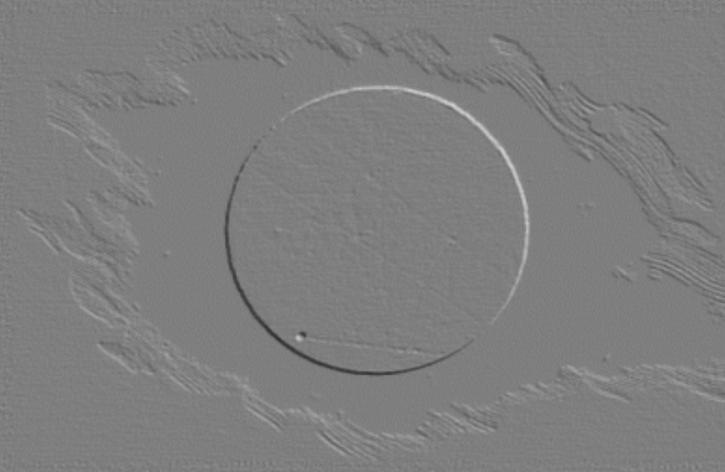
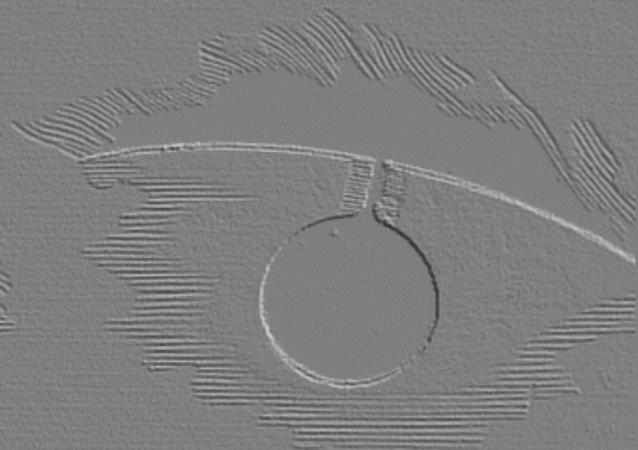
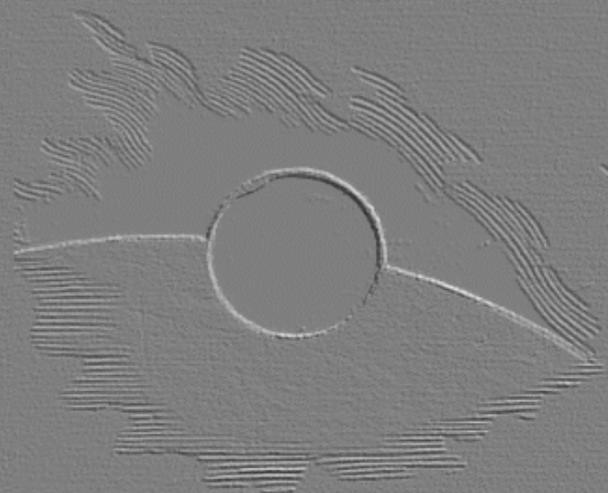


TRANSIT OF VENUS



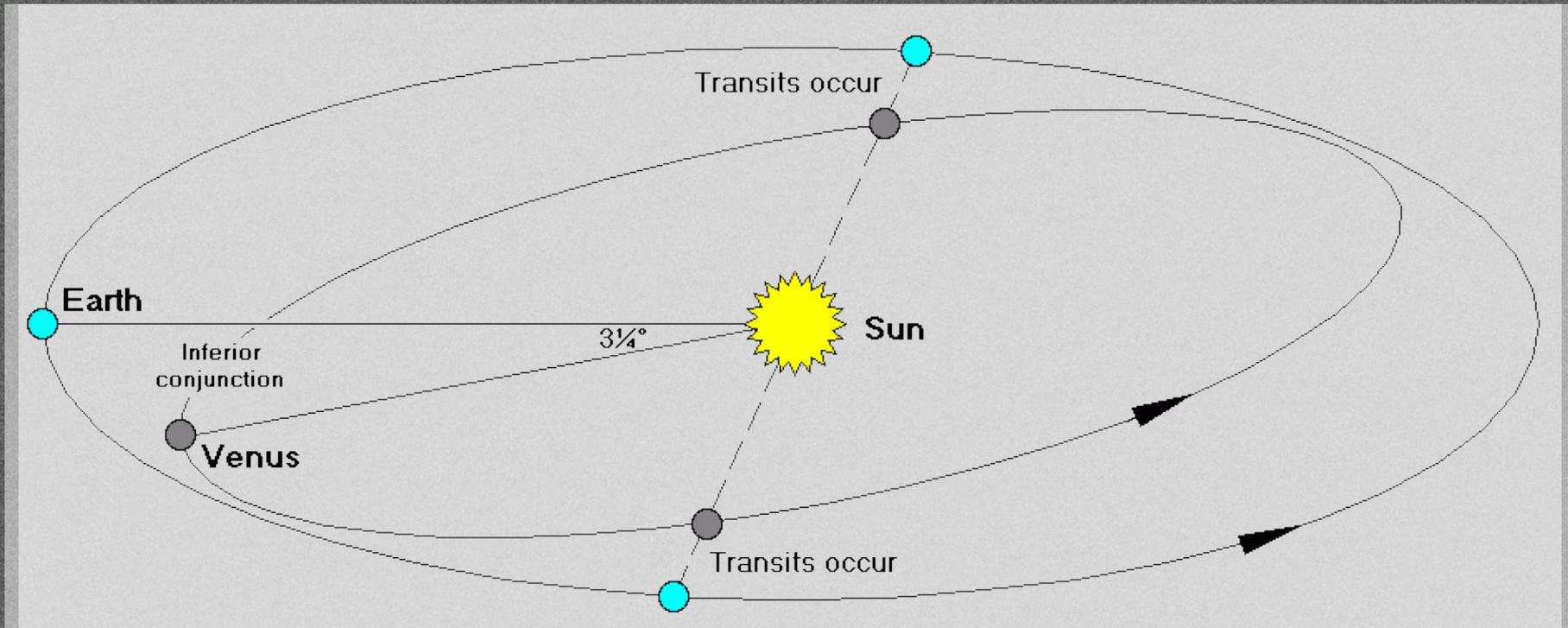
# Transit of Venus relics in South Africa

by Willie Koorts



# What are Transits?

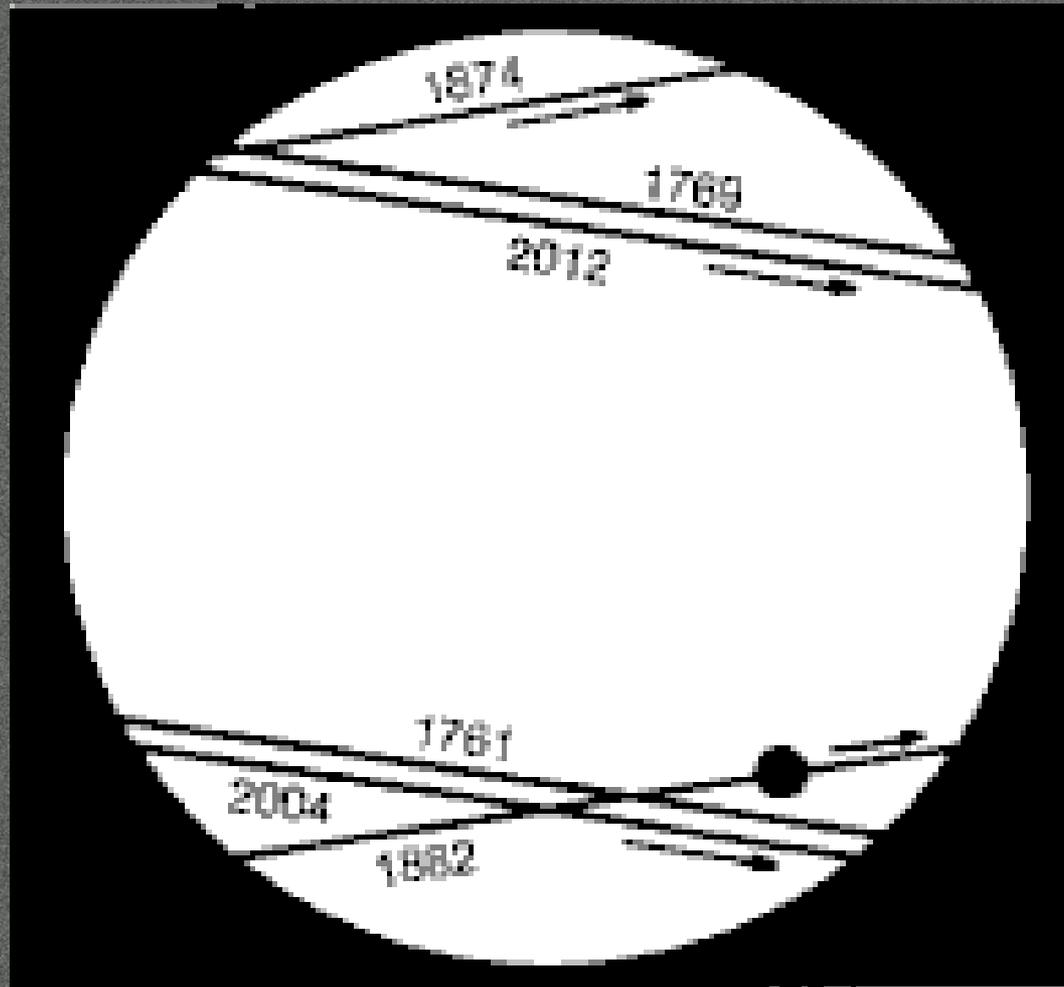
*Planet - Venus*



Transits only occur when Venus and the Earth are simultaneously on the same side of the Sun where the orbits cross (dotted line). Both planets then need to be within  $\pm 1.7^\circ$  of the node.

