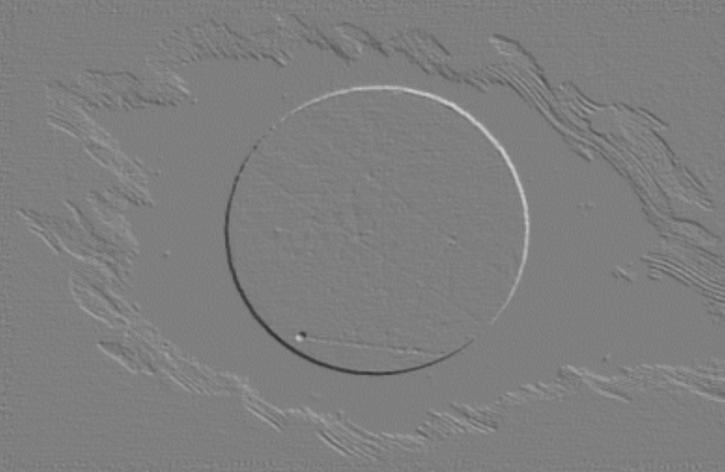
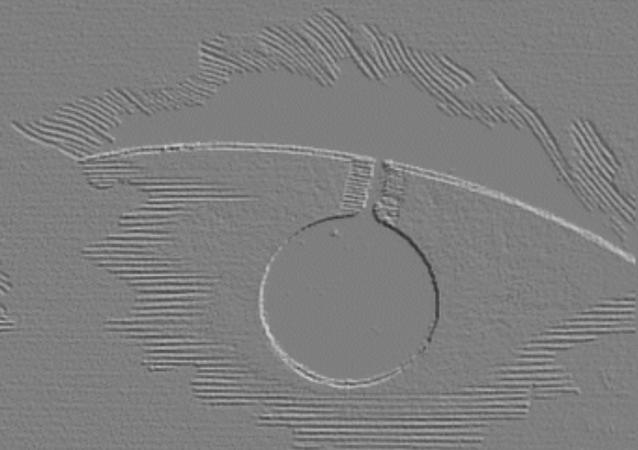
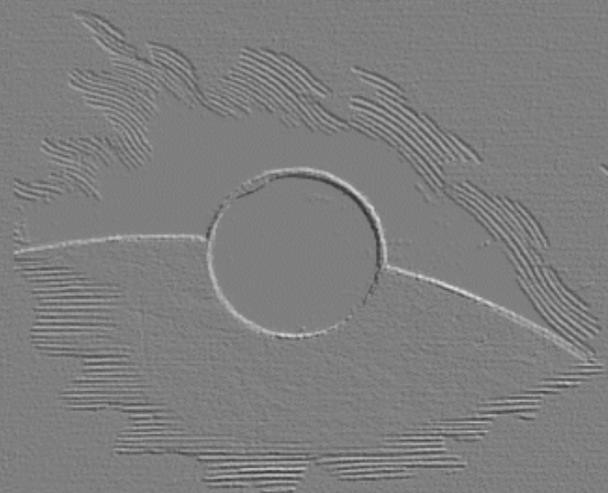


TRANSIT OF VENUS



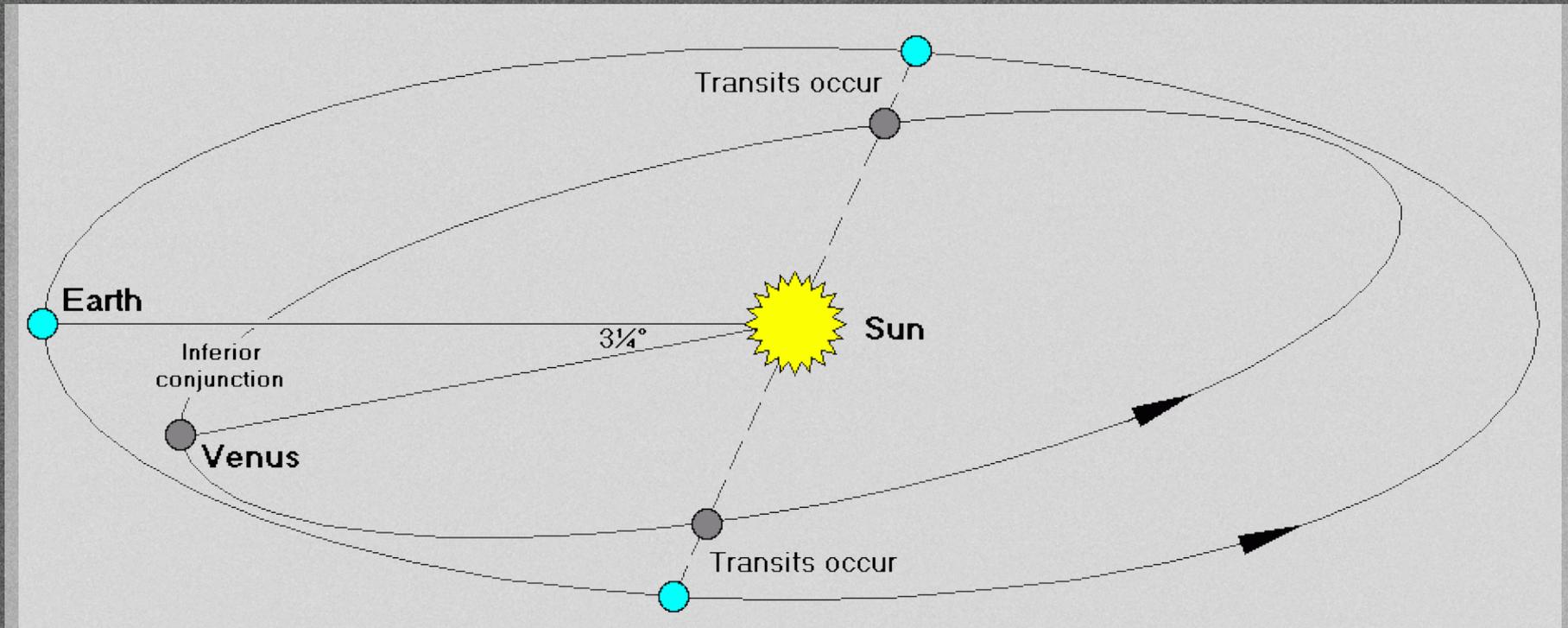
Transit of Venus relics in South Africa

by Willie Koorts



What are Transits?

