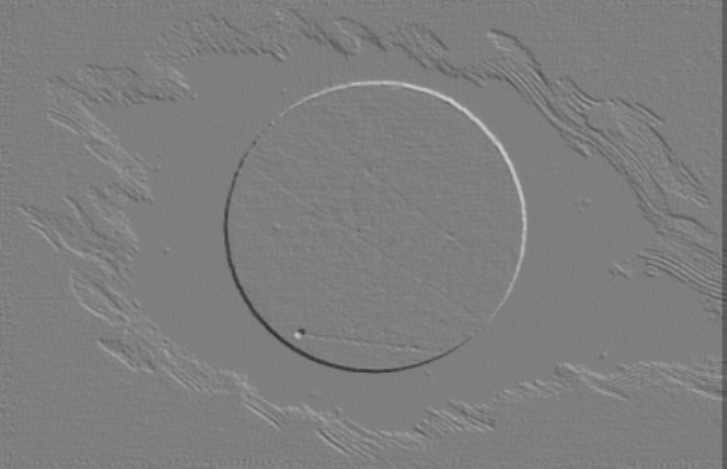
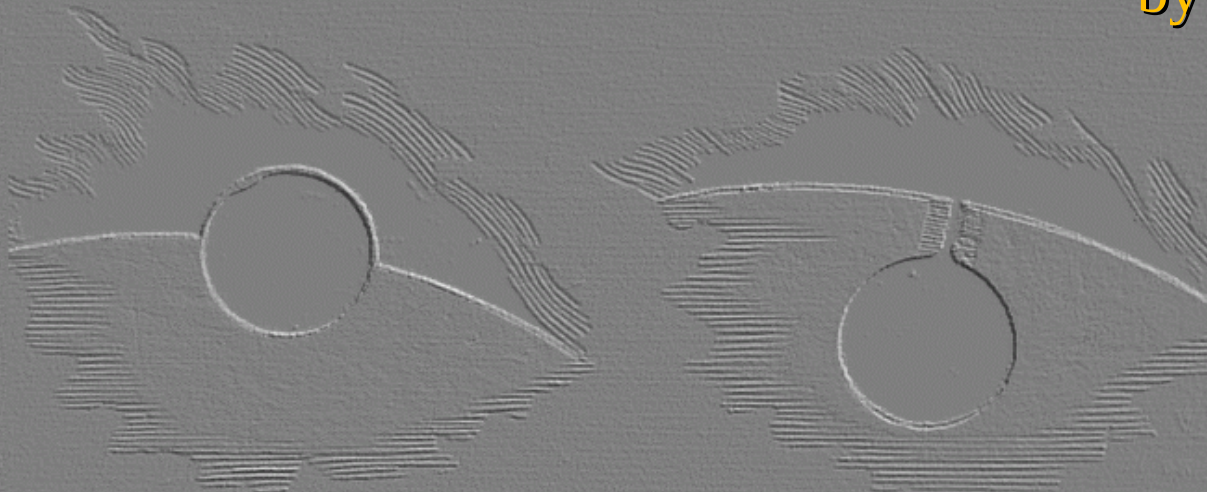