# What are Transits?

*Mercury - Venus*



# What are Transits?

- Only the two inner planets (Mercury and Venus) can transit the disk of the Sun (as seen from the Earth)



- Frequency of Transits:

- Mercury .... 13 to 14 times per century

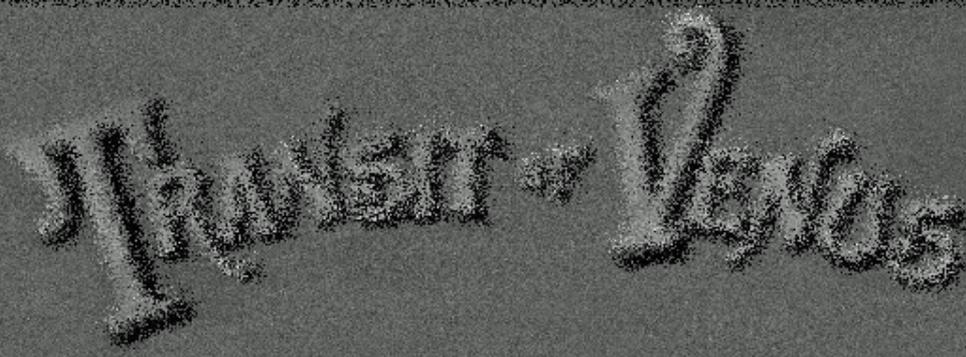
- Venus ..... 13.7 times per millennium

- Previous Transit pairs: (1631) & 1639, 1760&1769, 1874&1882

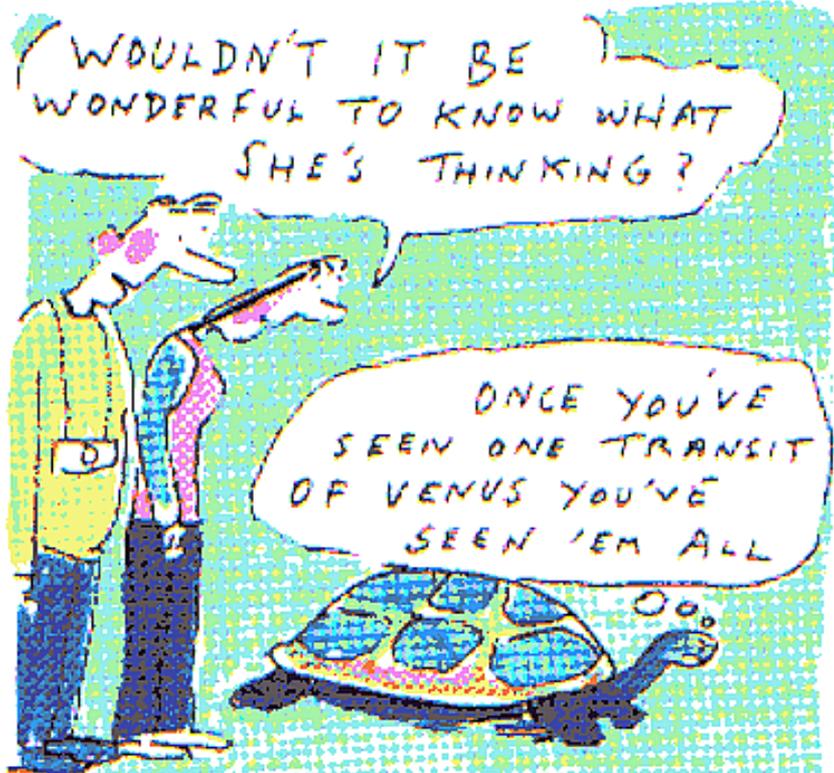
- Seen by ..... (0) ..... 2 ..... 10's ..... 100's of people

- Last pair – 2004 & 2012 – seen by millions

# What are Transits?



## Hear it for Harriet



Though most people's interest in the recently deceased Galapagos tortoise Harriet was because of her supposed association with Darwin, now debunked by Henry Nicholls, my interest was astronomical (15 July, p 21). No human was alive for the 8 June 2004 transit of Venus who had seen the previous transit in 1882, much less the one in 1874. So Harriet was a creature who may well have seen those transits and eventually got to see three.

# Famous people and Transits

- Johannes Kepler
  - Was the first to predict that Transits of Venus are possible
- Sir Edmond Halley
  - Refined a method to determine the Solar Parallax from Transit “contact” timings (1761 onwards)
- Charles Mason and Jeremiah Dixon
  - Observed the 1761 Transit from Cape Town
- Captain James Cook
  - Observed the 1769 Transit from Tahiti on route to his discovery trip of Australia



# SA's Transit History

- **1761** : Mason & Dixon, on route to Sumatra, were running late and observed from Cape Town. In fact, they managed the only observations from the south Atlantic region.
- **1874** : SA not well placed, only a few local observations from Cape Town and P.E.
- **1882** :
  - American expedition to Wellington.
  - British expedition to Montagu Road (Touws River).
  - Locally from Cape Town, Durban & Aberdeen Rd.



Zimbabwe

Botswana

Mozambique

Namibia

Swaziland

**SOUTH AFRICA**

Lesotho

Durban

Beaufort West

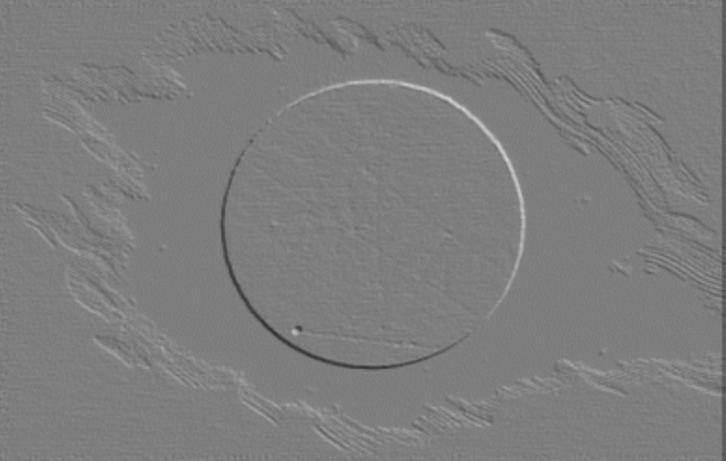
Aberdeen Rd

Wellington

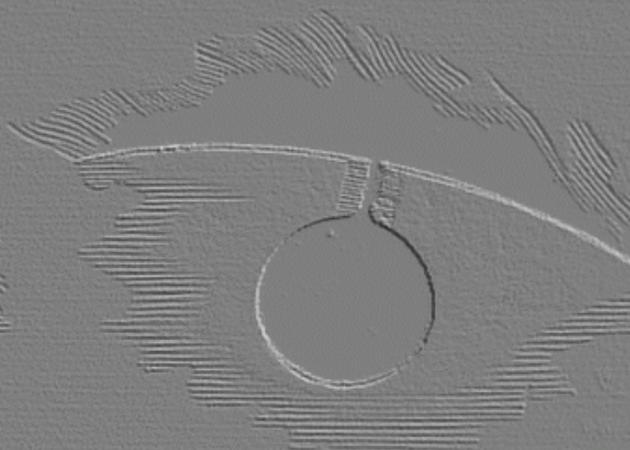
Touws River

Cape Town

TRANSIT OF VENUS



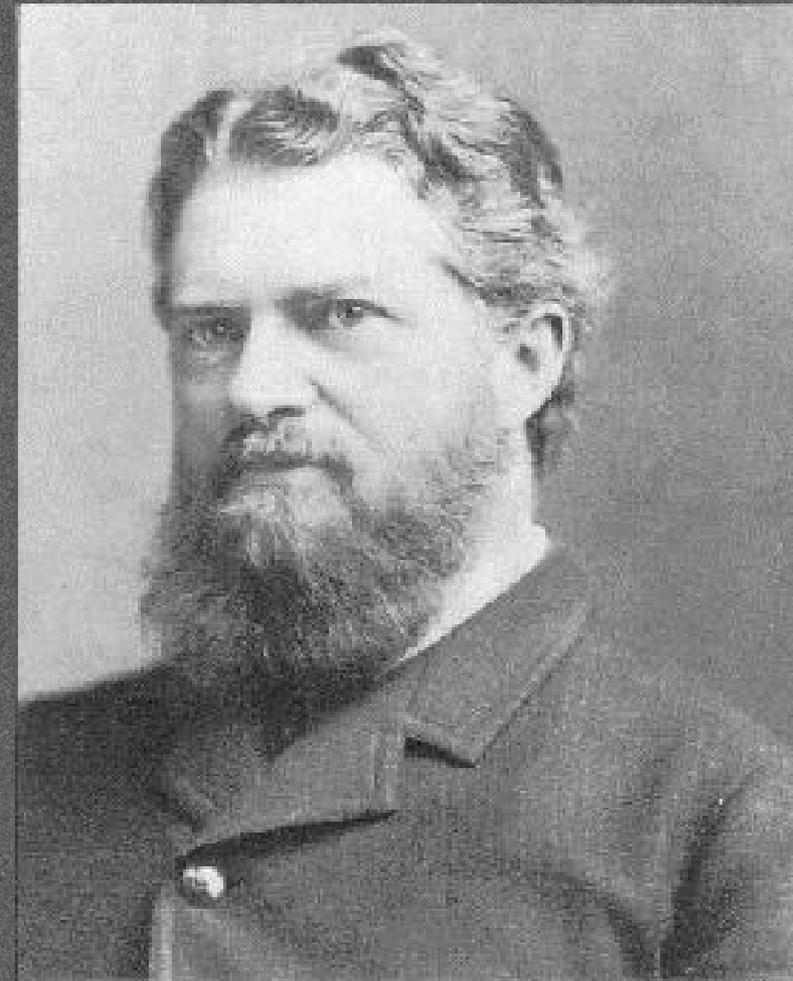
# The American Expedition



# American expedition

*Hunter - Davis*

- South African party:
  - Prof. Simon Newcomb (right)
  - Lieut. Thomas L. Casey
  - Ensign J.H.L. Holcombe
  - Mr. J. Ulke
- Originally destined for Beaufort-West but eventually chose Wellington.



# Huguenot Seminary

*Huguenot Seminary*

- Miss Ferguson was keen amateur and offered Astronomy at the Seminary since 1874.
- Gill often lectured there.
- Mary Elizabeth Cummings (right) came in 1877.
- In 1881 a 6-inch Fitz telescope became surplus at Holyoke and was given to Wellington.
- Gill helped them install it in a rondawel-type observatory in 1882.