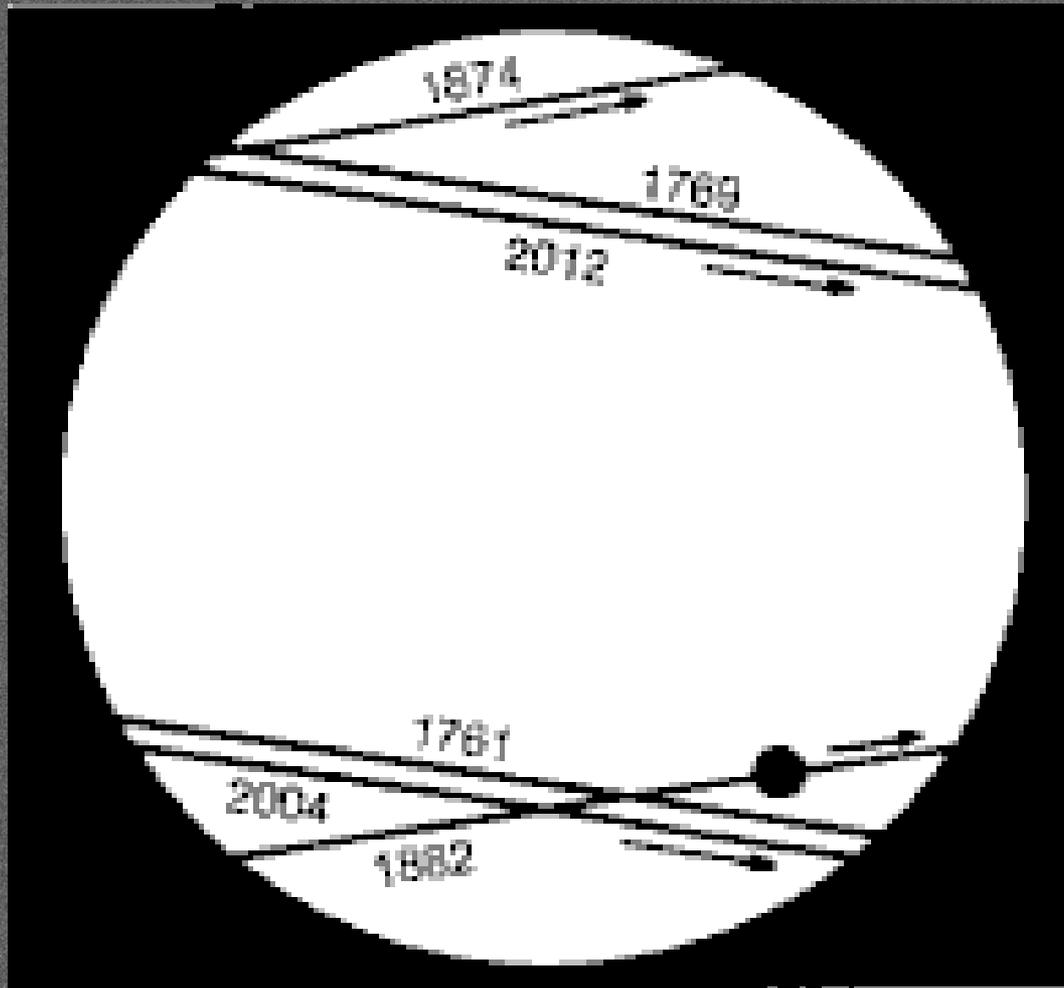
Planet - Venus



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

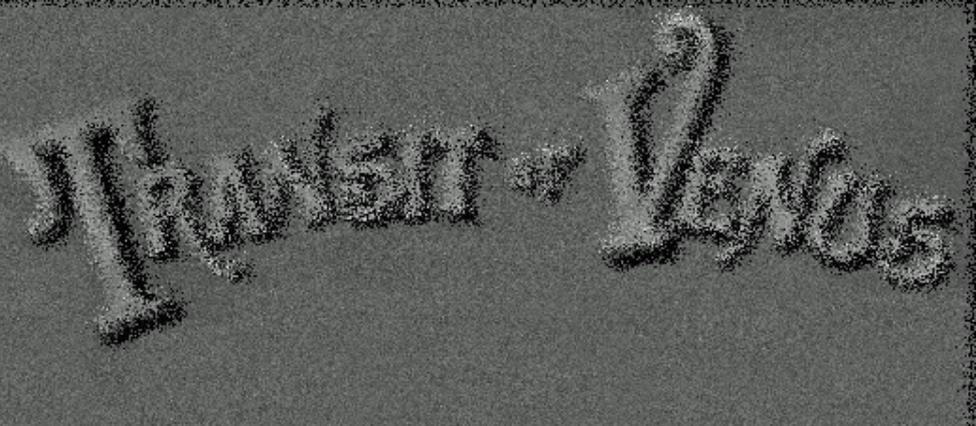


What are Transits?

- 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?

Harriet - Galapagos

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

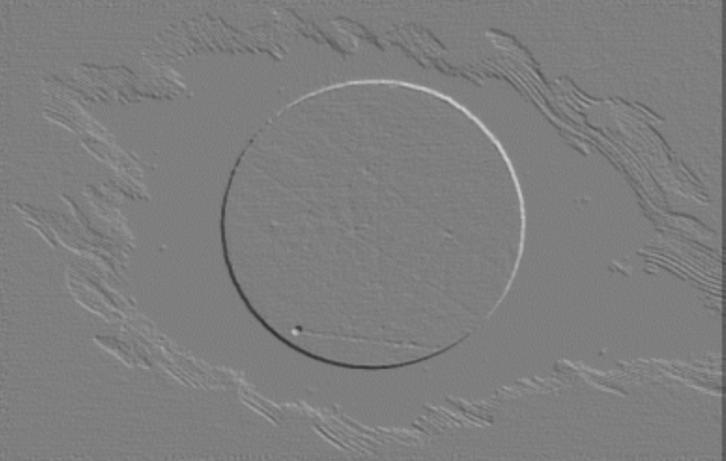


SA's Transit History

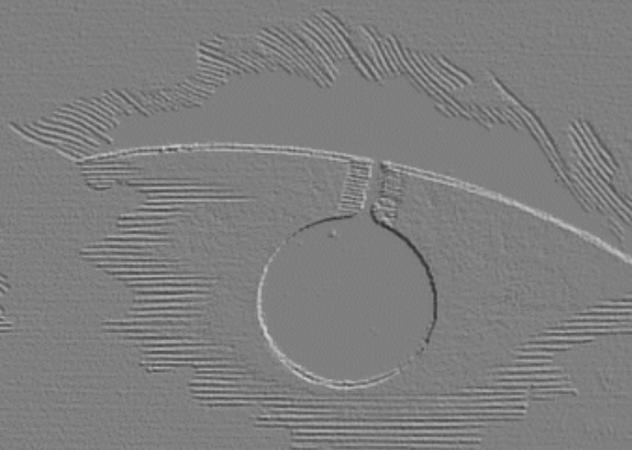
- **1761** : Mason & Dixon, on route to Sumatra, were running late and observed from Cape Town. In fact, they managed the only observations from the south Atlantic region.
- **1874** : SA not well placed, only a few local observations from Cape Town and P.E.
- **1882** :
 - American expedition to Wellington.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



TRANSIT OF VENUS



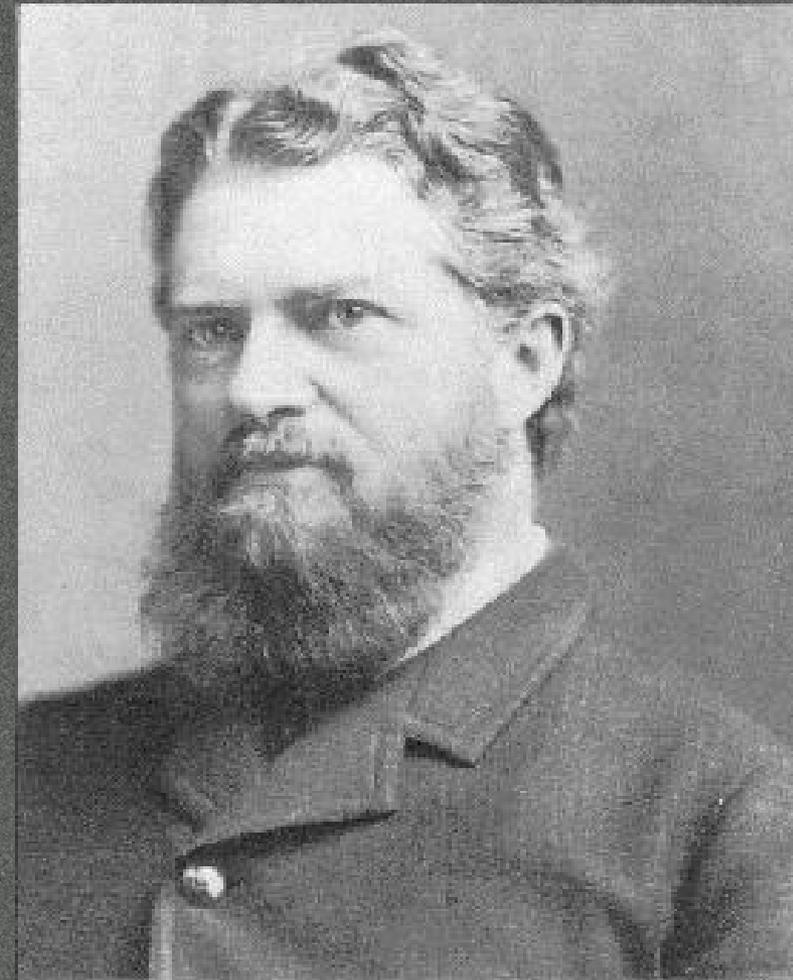
The American Expedition



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.

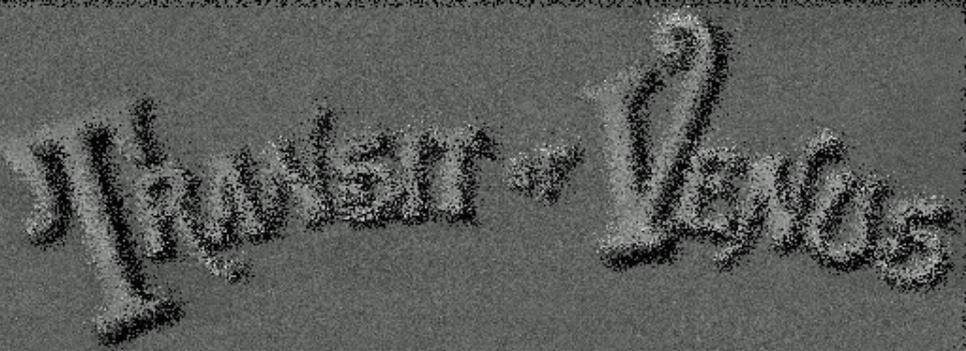


Huguenot Seminary

- 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.