TRANSIT of VENUS



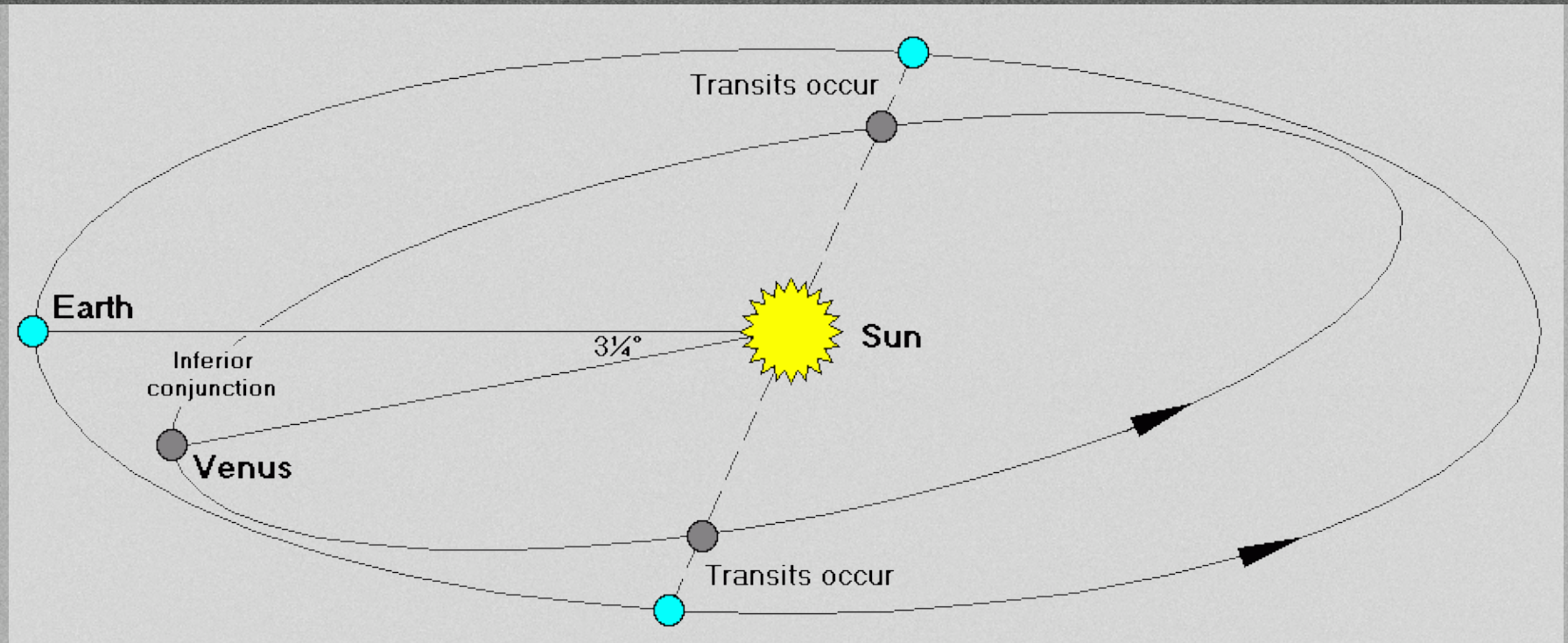
Transit of Venus relics in South Africa

by Willie Koorts



What are Transits?

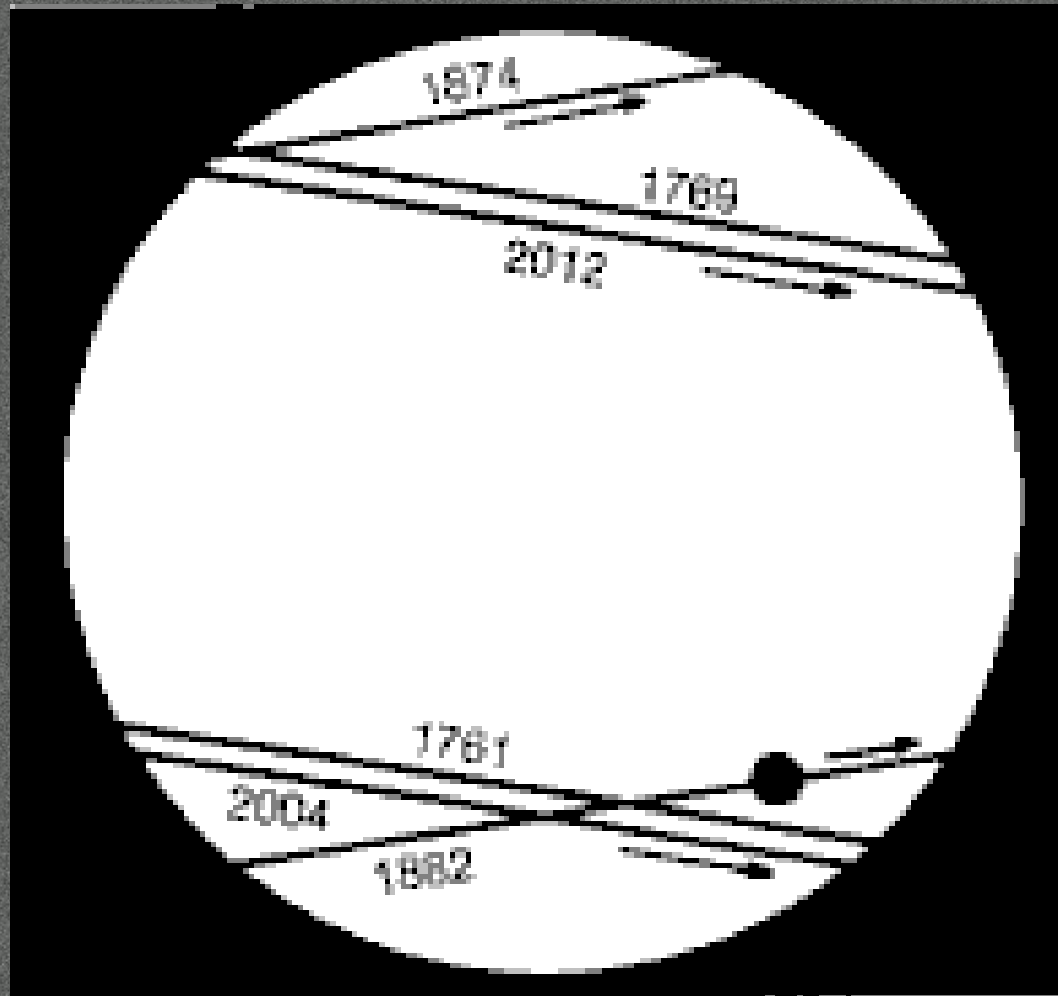
1/10/2011 - 2010/5



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.