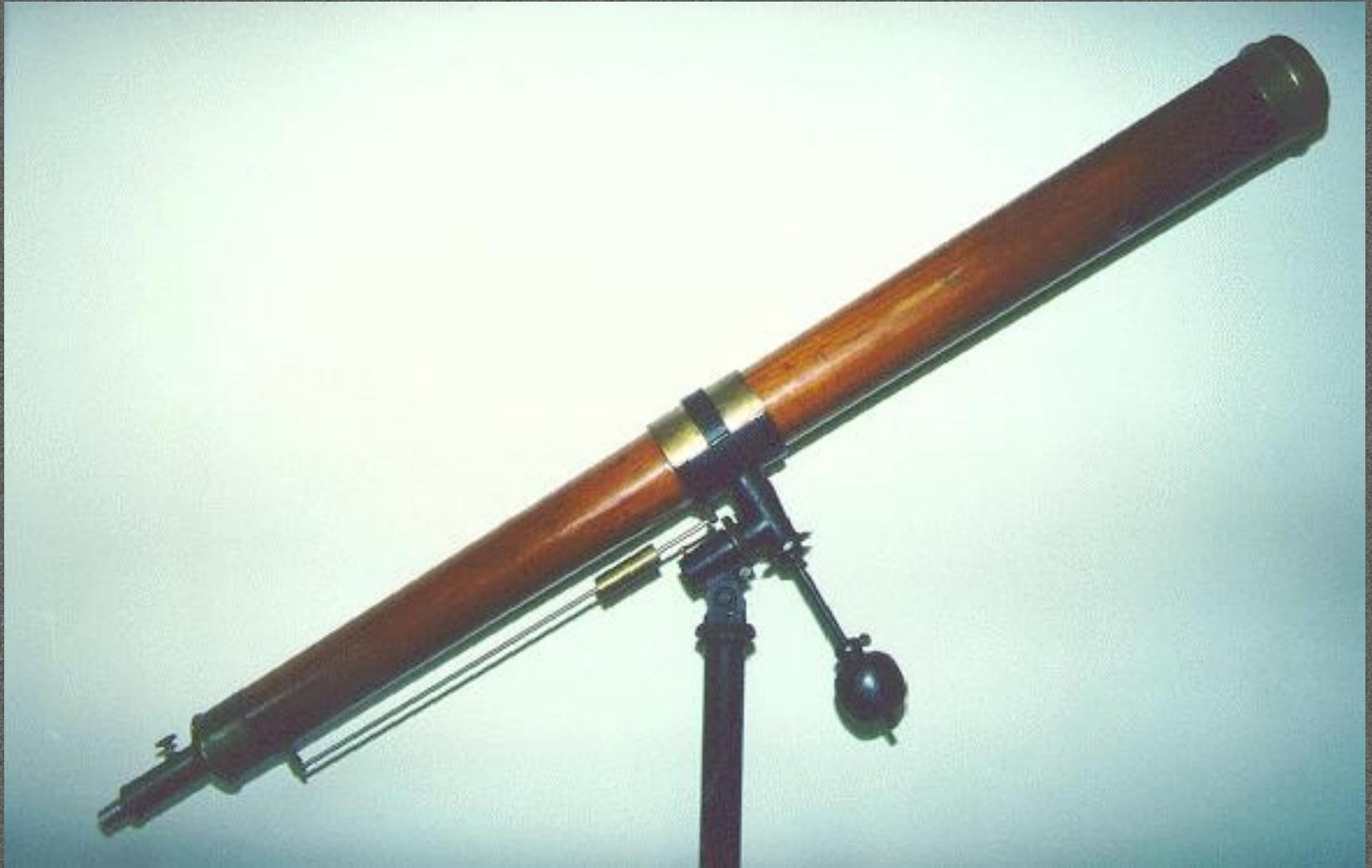
# Miss Cummings writes:



"I must tell you of our telescope before I close. Some of you perhaps know that it is the one through which we had a few peeps when pupils of Mt. Holyoke. When it was no longer needed there, Mr Williston kindly presented it to the So. African daughter of Mt. Holyoke. An observatory was erected for it in our garden, and the telescope was mounted under the direction of Dr Gill, the Astronomer Royal, from Cape Town. It was scarcely in order when the "Transit of Venus Expedition" from the United States, arrived in Cape Town, and soon after decided upon Wellington as the best astronomical station for their purpose. Our garden was selected as the best site, all things considered, and four buildings were erected. Prof Newcomb, the Chief of the Expedition, instructed the pupils in Miss Ferguson's astronomy class and several of us teachers, in the art of reading time quickly on the chronometer, and several of us were invited to share the practice of the astronomers, in observing an artificial transit of Venus, by means of an apparatus invented by one of the party. The actual transit took place the day before our anniversary and in the midst of the examinations and hurry of anniversary week, and to several of us teachers was the most important event, as it had been arranged that we should observe it through our own telescope, which was in excellent

# 6-inch Fitz

*Handwritten signature or name, possibly "Fitz" or "Fitzgerald", in a cursive script.*



# Seminary Observatory

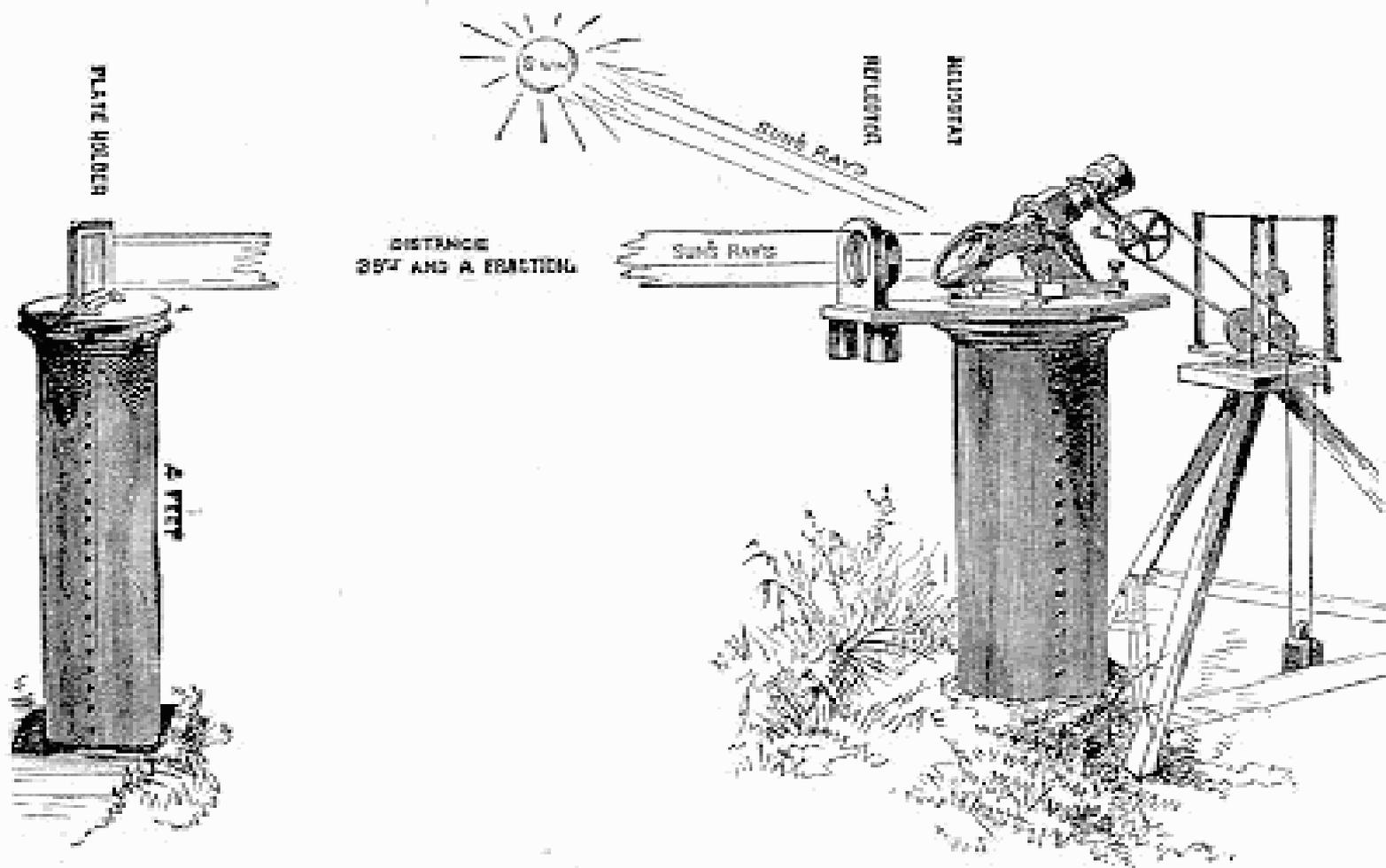
*Handwritten text, possibly a signature or name, appearing to read "Huntley - Davis"*