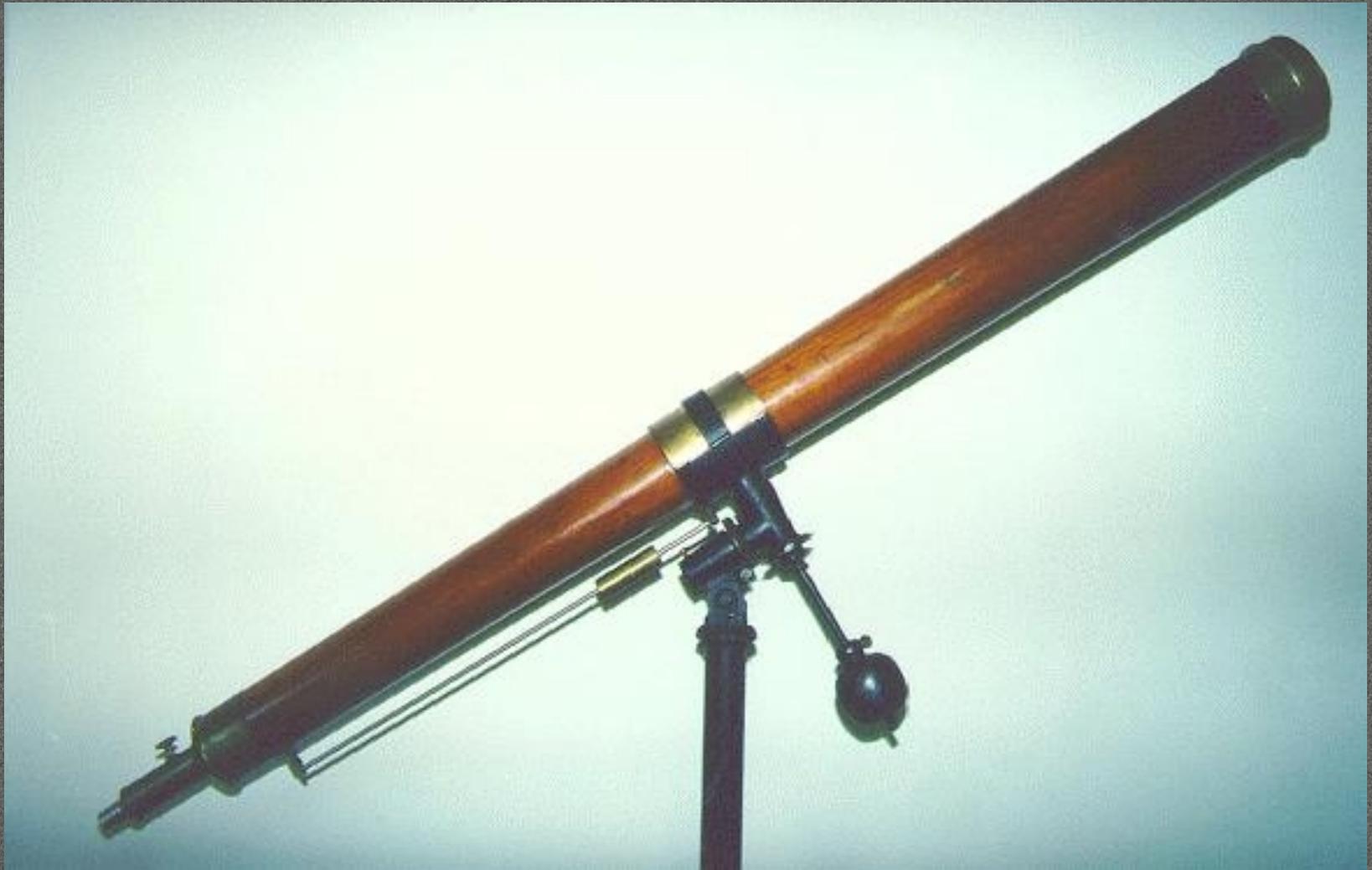
Miss Cummings writes:



"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

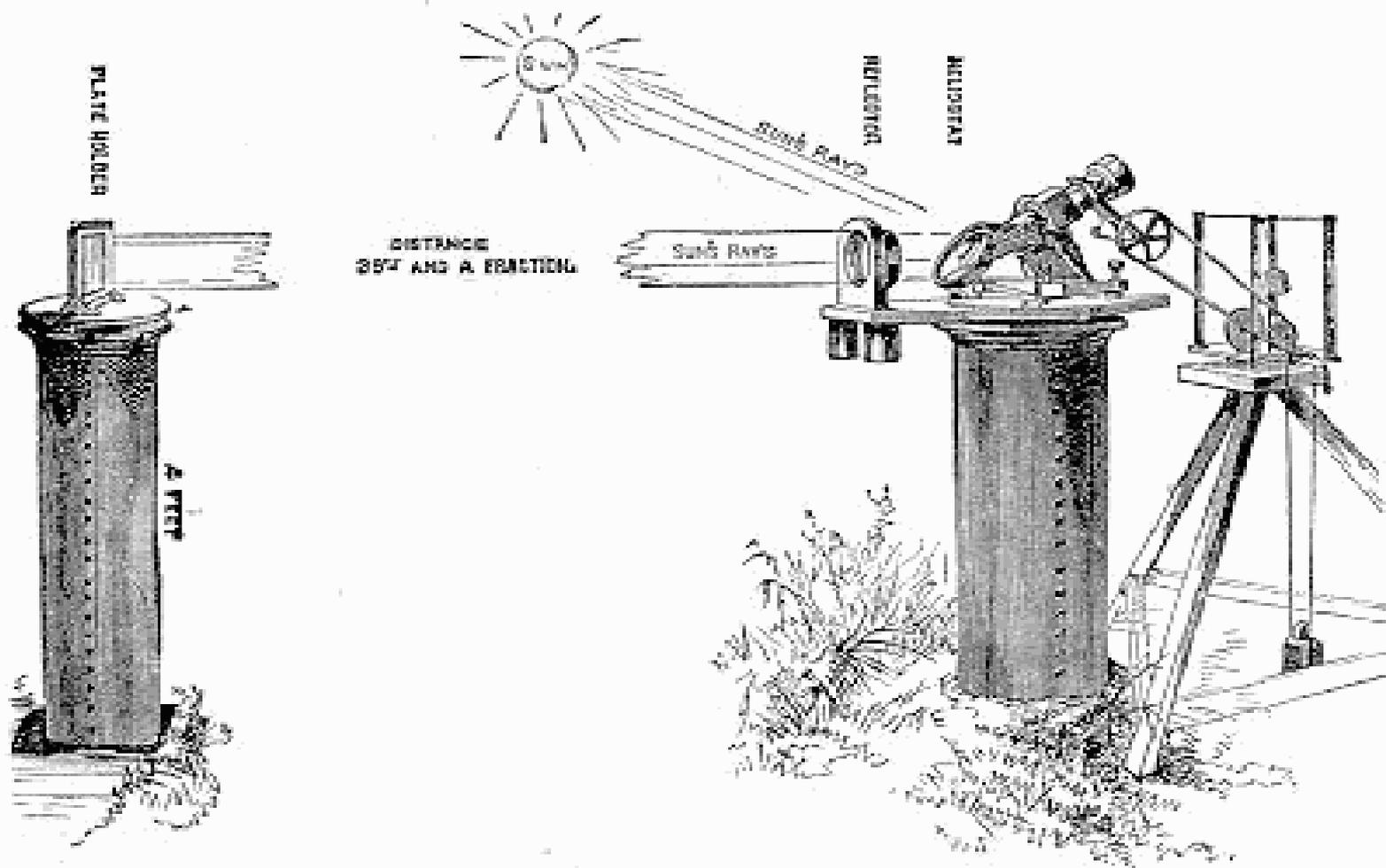
Handwritten text, possibly "Seminary - Dallas"