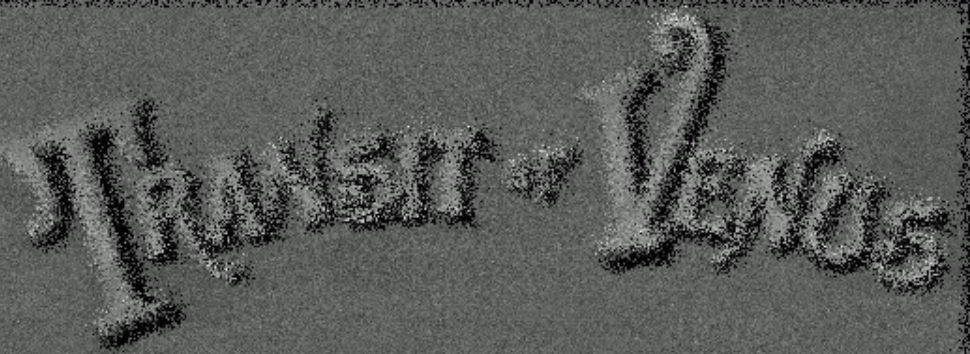
What are Transits?

Handwritten: Jupiter - 2005



What are Transits?

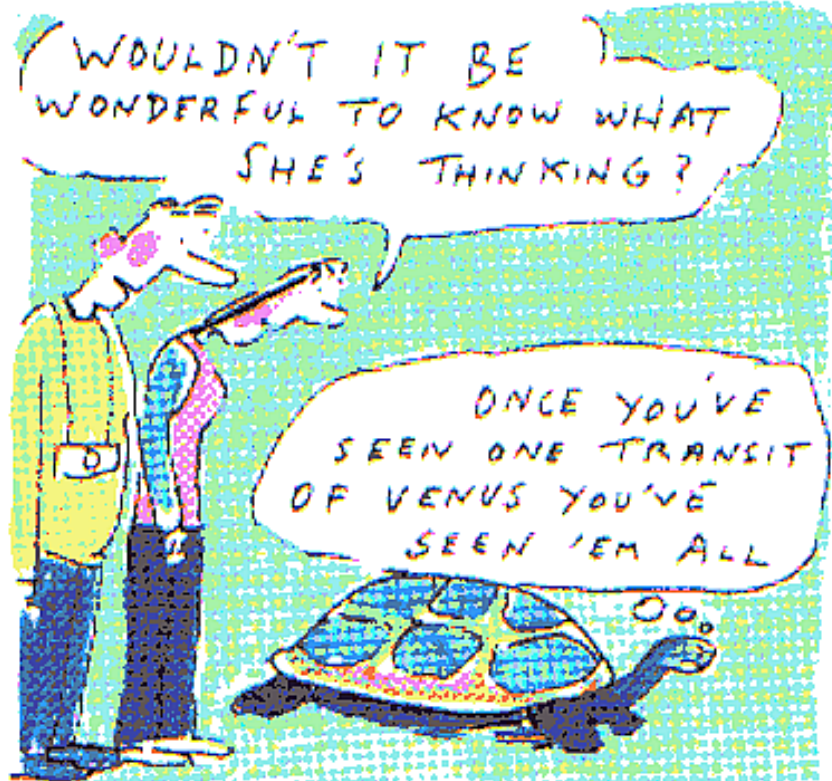
- Only the two inner planets (Mercury and Venus) can transit the disk of the Sun (as seen from the Earth)
- Frequency of Transits:
 - Mercury 13 to 14 times per century
 - Venus 13.7 times per millennium
 - Previous Transit pairs: (1631) & 1639, 1760 & 1769, 1874 & 1882
 - Seen by (0) 2 10's 100's of people
 - Last pair – 2004 & 2012 – seen by millions



What are Transits?

Harriet - Venus

Hear it for Harriet



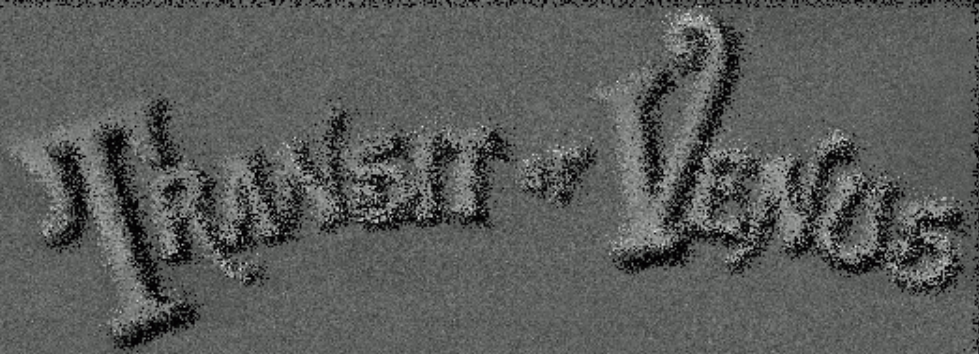
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Famous people and Transits