1932



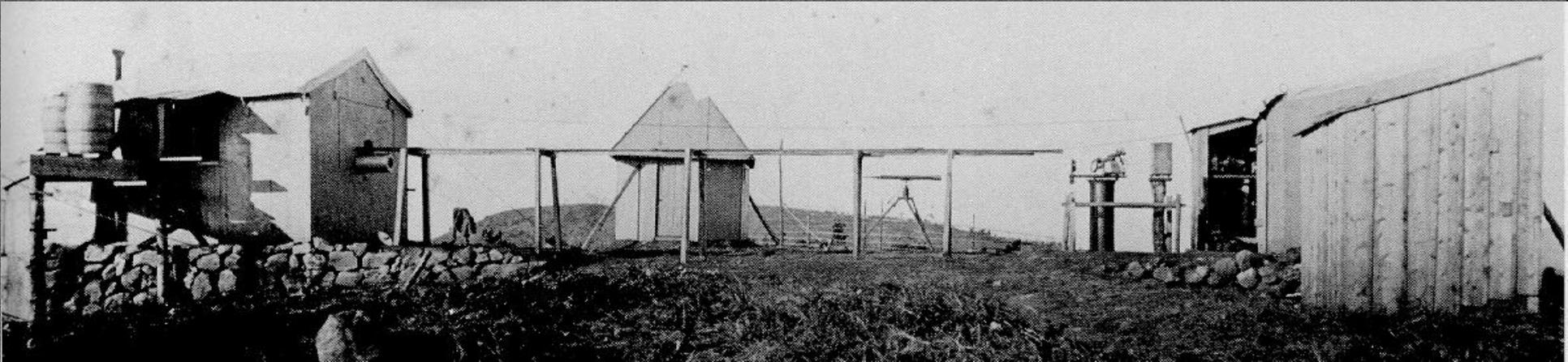
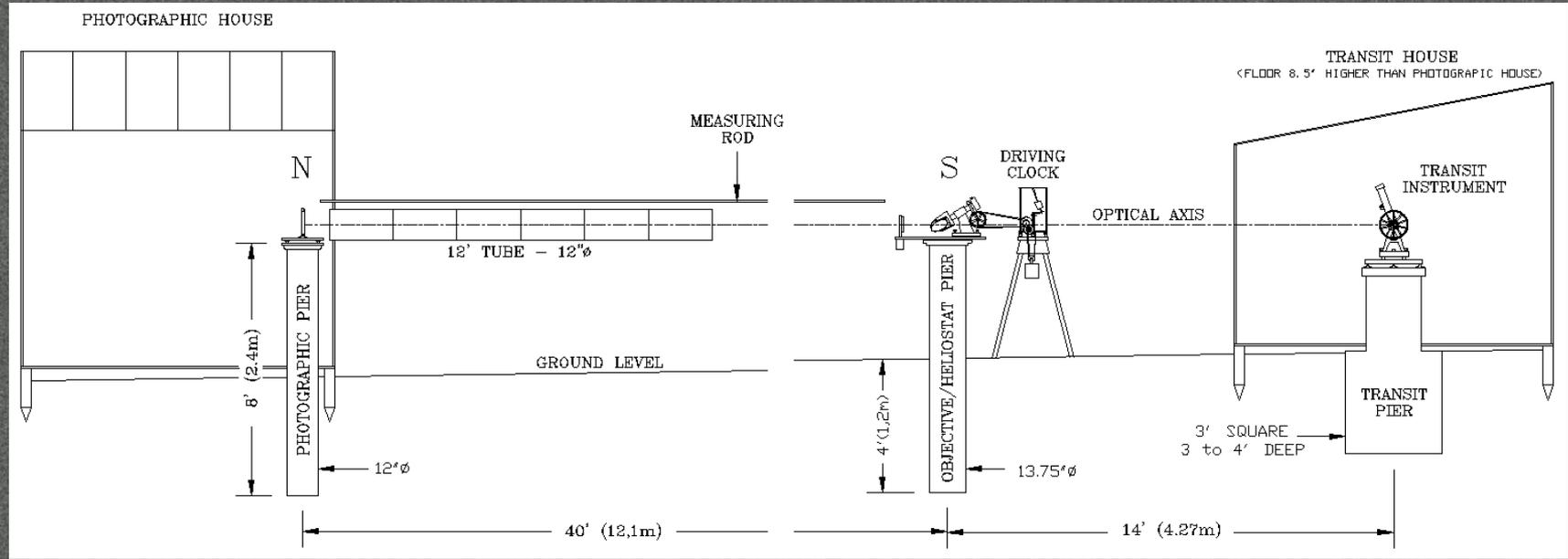
# Horizontal Photoheliograph

*Horizontal Photoheliograph*



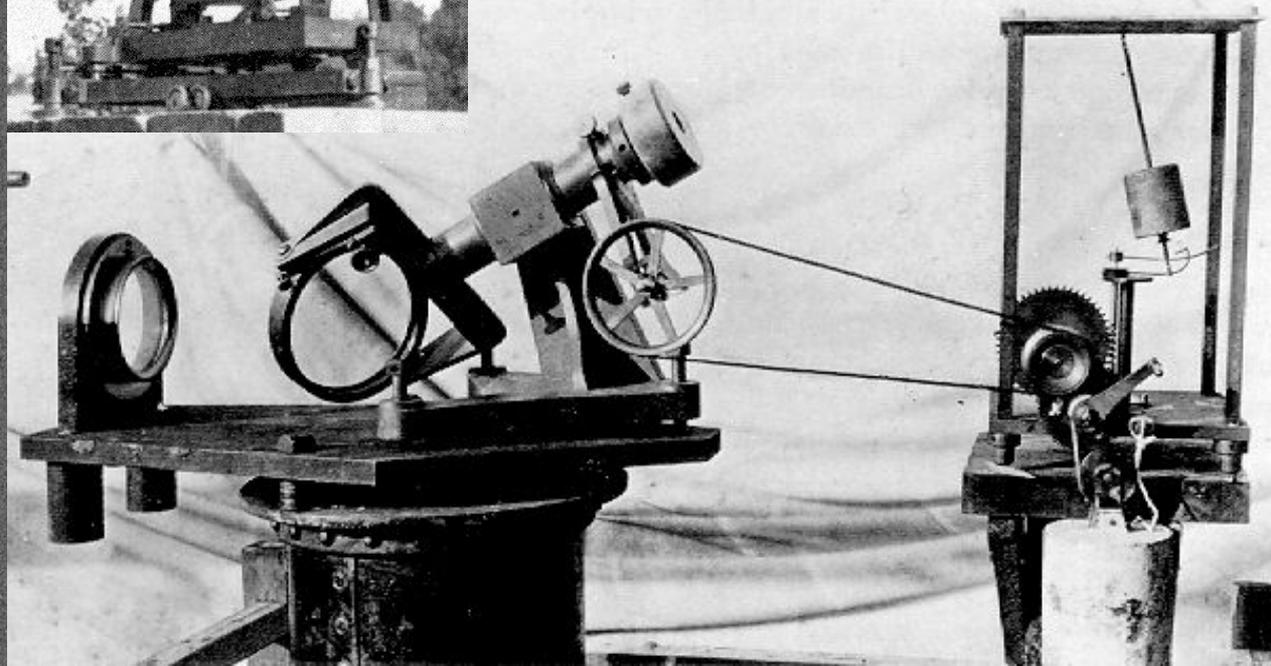
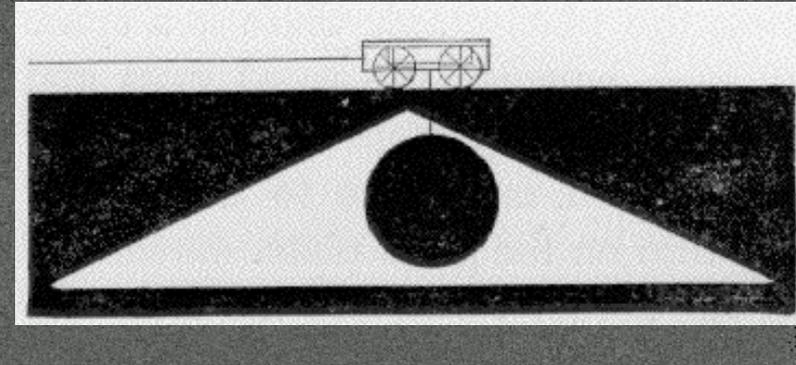
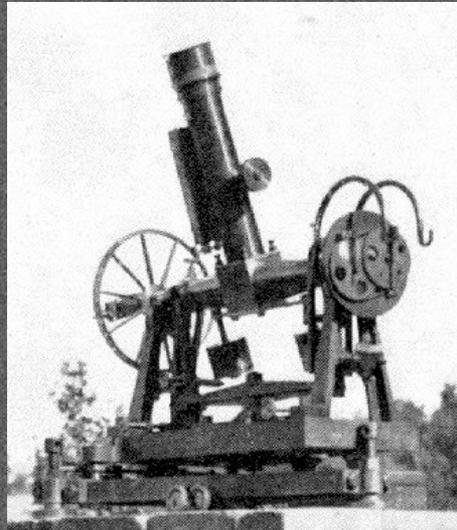
# Horizontal Photoheliograph

*Horizontal Photoheliograph*



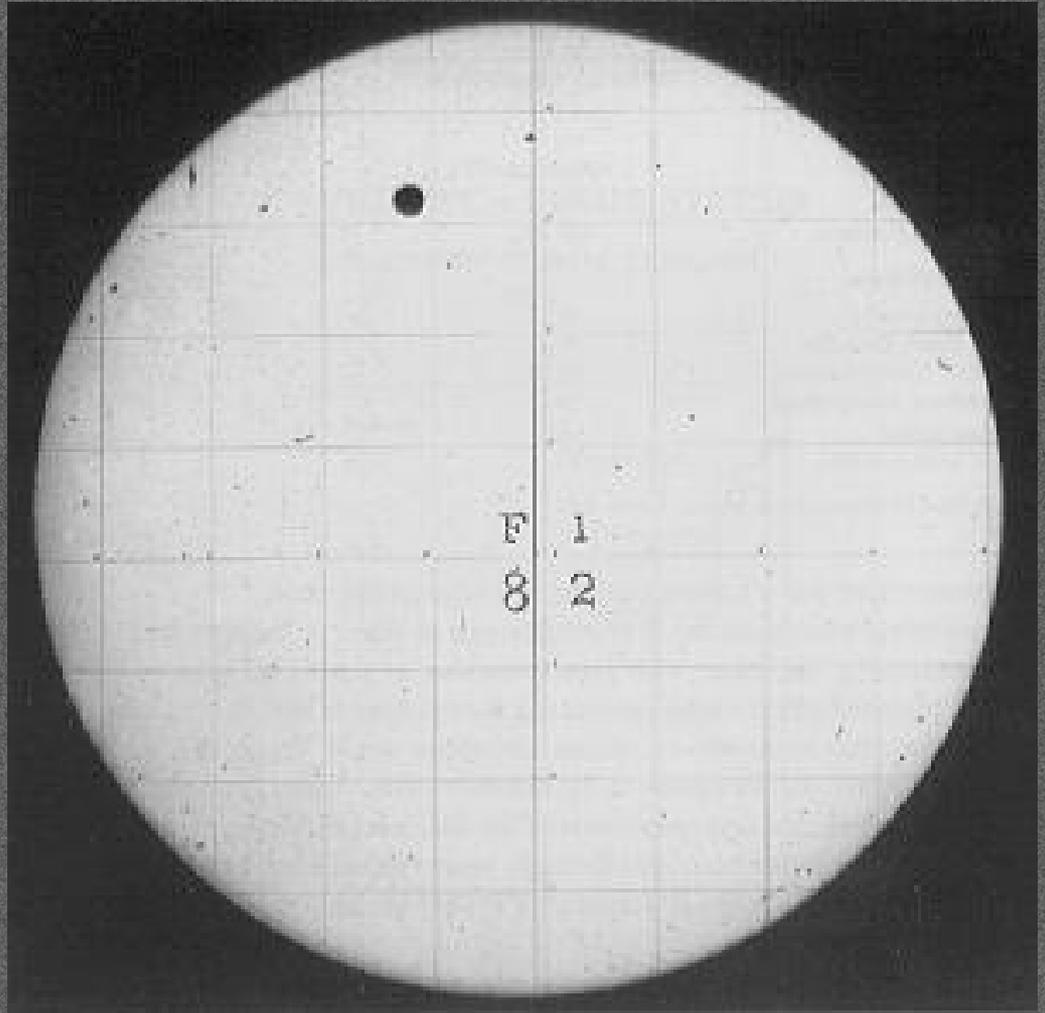
# American Instruments

*Wheeler & Davis*



# American photography

- 4½-inches diameter solar image on photographic plate.
- Grid for scale and distortion.
- Marks are flaws.
- Only 11 plates survived.