1932



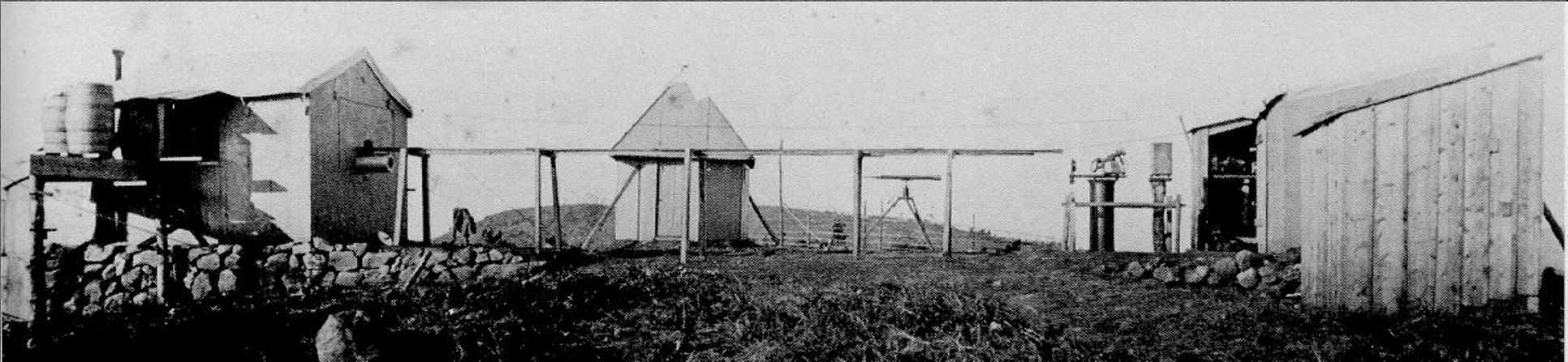
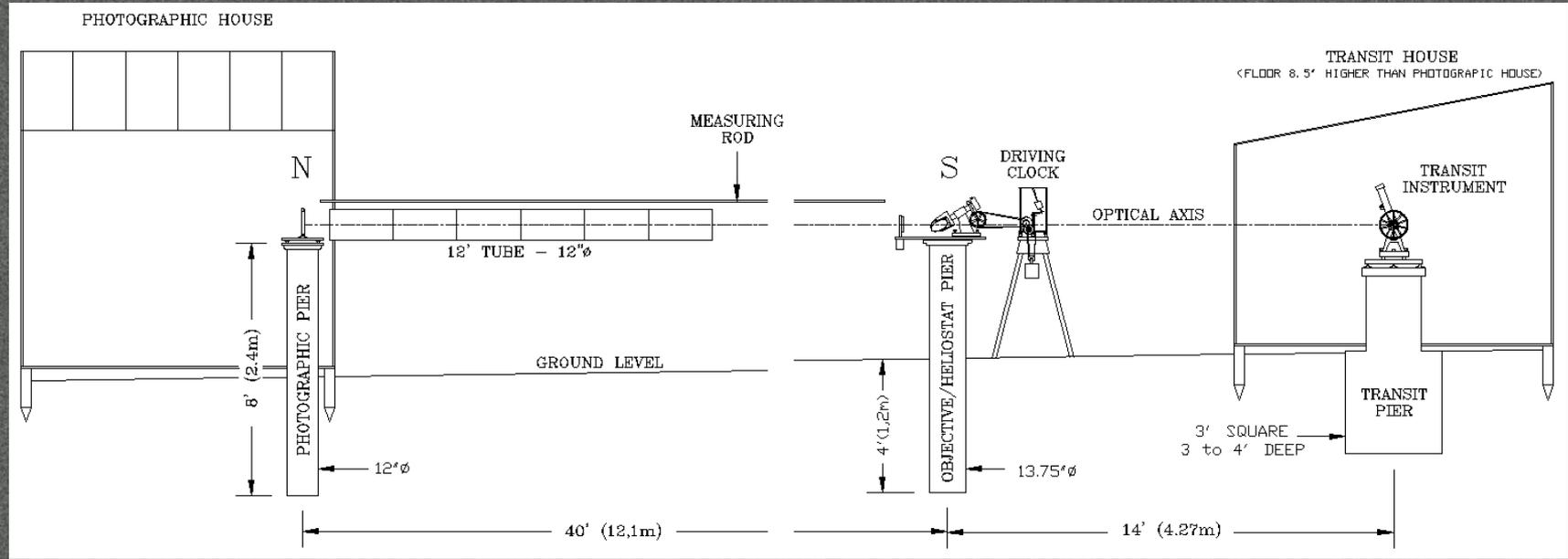
Horizontal Photoheliograph

Horizontal Photoheliograph



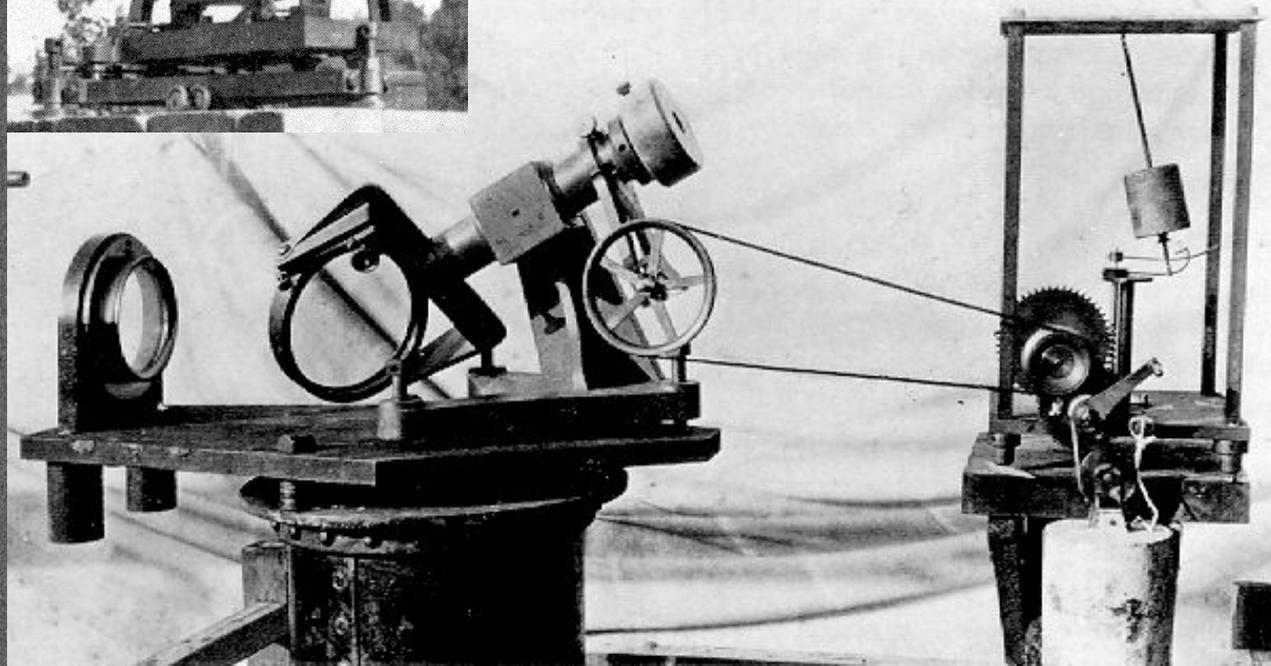
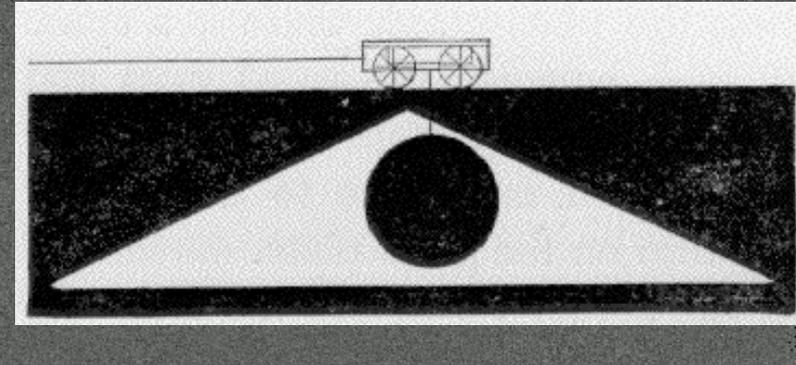
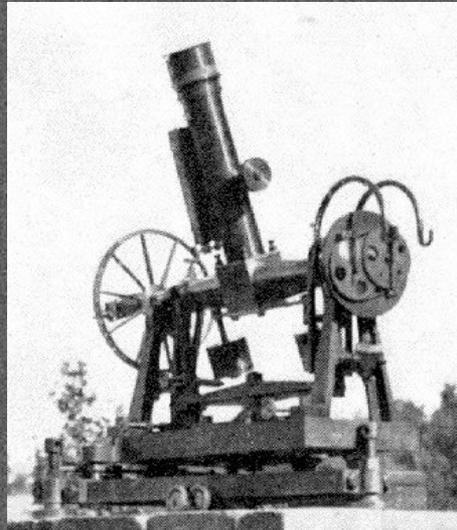
Horizontal Photoheliograph