- 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)
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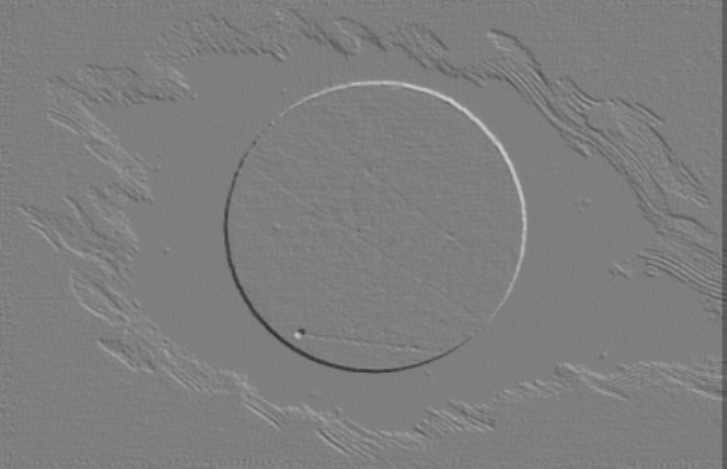
SA's Transit History



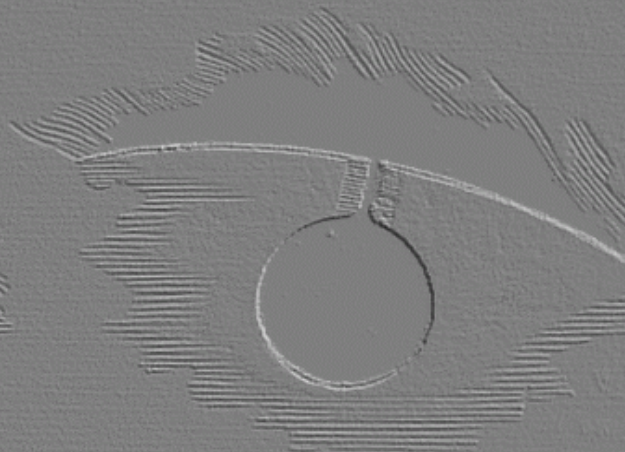
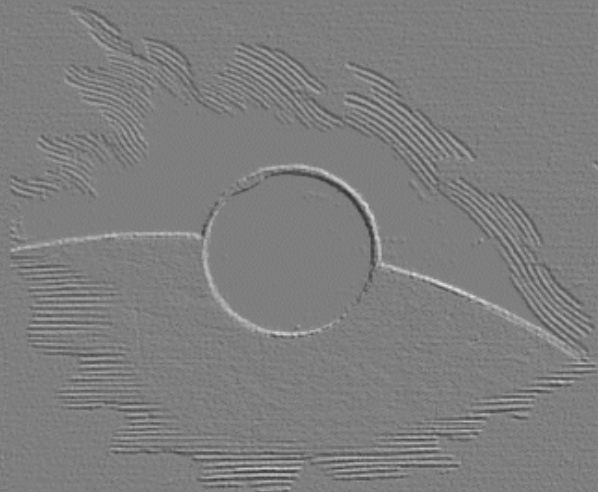
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 - American expedition to Wellington.
 - British expedition to Montagu Road (Touws River).
 - Locally from Cape Town, Durban & Aberdeen Rd.