*Handwritten text, possibly a signature or name, appearing as a dark, smudged mark on a dark background.*

# 1874 Practice at USNO

*Wheaton - Dallas*



# Observations

*Handwritten notes:*  
 1/20/05 - 1/20/05

Wellington, South Africa.	236	200				
Prof. S. Newcomb.			1	1		
Lieut. T. L. Casey.			1	1		
Ensign J. H. L. Holcombe.			1	1		
Miss M. E. Cummings.			1	1		
Miss A. P. Ferguson.			1	1		
Miss J. N. Brown.			1	1		
Santa Cruz, Patagonia.	224	204				
Lieut. S. W. Very.			1	1	1	1
Mr. O. B. Wheeler.			1	1	1	1
Santiago, Chile.	204	152				
Prof. Lewis Boss.			1	1	1	1
Mr. Miles Rock.			1	1	1	1
Auckland, N. Zealand.	74	31				
M. Edwin Smith.						1
Prof. H. S. Pritchett.					1	1
Mr. John J. Steveson.					1	1
Total for S. Hemisphere.	738	587	10	10	6	7
Total for both Hemispheres	1700	1382	14	17	17	17

# Observations

Reminiscences of Huguenot Seminary,  
1877-1887

Huguenot Seminary,

Wellington

day when the Transit took place. There was considerable excitement when it was found that the results obtained by the amateurs were more accurate than those of the professionals.

Prof. Newcombe, the chief astronomer, said this was due partly to good fortune and partly "to the quickening of the faculties which comes with intense interest." It is to be regretted

# Afterwards

Prof Newcomb wrote in his autobiography, 20 years later:

"On our departure we left two iron pillars, on which our apparatus for photographing the Sun was mounted, firmly imbedded in the ground, as we had used them. Whether they will remain there until the transit of 2004, I do not know, but cannot help entertaining a sentimental wish that, when the time of that transit arrives, the phenomenon will be observed from the same station, and the pillars be found in such a condition that they can again be used."

# Afterwards

Another 30 years later, H.E. Wood (Union Observatory, Jhb) reads Newcomb's wish, visits Wellington & writes:

"Unfortunately the iron pillars left behind by Newcomb have not remained undisturbed. Their existence has been forgotten and the piers have disappeared. Upon enquiries being made in April 1936, it was found that one of the garden boys remembered the position where one of the pillars had been and, on excavating, a foundation was found. At this spot an iron post has been erected to mark the site at which Newcomb's observations were made."

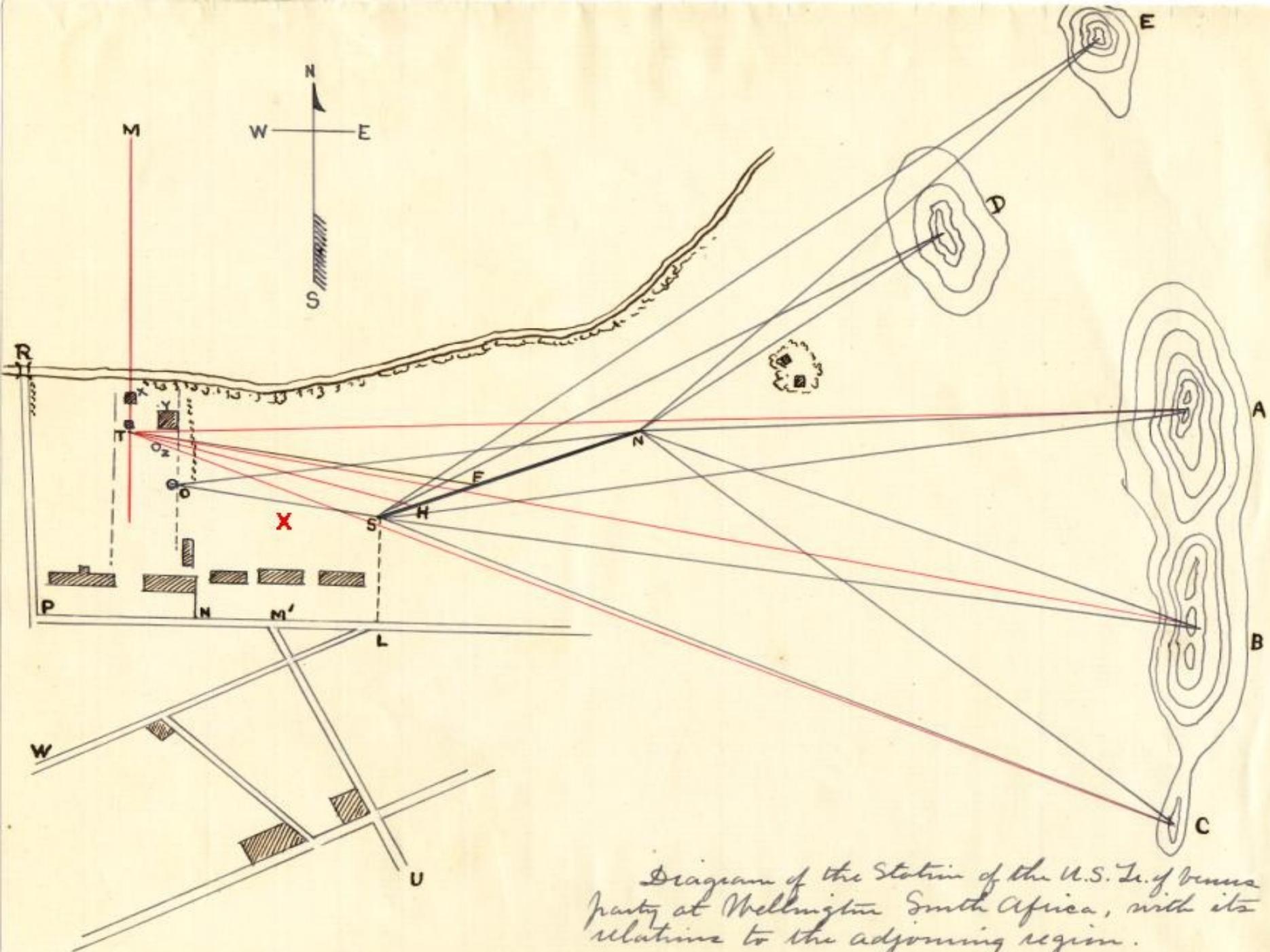
# Wood's Iron Post?

*Walter Davis*



Wood's  
Iron Post?

Seminary  
Observatory

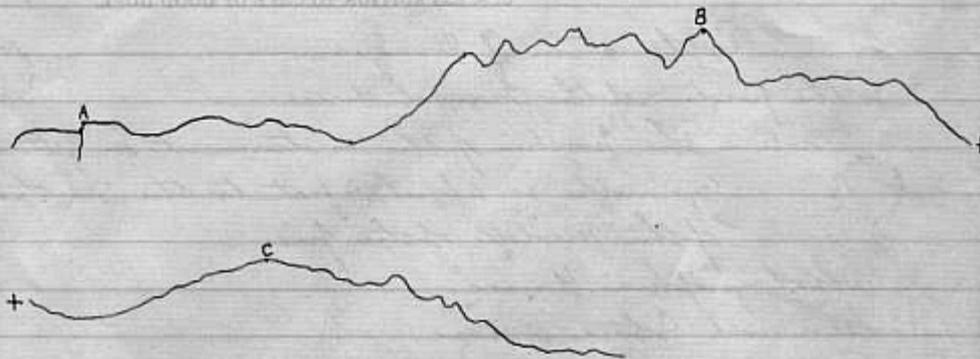


*Diagram of the Station of the U.S. L. of Venus party at Wellington South Africa, with its relations to the adjoining region.*

# Newcomb's report

TRANSIT OF VENUS, 1882 DEC. 6.

U. S. EXPEDITION TO CAPE OF GOOD HOPE.



The above represents the profile of the mountains  
from N.

A is the bottom angle of a sharply marked cleft  
B is a sharply marked peak  
C is the highest point of the next mountain  
to the south.

D is a high green hill with rounded top  
and the readings are taken on a beam  
which has been erected on its summit  
E is the highest peak to be seen rising to  
its North from N.

Angle SNC =  $96^{\circ} 42.2$

" SNB = 116 3

" SNA = 156 25

" SND = 166 13.5

" SNE = 152 19

" SNO = 10 40

" NSO = 148 58

Azimuth MTA =  $84^{\circ} 15'$

" MTB = 121 50.5

" MTC = 140 56.5

" MTH = 108 1

HS = 25.28 ft

Angle NSL =  $119^{\circ} 35'$

SL = 383 feet.

Angle SLP =  $87^{\circ} 5'$

" SEW = 118 4

LM' = 230 ft

Angle LM'U =  $59^{\circ} 50'$

M'N = 225 ft.

NP = 356 .