Horizontal Photoheliograph



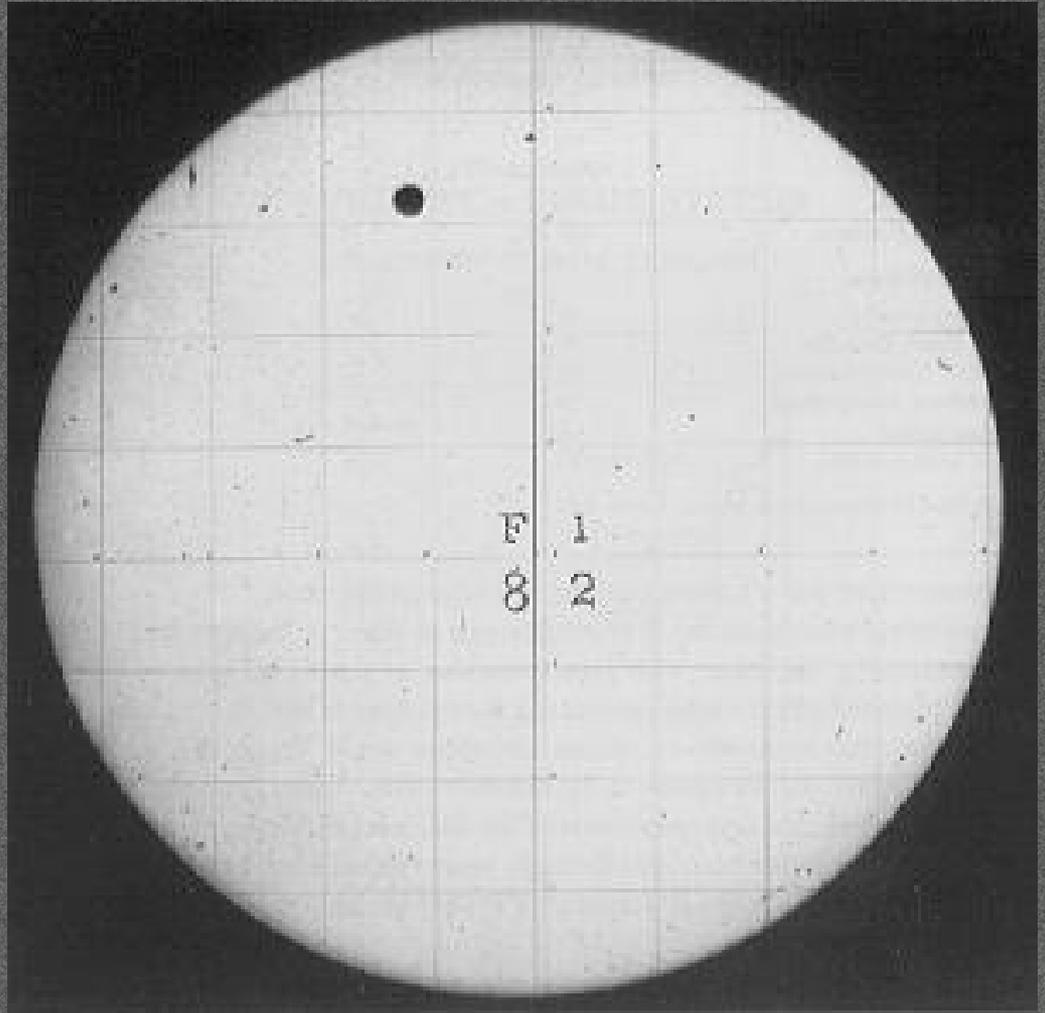
American Instruments

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 "F 1" and "8 2", is visible in the top right corner of the image.

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



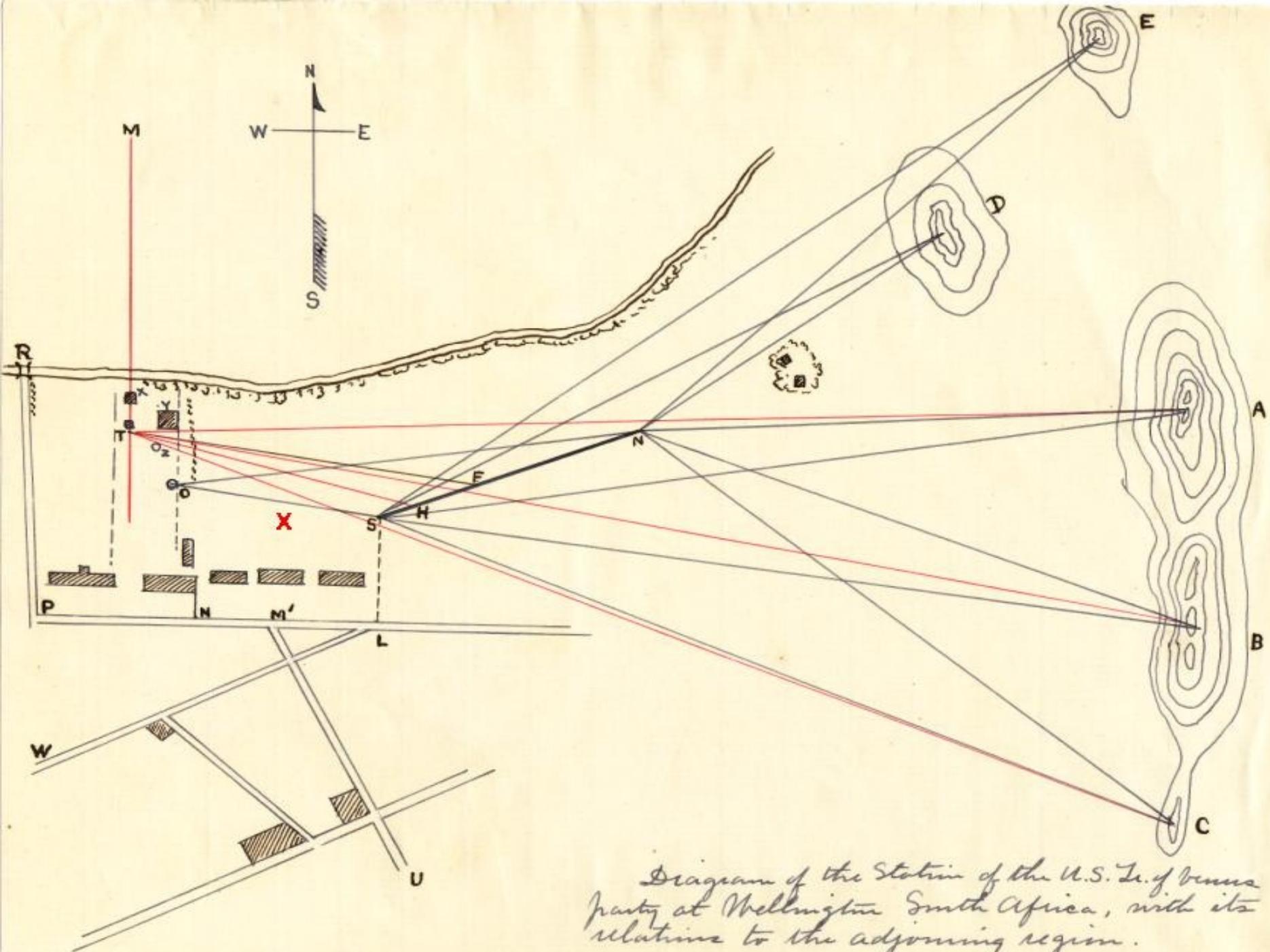
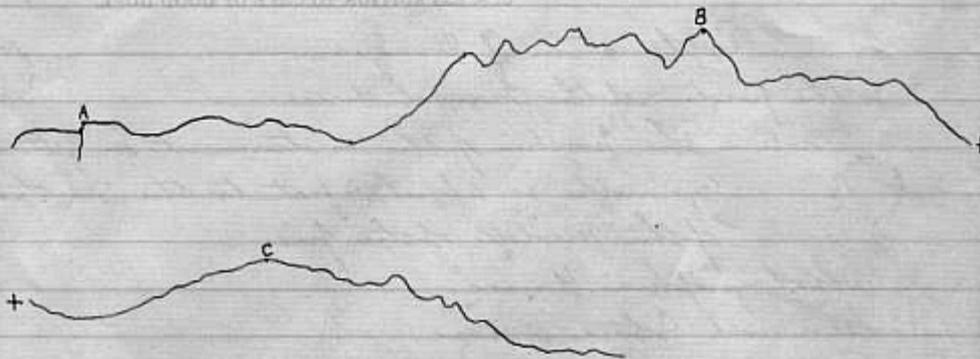


Diagram of the Station of the U.S. L. of Venus party at Wellington South Africa, with its relations to the adjoining region.

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 = $95^{\circ} 00'$

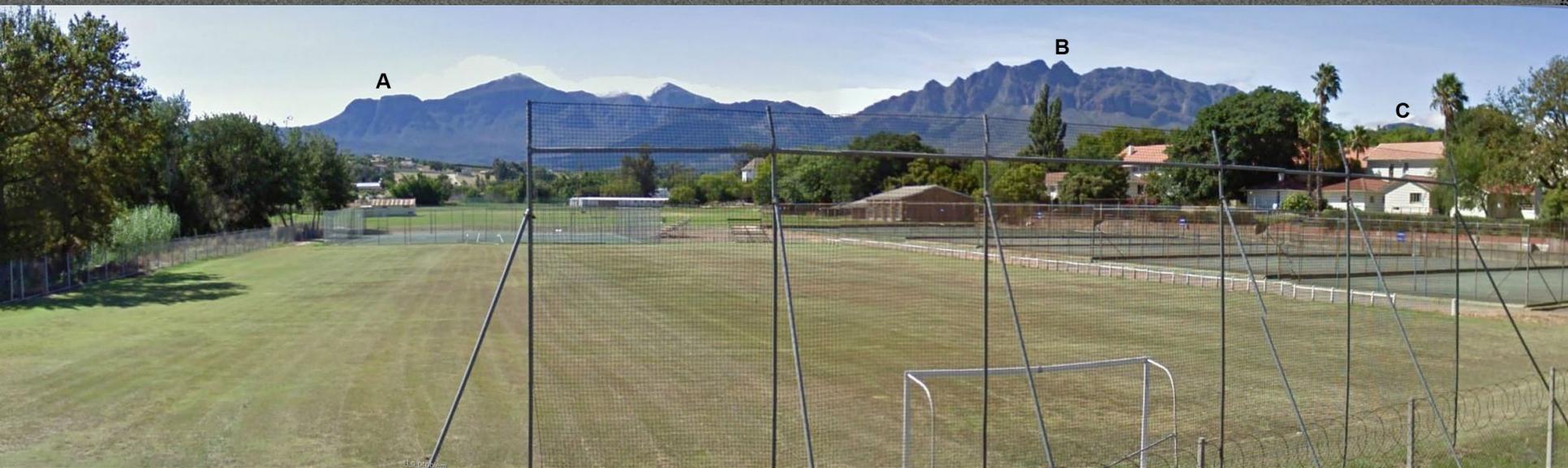
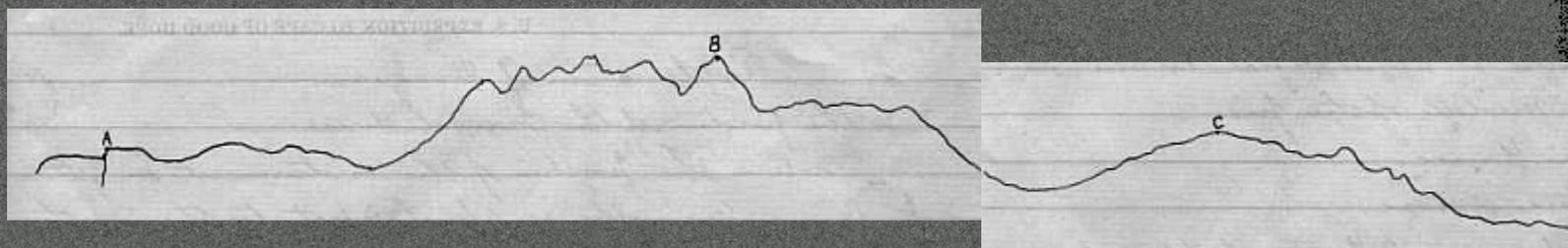
PR = 696 feet.