TRANSIT OF VENUS



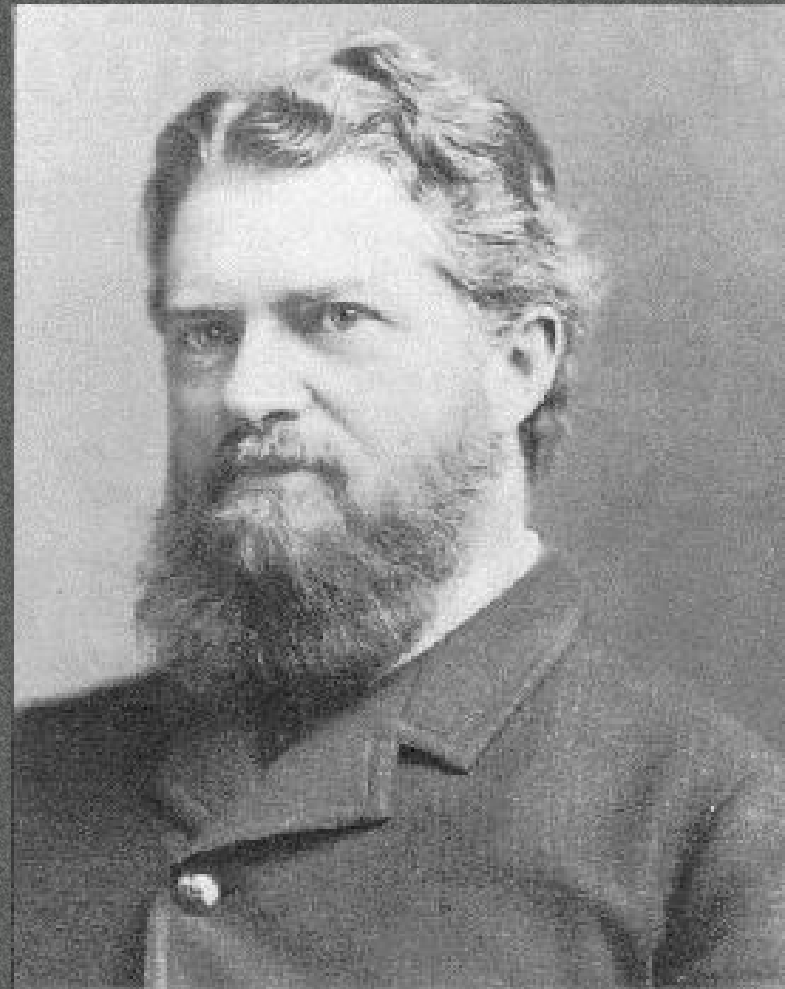
The American Expedition



American expedition

1/2 Hunter - 2/3 Lewis

- 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.