Angle RPL =  $95^{\circ} 00'$

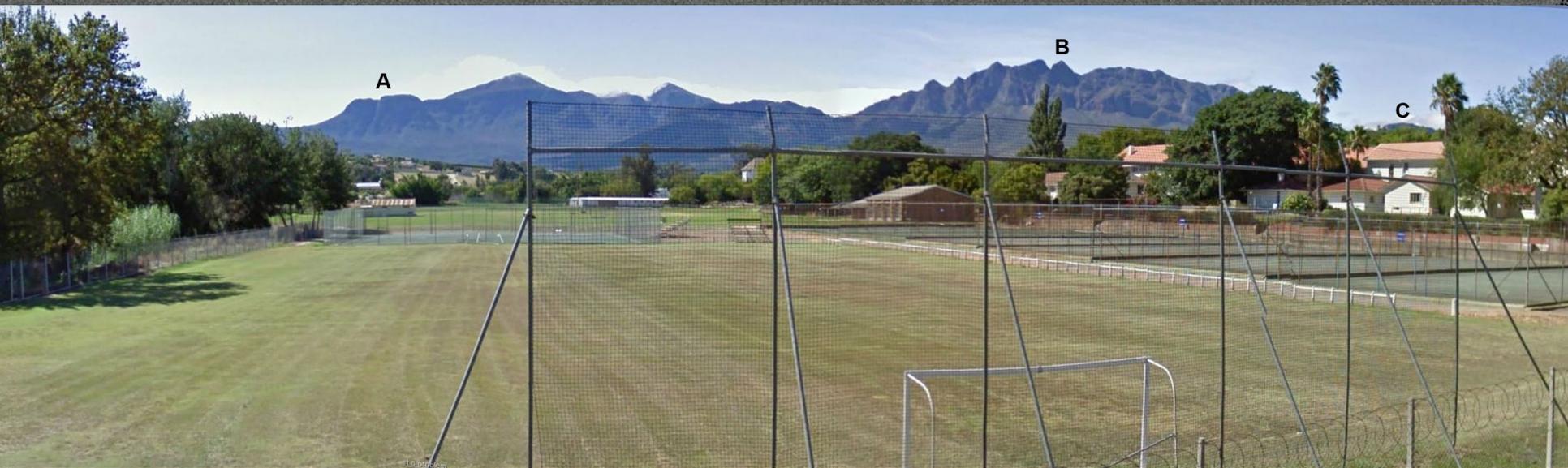
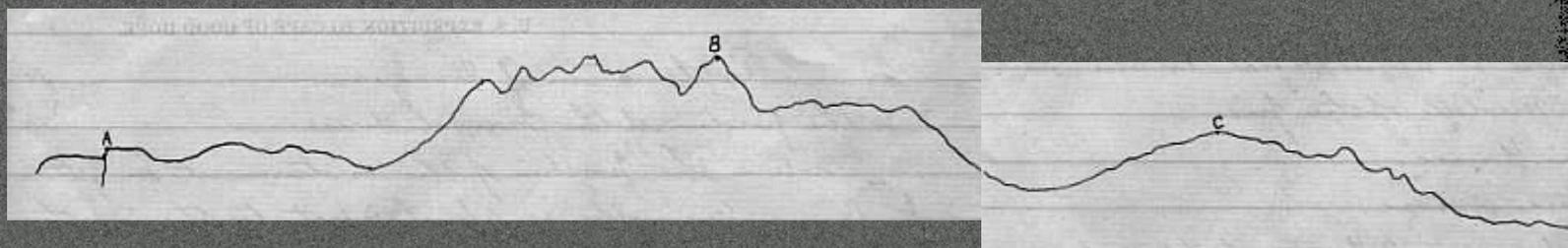
PR = 696 feet.

R Bridge over small stream near station  
MT Meridian of Transit

J. L. Combs

# Survey

1/10/2018 - 1/10/2018



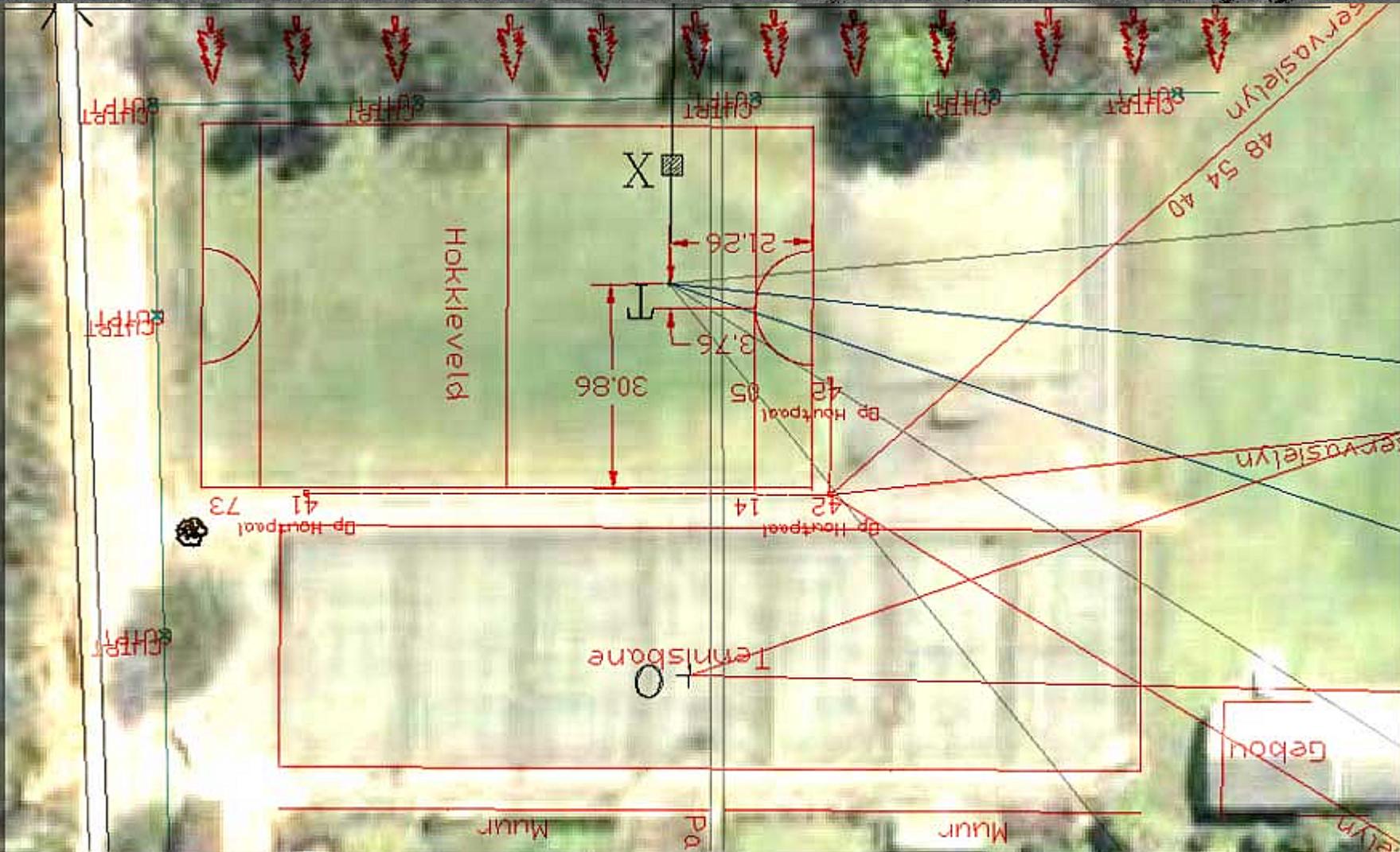
# Survey

Hyman - Davis









# Seminary Observatory

*Yonkers - New York*  
1935



# Newcomb's Site, June 2004



Wellington,  
8 June 2004

Wynne - Dallas



Prof. D. Block

Walter Dyer



Prof. D. Block

*Handwritten signature*



# Prof. D. Block

*Handwritten signature: Prof. D. Block*



## CERTIFICATE

This is to certify that the items accompanying this certificate are genuine

**Gold Reef City**  
MINT  
Est. 1986  
Gold Reef City Mint  
Johannesburg, South Africa  
Tel (+2711) 496-1405  
Fax (+2711) 496-1137