R Bridge over small stream near station
MT Meridian of Transit

J. L. Combs

Survey

1/10/2017 - 1/10/2017



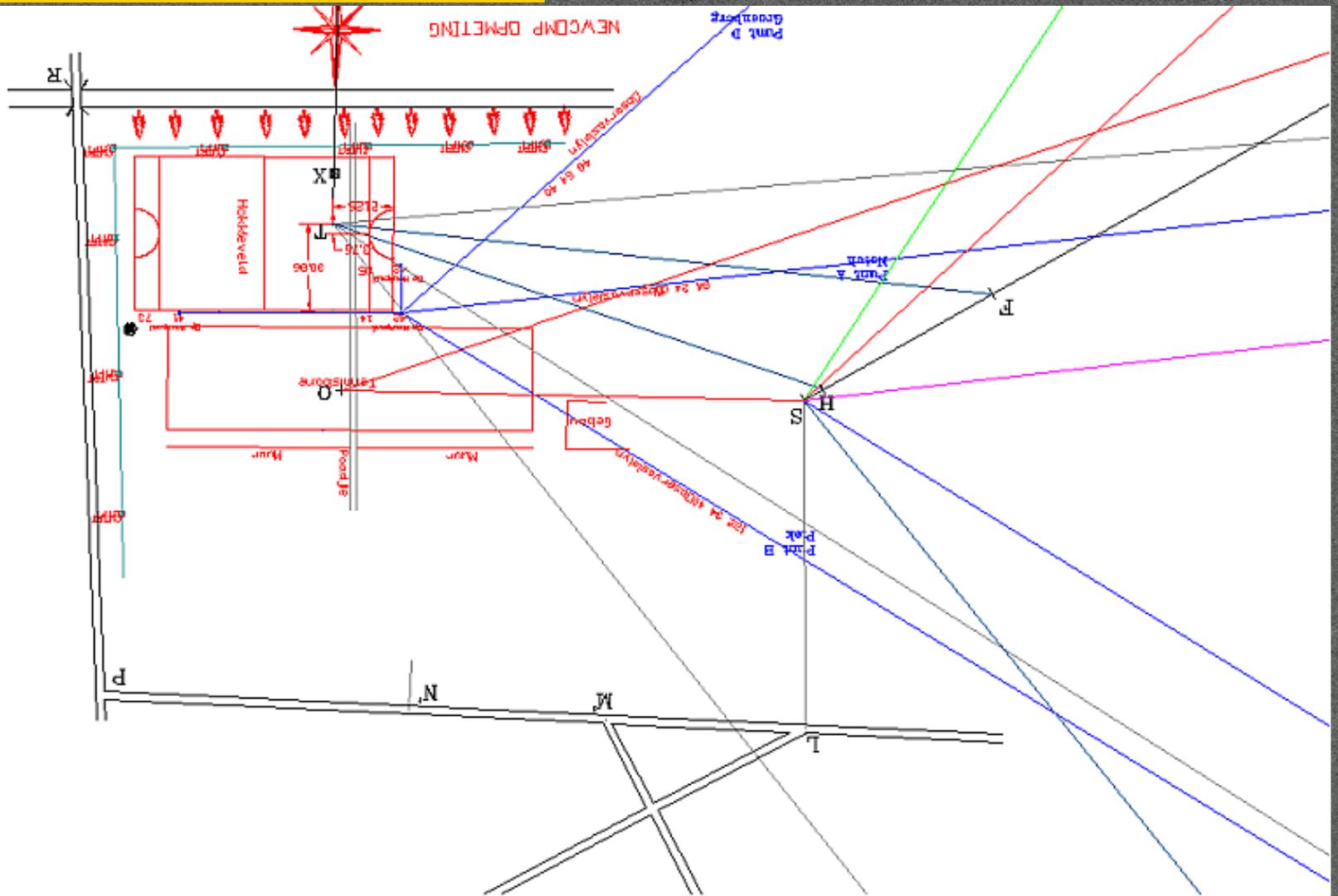
Survey

Hyman - Davis



Survey

Handwritten notes in a cursive script, likely representing the name of the surveyor or a specific project identifier.



Survey

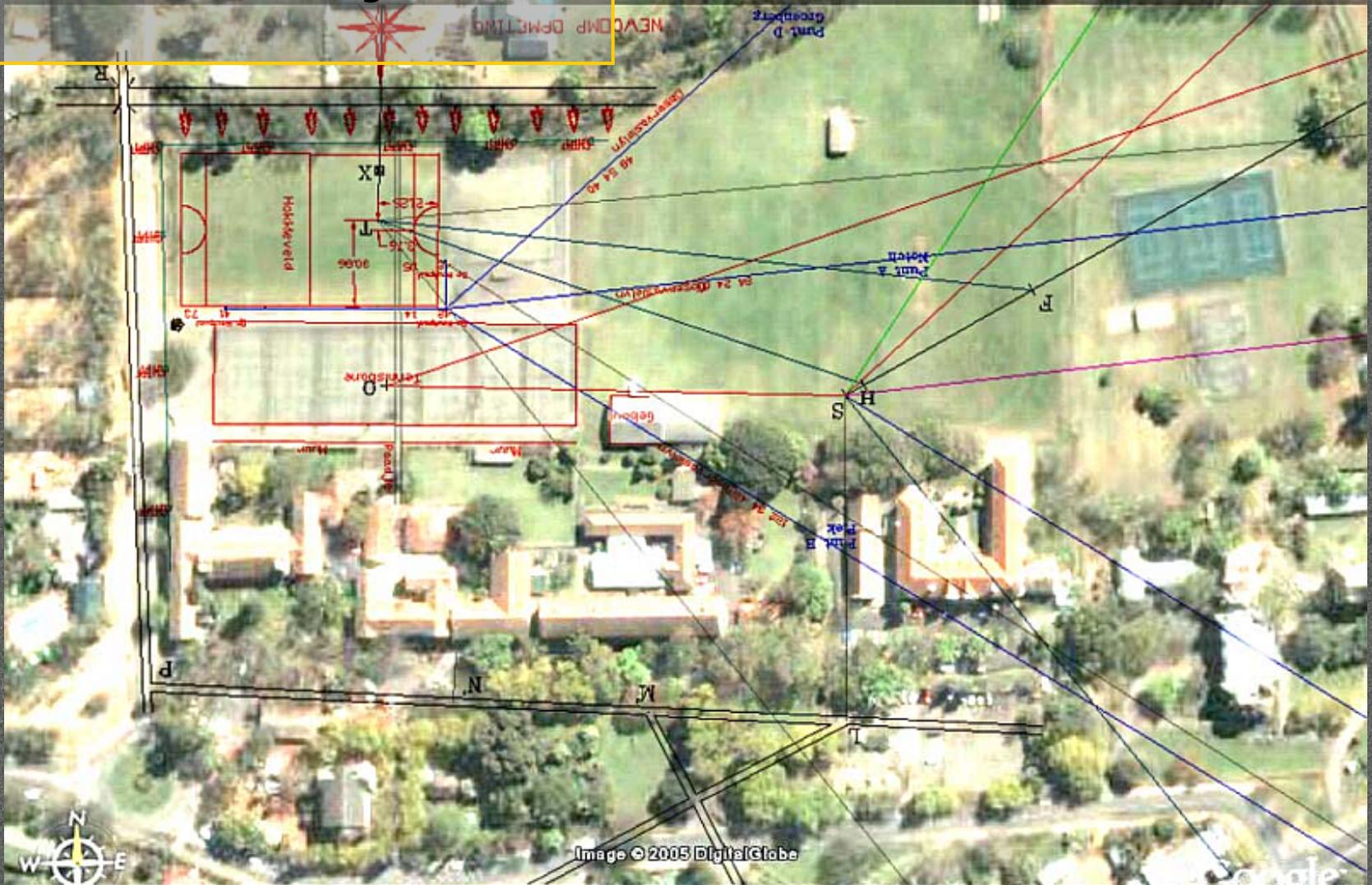
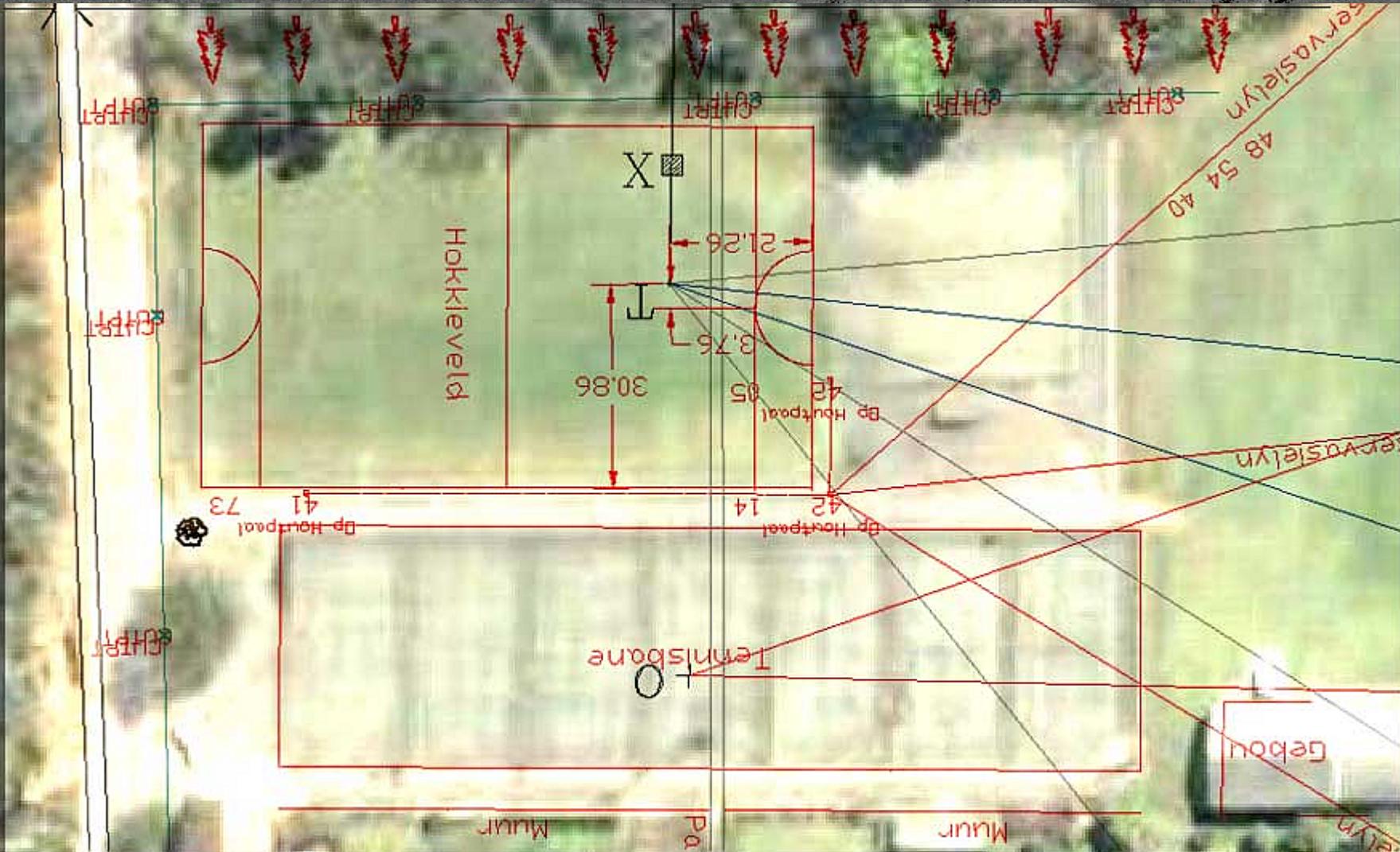