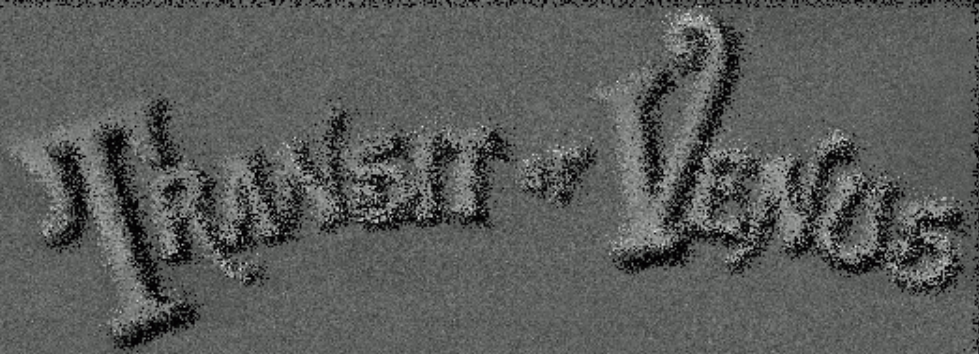
Huguenot Seminary

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

1/2 inch - 2 1/2 inch



Seminary Observatory

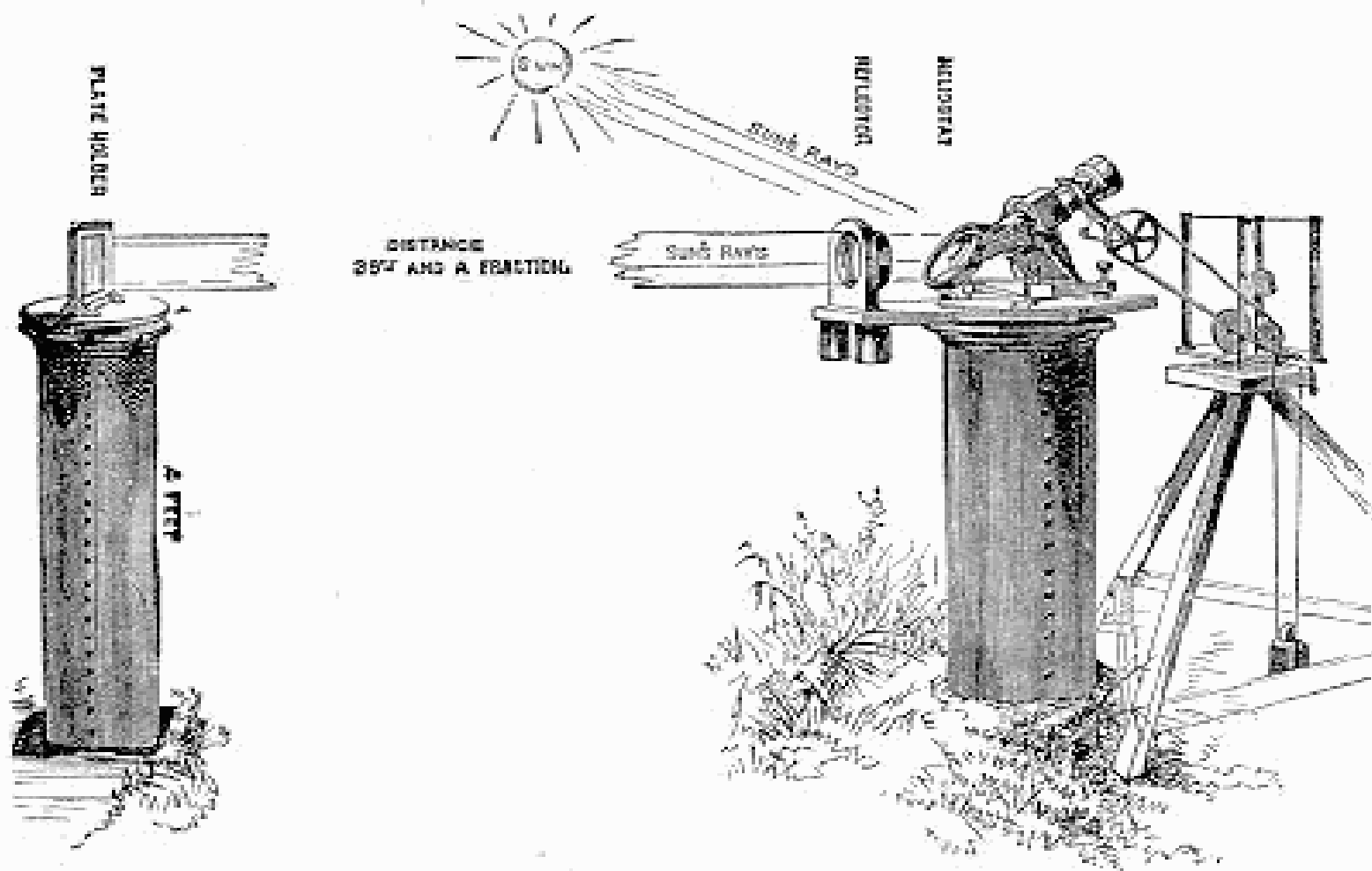
1/10/1911 - 1/10/1915

1932



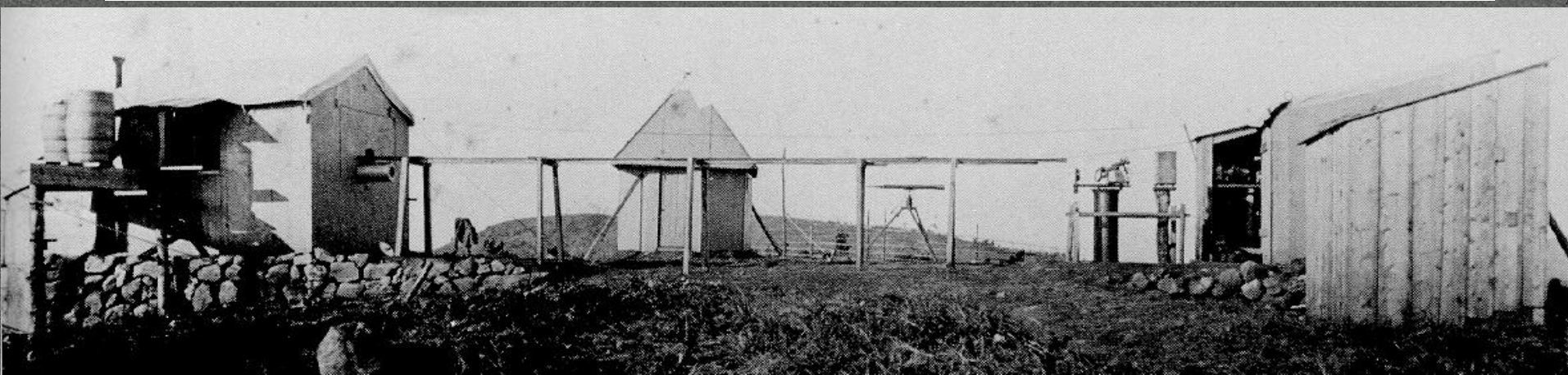
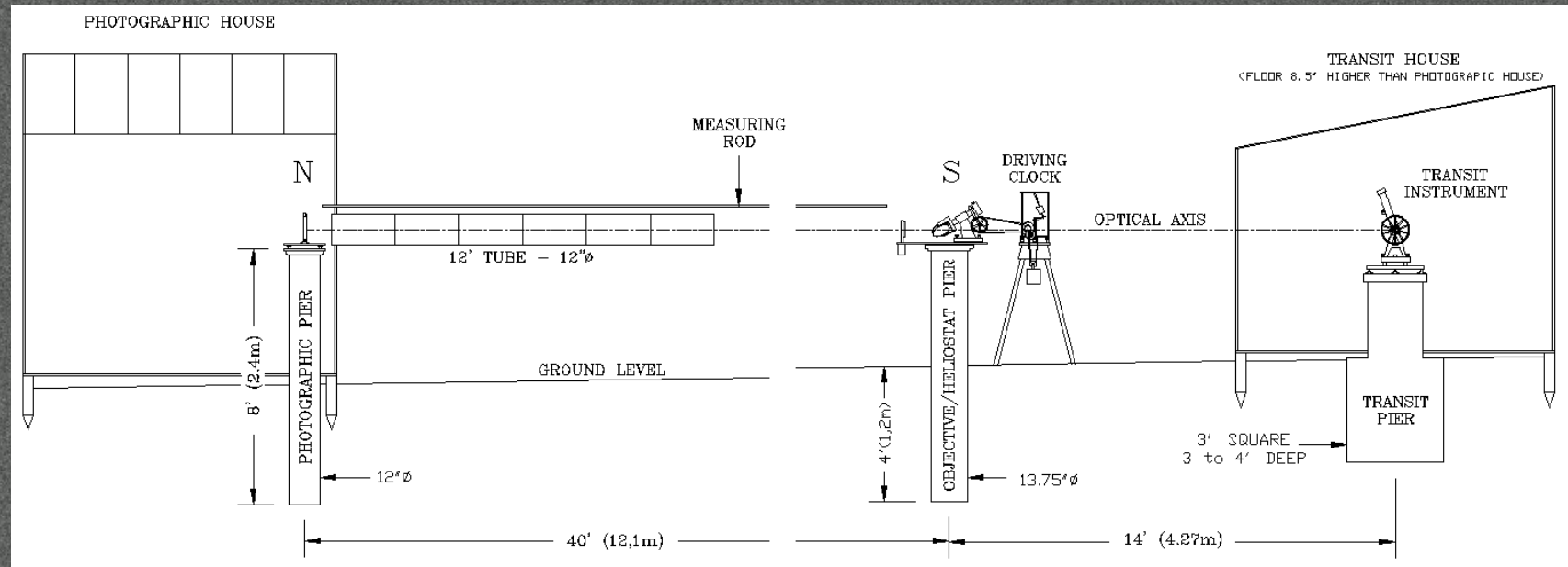
Horizontal Photoheliograph

