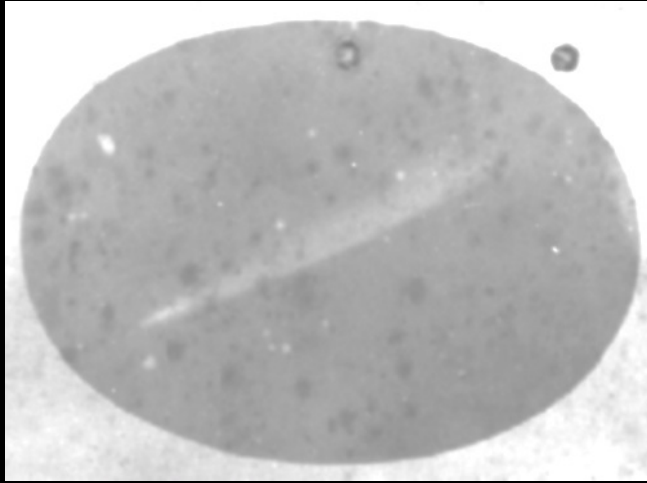
David Gill (HMA 1879-1907) was a consummate instrumentalist and innovator.

----- Meeting Notes (23/09/2017 16:19) -----  
These were the staff when he arrived.  
Rundown condition under his predecessor.

# Gill's heliometer at the Cape



Comet of 1882: photo by W. Simpson  
of Aberdeen, Cape



----- Meeting Notes (23/09/2017 16:19) -----

Big surprise in 1882 - very bright comet, visible in daytime



Lens borrowed from Mr Allis,  
photographer of Mowbray



----- Meeting Notes (23/09/2017 16:19) -----

Plates - glass

Recently made more Sensitive

Sitters previously had to be still for long periods.

Fixed lens to telescope so he could follow the stars for long exposures.

Lens now in our Museum

## Picture of Comet by Gill (1882)



----- Meeting Notes (23/09/2017 16:19) -----

This photo circulated widely.

Made Gill famous

See star background in detail

Permanent record of positions

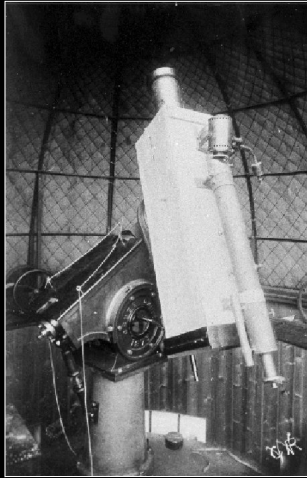
Were measured later

# Dallmeyer Portrait lens



----- Meeting Notes (23/09/2017 16:19) -----  
Big lens used for portraits for sensitivity  
light gathering power

## Gill's first Sky Survey Camera (1886)



Mounted on the "Wind Tower" – demolished 1966

----- Meeting Notes (23/09/2017 16:19) -----

Mounted lens on wooden box with plateholder at end

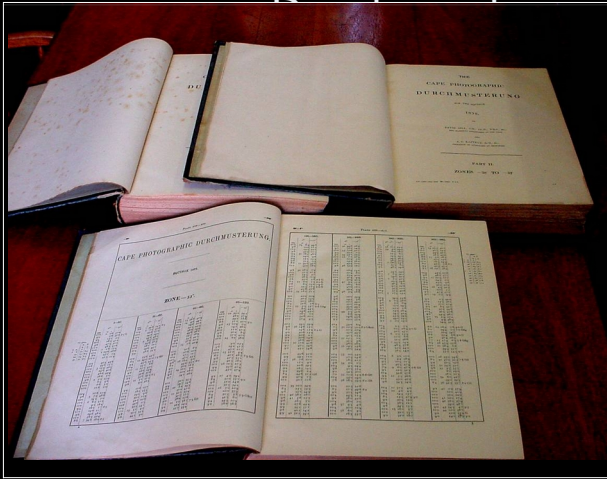
Mounted on sturdy tracking mount

Guide telescope

Placed in on Wind Tower, old anemometer mount from 1842

Used own money because of jealousy of Christy

# First Catalogue of Stars by Photography: The Cape Photographic



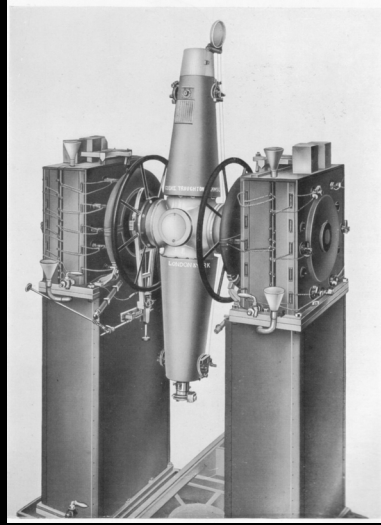
Jacobus  
Kapteyn:  
"wijsheid is  
beter dan  
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454875 stars! (Gill and  
Kapteyn)

----- Meeting Notes (23/09/2017 16:19) -----

Helped by Jacobus Kapteyn of Groningen who did the measuring.

**Gill Reversible Transit Circle (1901)**  
**Many innovations - widely copied**



## Gill Reversible Transit Circle (RTC)



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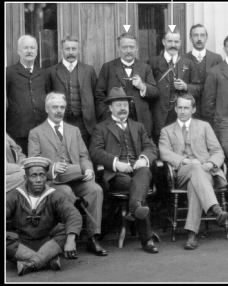


## Some other achievements of Sir David Gill

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- Made geodetic surveys
- Fixed the border between South Africa and South West Africa - was trusted by both German and British governments
- Was an extremely successful instrument designer, whose transit circle was copied decades after his time.

## Research astronomers at the Royal Observatory 1890-1915

Halm Lunt



JKE Halm (stellar dynamics)  
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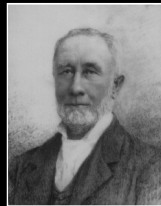
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Innes (later discovered nearest star)



McClean (spectroscopy)  
Oxygen in stars



JGEG Voûte (photogr. parallaxes)  
Proxima lowest luminosity known

All photos: SAAO Archives

----- Meeting Notes (23/09/2017 16:19) -----

Attracted other astronomers to do research in s hemisp  
Comment

## Jacob Halm Chief Assistant(1907-1927)



- First explanation of what is now called a “P-Cygni Profile”
- Suggested that star velocities follow a Maxwellwellian distribution
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DS Evans

Stoy – agitation for new location

Cousins – precision photometrist

Churms – Co-dscoverer of Uranian rings

DS Evans – pioneer of high-speed photometry

## AWJ Cousins (1903-2001)



Pioneer of precision photoelectric photometry - inter alia essential to distance scale of Universe  
Developer of UBVRI standard photometric system  
Carried on observing on 18-inch telescope at Royal Observatory site until over 90

The End