Image © 2005 DigitalGlobe

Google



Seminary Observatory

Yonkers - New York
1935



Newcomb's Site, June 2004



Wellington,
8 June 2004

My dear - Dad



Prof. D. Block

Walter Dyer



Prof. D. Block

Handwritten signature

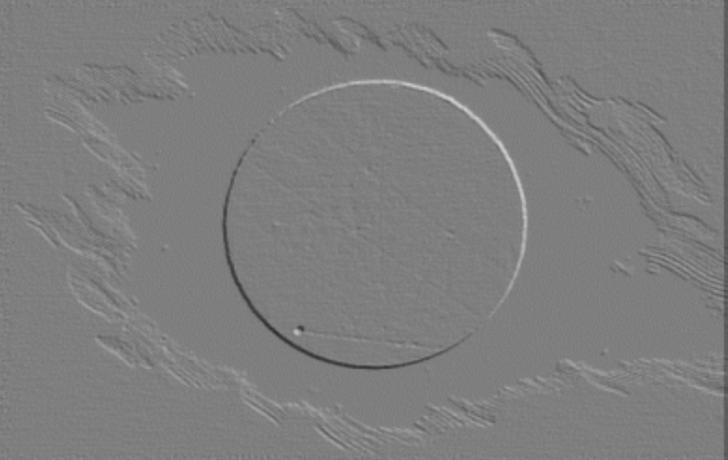


Prof. D. Block

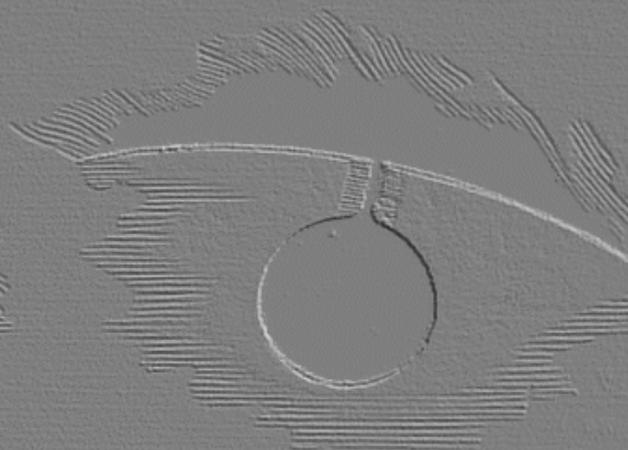
Handwritten signature



TRANSIT OF VENUS



The British Expeditions



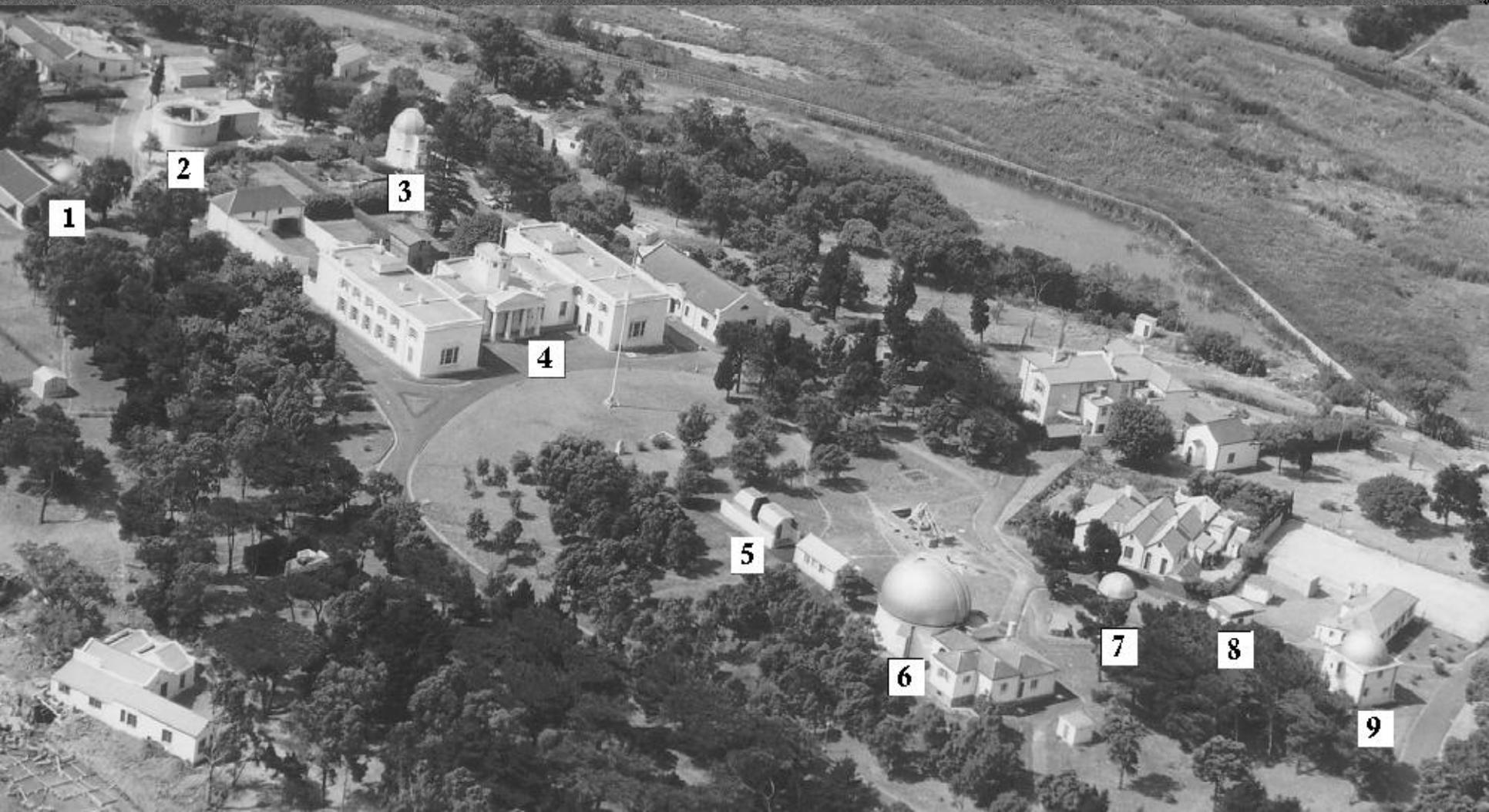
British & local observations

Handwritten text: Hunter - Lewis

Station	Observer	Assisted by	Telescope	Power	Chronometer
Durban 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
Aberdeen Road 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
Montagu Road (Touws River) 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
Cape Observatory 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