1/2 hour - 25005



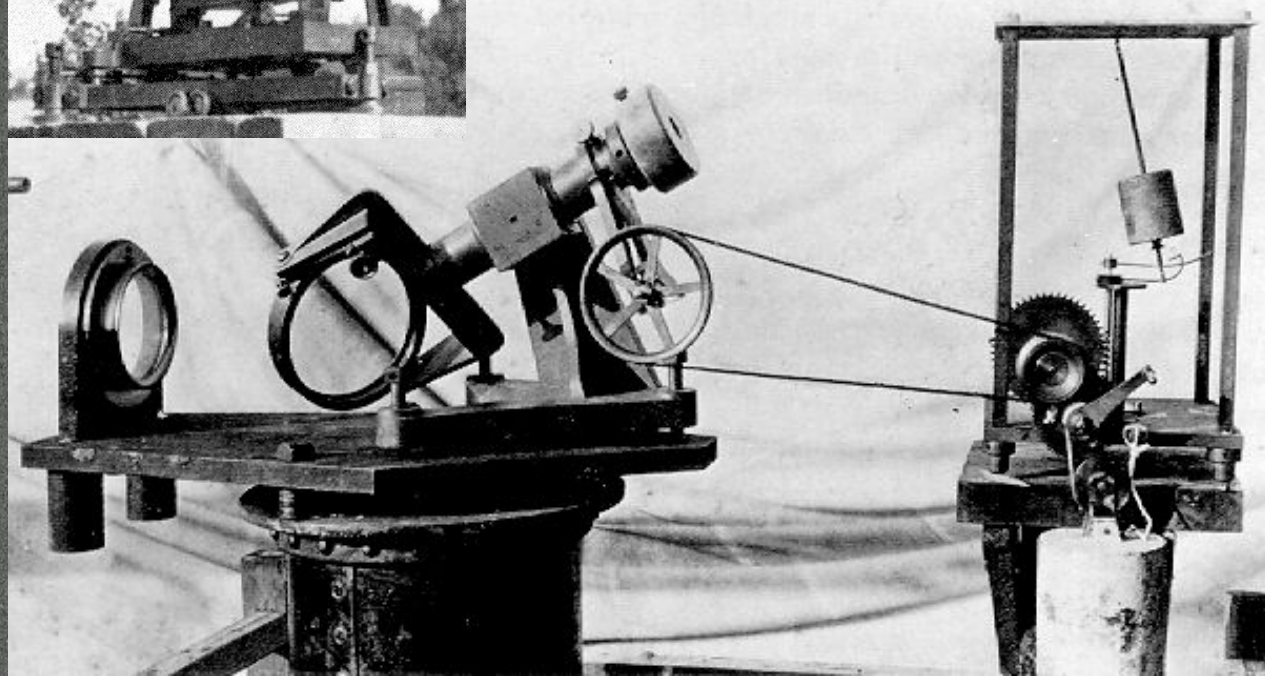
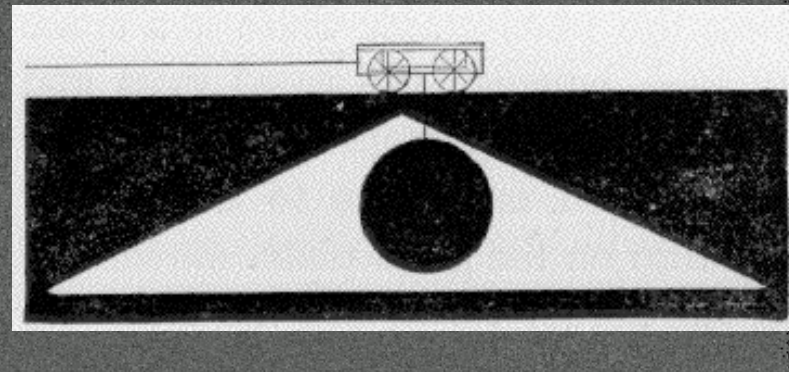
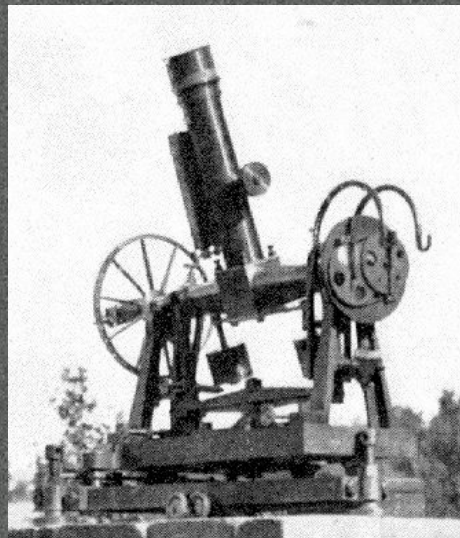
Horizontal Photoheliograph