**"Transit of Venus"**  
Medallion  
Manufactured of Fine Silver  
99.9 % purity

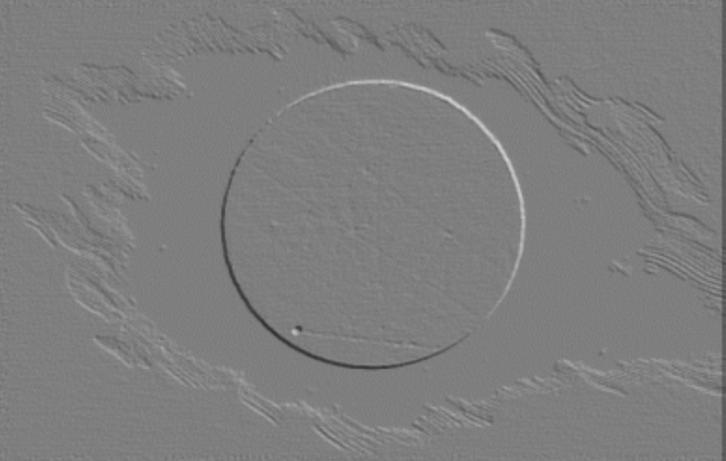
Number 135 of 100 pieces

Signed... *Soleiman*

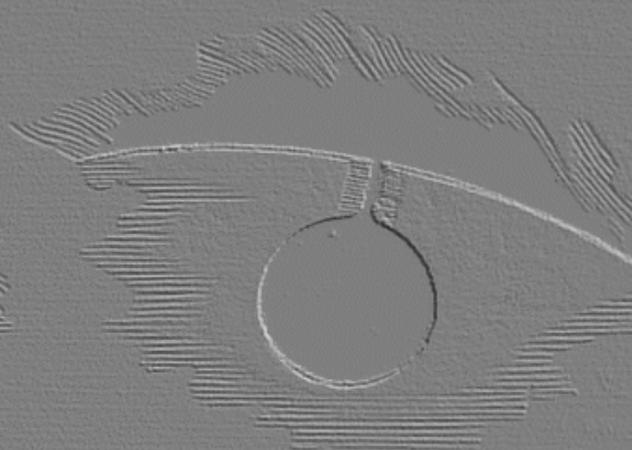
Date 8th June 2004

Manufactured by Gold Reef City Mint

TRANSIT OF VENUS



## The British Expeditions



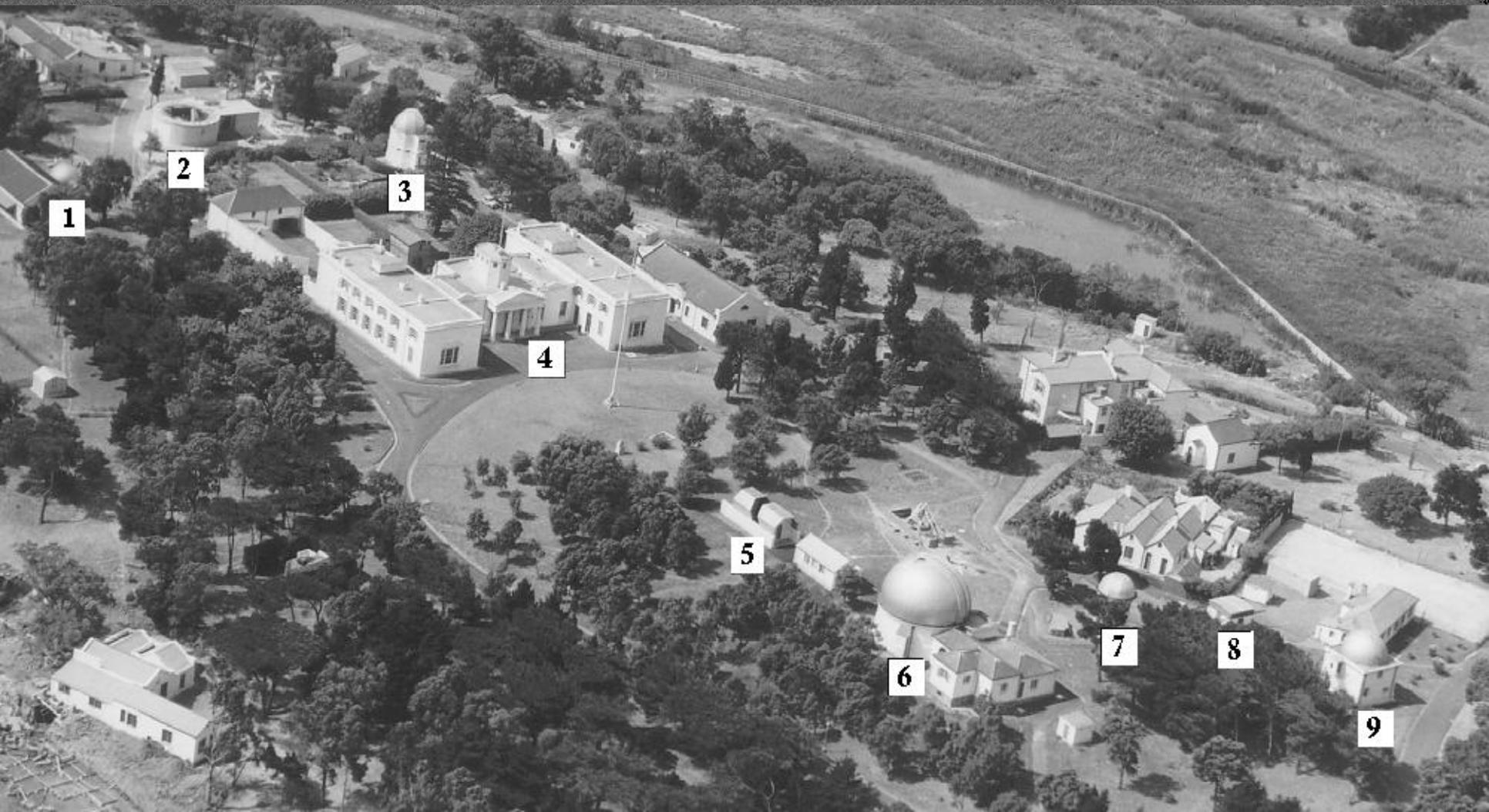
# British & local observations

*Handwritten text: Hunter - Lewis*

Station	Observer	Assisted by	Telescope	Power	Chronometer
<b>Durban</b> 31° 00' 17".7 E 29° 50' 47".4 S	Mr. E. Neison	Mr. P. Sandford	8" Grubb Equatorial (stopped down to 6")	160	Poole 1407
<b>Aberdeen Road</b> 24° 18' 54".3 E 32° 45' 56".5 S	Mr. W.H. Finlay		6" Grubb Equatorial	180	Molyneux 2184
	Mr. R.T. Pett		6" Grubb Equatorial	180	Molyneux 2275
<b>Montagu Road (Touws River)</b> 20° 02' 09".6 E 33° 20' 23".0 S	Mr. A. Marth	Corp. Thornton	6" Grubb Equatorial	180	Birchall 308
	Mr. C.M. Stevens	Mr. J.E. Willis	4½" Dallmeyer Equatorial	145 & 185	Arnold 227
<b>Cape Observatory</b> 18° 28' 41".1 E 33° 56' 03".5 S	Dr. (later Sir) D. Gill	Mr. Gamble & Mr. Fry	6" Grubb Equatorial	110	Dent 1681 Molyneux 3299
	Mr. G.W.H. Maclear	Mr. Coakes	7" Merz Equatorial	184	Parkinson & Bouts 801
	Mr. (later Dr.) W.L. Elkin		4.2" "Dun Echt" Heliometer	180	Gill
	Mr. J. Freeman		3½" Theodolite	74	Arnold 1167
	Mr. C.R. Pillans	Mr. M.W. Theal	3½" Equatorial	120	Barraud 618
	Capt. M. Jurisch		2½" Reinfelder & Hertel Telescope	135	Murray 753

# Royal Observatory

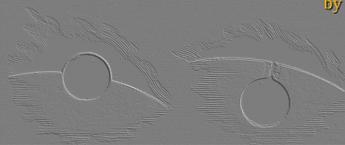
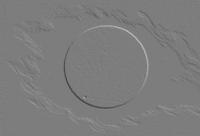
*Handwritten signature or name*



TRANSIT OF VENUS

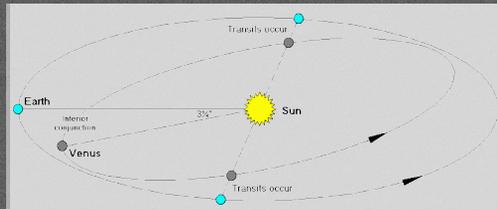
**Transit of Venus**  
relics in South Africa

by Willie Koorts



## What are Transits?

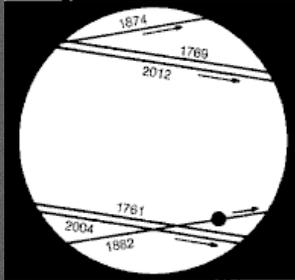
*Transit of Venus*



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What are  
Transits?

*Transits of Venus*



## What are Transits?

Transit of Venus

- Only the two inner planets (Mercury and Venus) can transit the disk of the Sun (as seen from the Earth)



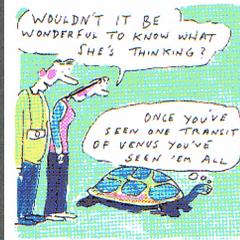
- Frequency of Transits:

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  - Last pair – 2004 & 2012 – seen by millions

## What are Transits?

*Transit of Venus*

### Hear it for Harriet



Though most people's interest in the recently deceased Galapagos tortoise Harriet was because of her supposed association with Darwin, now debunked by Henry Nicholls, my interest was astronomical (15 July, p 21). No human was alive for the 8 June 2004 transit of Venus who had seen the previous transit in 1882, much less the one in 1874. So Harriet was a creature who may well have seen those transits and eventually got to see three.

## Famous people and Transits

*Transit of Venus*

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Was the first to predict that Transits of Venus are possible
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Refined a method to determine the Solar Parallax from Transit “contact” timings (1761 onwards)
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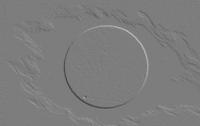
## SA's Transit History

*Hansen - Venus*

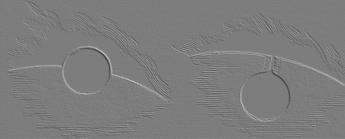
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- **1882** :
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  - British expedition to Montagu Road (Touws River).
  - Locally from Cape Town, Durban & Aberdeen Rd.



TRANSIT OF VENUS



The American Expedition



## American expedition

*Transfer to Vexos*

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  - Prof. Simon Newcomb (right)
  - Lieut. Thomas L. Casey
  - Ensign J.H.L. Holcombe
  - Mr. J. Ulke
- Originally destined for Beaufort-West but eventually chose Wellington.



## Huguenot Seminary

*Huguenot Seminary*

- Miss Ferguson was keen amateur and offered Astronomy at the Seminary since 1874.
- Gill often lectured there.
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*Transit of Venus*

"I must tell you of our telescope before I close. Some of you perhaps know that it is the one through which we had a few peeps when pupils of Mt. Holyoke. When it was no longer needed there, Mr Williston kindly presented it to the So. African daughter of Mt. Holyoke. An observatory was erected for it in our garden, and the telescope was mounted under the direction of Dr Gill, the Astronomer Royal, from Cape Town. It was scarcely in order when the "Transit of Venus Expedition" from the United States, arrived in Cape Town, and soon after decided upon Wellington as the best astronomical station for their purpose. Our garden was selected as the best site, all things considered, and four buildings were erected. Prof Newcomb, the Chief of the Expedition, instructed the pupils in Miss Ferguson's astronomy class and several of us teachers, in the art of reading time quickly on the chronometer, and several of us were invited to share the practice of the astronomers, in observing an artificial transit of Venus, by means of an apparatus invented by one of the party. The actual transit took place the day before our anniversary and in the midst of the examinations and hurry of anniversary week, and to several of us teachers was the most important event, as it had been arranged that we should observe it through our own telescope, which was in excellent

6-inch Fitz

*Hunter & Sons*



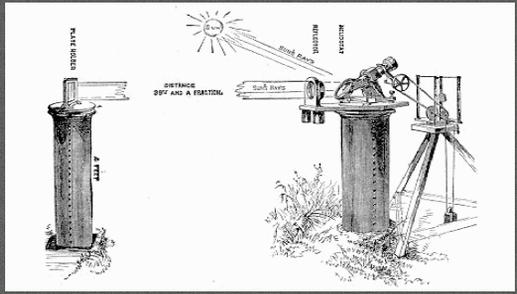
Seminary  
Observatory

*Historic Photos*  
1932



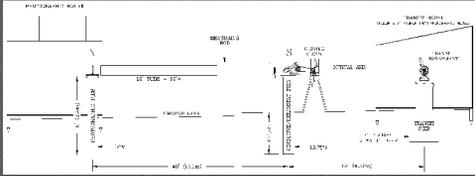
# Horizontal Photoheliograph

Hewlett-Packard



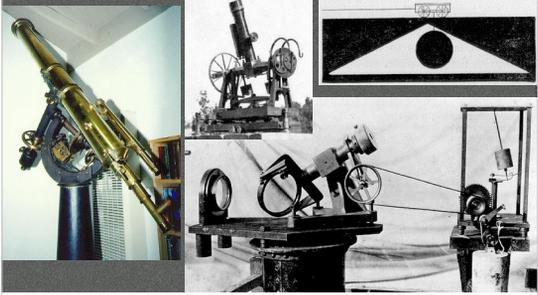
# Horizontal Photoheliograph

*Transfer - Lines*



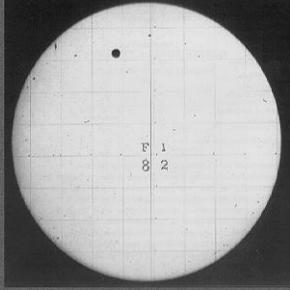
American  
Instruments

*Hunter & Sons*



## American photography

- 4½-inches diameter solar image on photographic plate.
- Grid for scale and distortion.
- Marks are flaws.
- Only 11 plates survived.