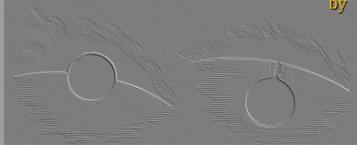
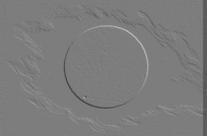
Handwritten signature or name



TRANSIT OF VENUS

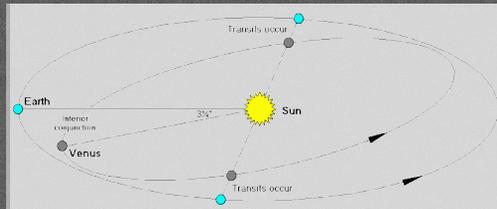
Transit of Venus
relics in South Africa

by Willie Koorts



What are Transits?

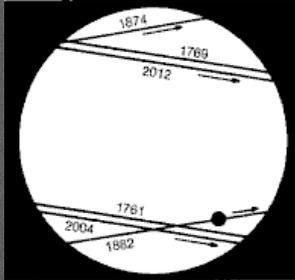
Transit of Venus



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?

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)



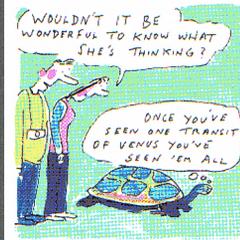
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What are Transits?

Transit of Venus

Hear it for Harriet



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Famous people and Transits

Transit of Venus

- **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)
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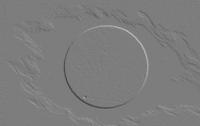
SA's Transit History

Hansen - Venus

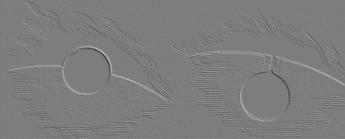
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 - American expedition to Wellington.
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TRANSIT OF VENUS



The American Expedition



American expedition

Transfer to Vexos

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 - 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.
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Miss Cummings
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Transit of Venus

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6-inch Fitz

Hunter & Sons



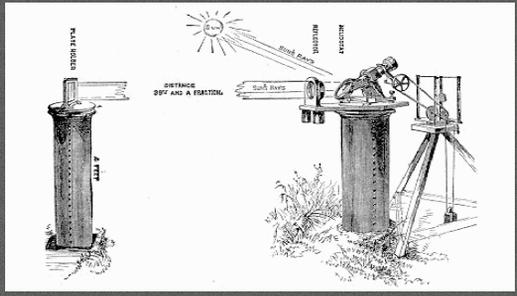
Seminary
Observatory

Historic Photos
1932



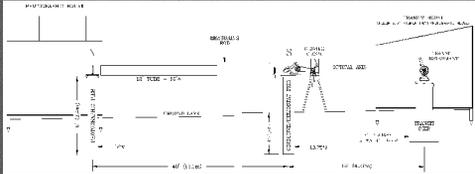
Horizontal Photoheliograph

Hewlett-Packard



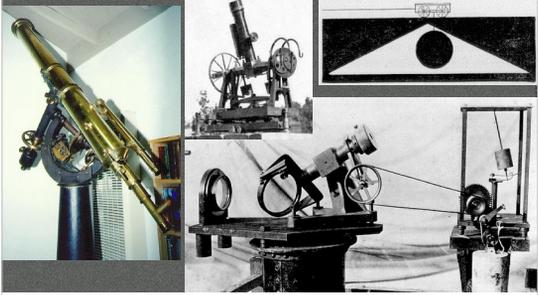
Horizontal Photoheliograph

Transfer - Lines



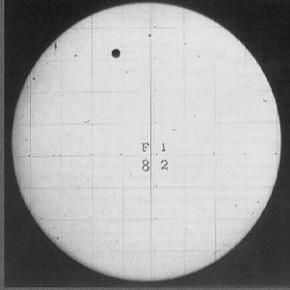
American
Instruments

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
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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. Fritchett.						1
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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 Heuguenot Seminary,
1877-1887*

Heuguenot Seminary,

Wellington

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"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

Howser - 1905

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?

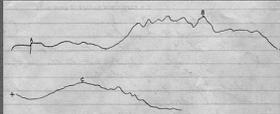
Historical Review



Wood's
Iron Post?

Seminary
Observatory

Newcomb's report



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

D is a high green hill with 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 = $160^{\circ} 58.5'$
 - MTD = $102^{\circ} 3'$
 - MS = $26.244'$

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

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

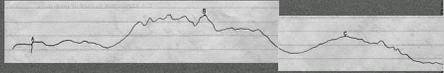
Angle RPL = $95^{\circ} 34'$
 PR = 496 feet

* Bridge over small stream near station
 W. T. Mountain of Transit

T. L. Casey

Survey

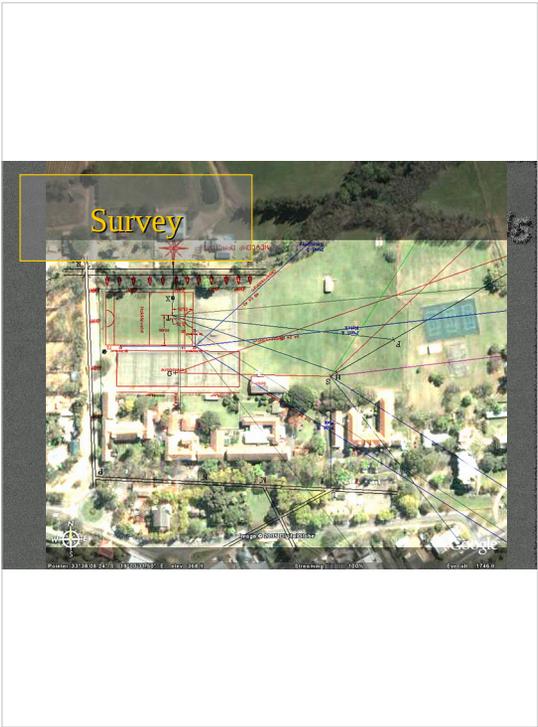
Transfer to Excel



Survey

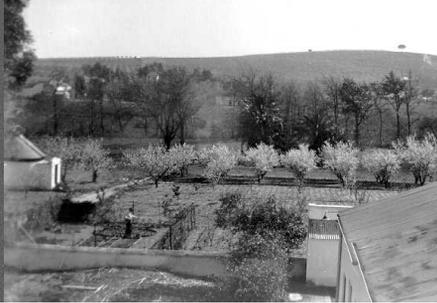
Transfer - Levels





Seminary
Observatory

Transfer to Texas
1935



Newcomb's
Site, June 2004



Wellington,
8 June 2004

Transfer - Venus



Prof. D. Block

Hawser - Lexus



Prof. D. Block

Handwritten text: "Hawser - 1882"

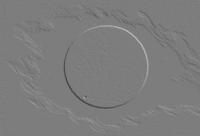


Prof. D. Block

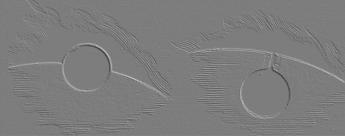
Transit of Venus



TRANSIT OF VENUS



The British
Expeditions



British & local observations

Howden - 1850s

Station	Observer	Assisted by	Telescope	Power	Chronometer
Durban 31° 00' 17" S E 29° 32' 47" E	Mr. E. Neison	Mr. F. Sandford	8" Grubb Equatorial (stopped down to 6")	160	Poole 1407
Aberdeen Road 24° 18' 34" S E 32° 42' 32" E	Mr. W.H. Finlay		6" Grubb Equatorial	180	Molyneux 2184
	Mr. R.T. Pett		6" Grubb Equatorial	180	Molyneux 2275
Montagu Road (Touws River) 20° 02' 09" S 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
Cape Observatory 18° 28' 41" S 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. Maclear	Mr. Coaker	7" Merz Equatorial	184	Parkinson & Bouts 801
	Mr. (later Dr.) W.L. Ekin		4.2" "Dun Eckh" Heliumeter	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