1874 Practice  
at USNO

*Transfer to USNO*



## Observations

*Hunter - 1895*

Wellington, South Africa.	236	200				
Prof. S. Newcomb.			1	1		
Lieut. T. L. Casey.			1	1		
Ensign J. H. L. Holcombe.			1	1		
Miss M. E. Cummings.			1	1		
Miss A. P. Ferguson.			1	1		
Miss J. N. Brown.			1	1		
Santa Cruz, Patagonia.	224	204				
Lieut. S. W. Very.			1	1	1	1
Mr. O. B. Wheeler.			1	1	1	1
Santiago, Chile.	204	152				
Prof. Lewis Boss.			1	1	1	1
Mr. Miles Rock.			1	1	1	1
Auckland, N. Zealand.	74	31				
M. Edwin Smith.						1
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Mr. John J. Steveson.						1
Total for S. Hemisphere.	738	587	10	10	6	7
Total for both Hemispheres	1700	1382	14	17	17	17

## Observations

Hansen - Venus

*Reminiscences of Huguinet Seminary,  
1877-1887*

Huguinet Seminary,

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## Afterwards

*Hansen - Venus*

Prof Newcomb wrote in his autobiography, 20 years later:

"On our departure we left two iron pillars, on which our apparatus for photographing the Sun was mounted, firmly imbedded in the ground, as we had used them. Whether they will remain there until the transit of 2004, I do not know, but cannot help entertaining a sentimental wish that, when the time of that transit arrives, the phenomenon will be observed from the same station, and the pillars be found in such a condition that they can again be used."

## Afterwards

*Howler Venus*

Another 30 years later, H.E. Wood (Union Observatory, Jhb) reads Newcomb's wish, visits Wellington & writes:

"Unfortunately the iron pillars left behind by Newcomb have not remained undisturbed. Their existence has been forgotten and the piers have disappeared. Upon enquiries being made in April 1936, it was found that one of the garden boys remembered the position where one of the pillars had been and, on excavating, a foundation was found. At this spot an iron post has been erected to mark the site at which Newcomb's observations were made."

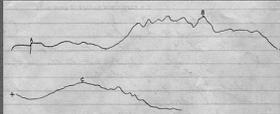
Wood's Iron  
Post?

*Historical Review*





## Newcomb's report



The above represents the profile of the mountain from N  
 A is the better angle of a sharply rounded cliff  
 B is a sharply rounded peak  
 C is the highest point of the mountain to the south.

D is a high green hill well rounded top and the country on both sides is a plain which has been cleared on its summit  
 E is the highest peak to be seen from the North from N.

### TRANSIT OF VENUS, 1882 DEC. 6. U. S. EXPEDITION TO CAPE OF GOOD HOPE.

Angle SNC =  $94^{\circ} 42'$   
 - SNB =  $116^{\circ} 3'$   
 - SNA =  $136^{\circ} 25'$   
 - SND =  $164^{\circ} 25'$   
 - SNE =  $182^{\circ} 18'$   
 - SNO =  $10^{\circ} 40'$   
 - NSO =  $194^{\circ} 34'$

Opposite MTA =  $90^{\circ} 15'$   
 - MTB =  $121^{\circ} 58.5'$   
 - MTC =  $160^{\circ} 58.5'$   
 - MTE =  $102^{\circ} 3'$   
 - MS =  $26.244'$

Angle NSL =  $119^{\circ} 35'$   
 SL =  $385 \text{ feet}$   
 Angle SEP =  $37^{\circ} 15'$   
 SEN =  $114^{\circ} 4'$   
 LW =  $230 \text{ feet}$

Angle LWD =  $59^{\circ} 56'$   
 ND =  $245 \text{ feet}$   
 NP =  $358'$

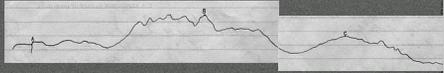
Angle RPL =  $95^{\circ} 34'$   
 PR =  $496 \text{ feet}$

\* Bridge over small stream near station  
 MT. Mountain of Transit

T. L. Casey

# Survey

Transfer to Excel



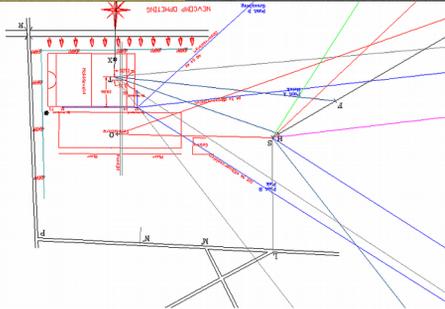
# Survey

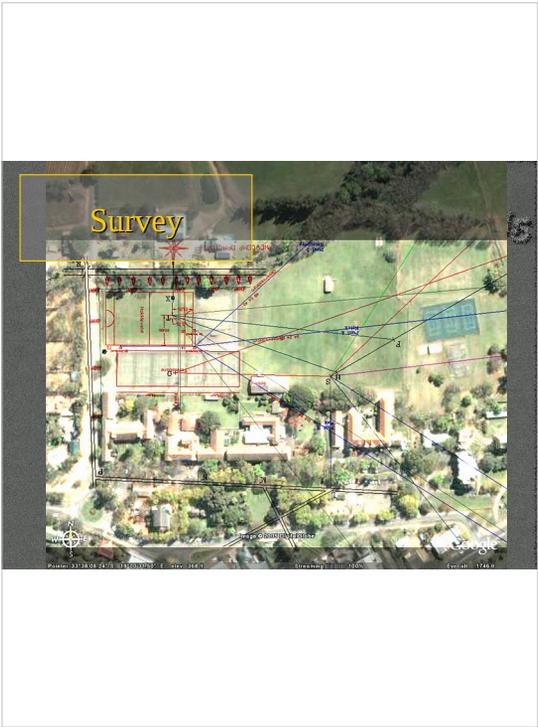
*Transfer to Lexus*

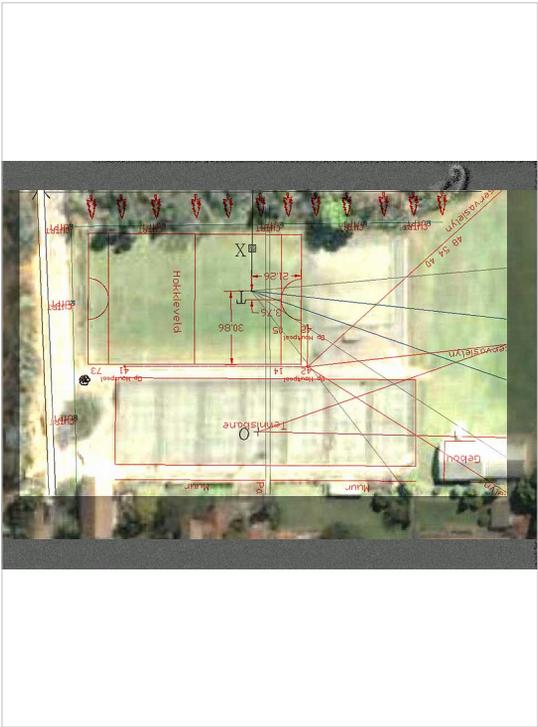


# Survey

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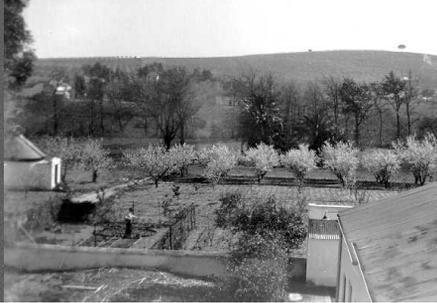






Seminary  
Observatory

*Transfer to Texas*  
1935



Newcomb's  
Site, June 2004



Wellington,  
8 June 2004

*Transfer - Venus*



Prof. D. Block

Hawthorn Valley



Prof. D. Block

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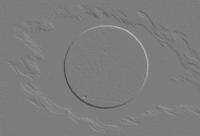


Prof. D. Block

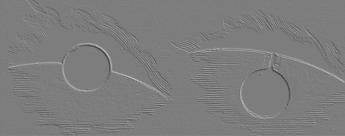
*Transit of Venus*



TRANSIT OF VENUS



The British  
Expeditions



## British & local observations

*Howden - 1850s*

Station	Observer	Assisted by	Telescope	Power	Chronometer
<b>Durban</b> 31° 00' 17" E 29° 32' 47" S	Mr. E. Neison	Mr. F. Sandford	8" Grubb Equatorial (stopped down to 6")	160	Poole 1407
<b>Aberdeen Road</b> 24° 18' 34" E 32° 42' 32" S	Mr. W.H. Finlay		6" Grubb Equatorial	180	Molyneux 2184
	Mr. R.T. Pett		6" Grubb Equatorial	180	Molyneux 2275
<b>Montagu Road</b> (Touws River) 20° 02' 09" E 32° 28' 23" S	Mr. A. Marth	Corp. Thornton	6" Grubb Equatorial	180	Burchall 308
	Mr. C.M. Stevens	Mr. J.E. Willis	4 1/2" Dallmeayer Equatorial	145 & 185	Arnold 227
<b>Cape Observatory</b> 18° 28' 41" E 33° 56' 03" S	Dr. (later Sir) D. Gill	Mr. Gumble & Mr. Fry	6" Grubb Equatorial	110	Dent 1681 Molyneux 3299
	Mr. G.W.H. Meikle	Mr. Coakes	7" Merz Equatorial	184	Parkinson & Bouts 801
	Mr. (later Dr.) W.L. Ekin		4.2" "Dun Eckh" Helometer	180	Gill
	Mr. J. Freeman		3 1/2" Theodolite	74	Arnold 1167
	Mr. C.R. Fillans	Mr. M.W. Theal	3 1/2" Equatorial	120	Barraud 618
	Capt. M. Jursch		2 1/2" Reinfelder & Hertel Telescope	135	Murray 753

Royal  
Observatory

*Hunter & Sons*