Horizontal Photoheliograph



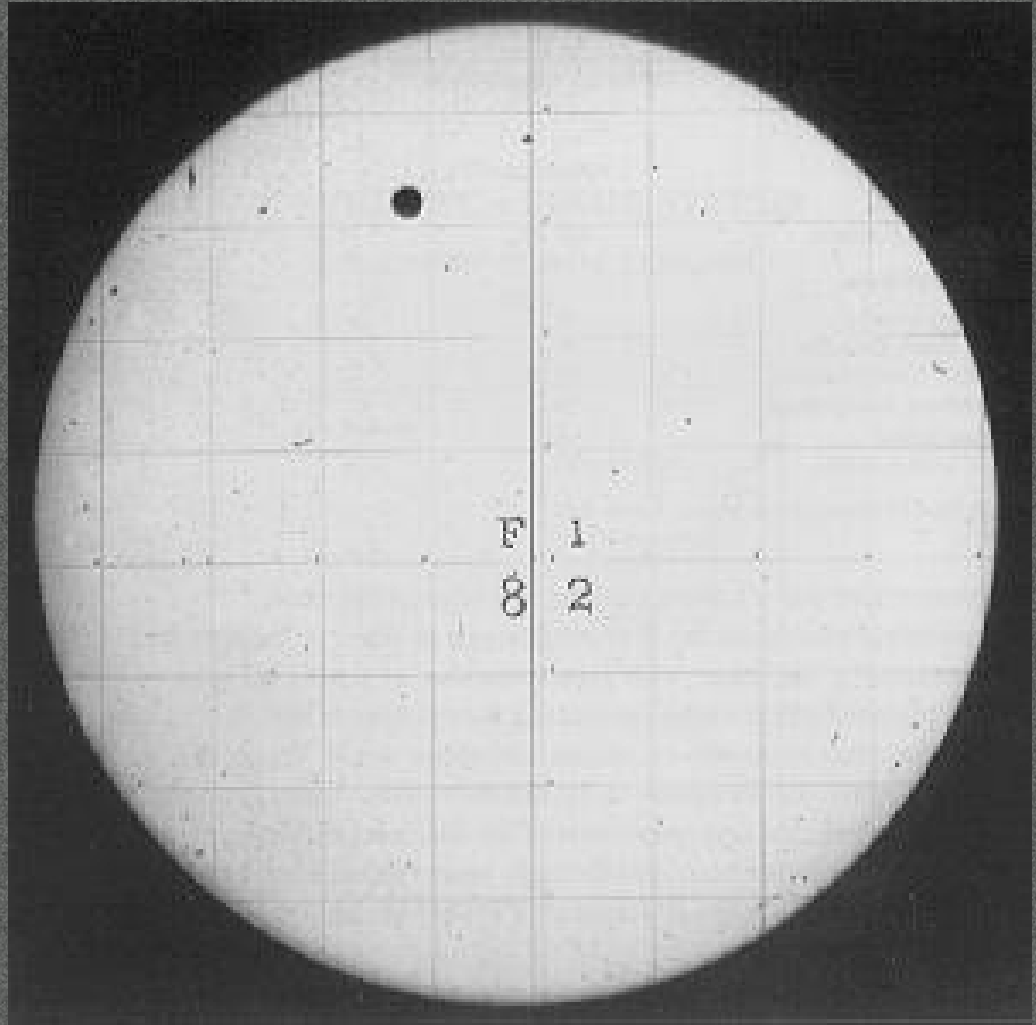
American Instruments

Handwritten text, possibly a signature or date, appearing as a watermark or stamp in the top right corner.



American photography

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



Handwritten text: 1/2 inch - 2 1/2 inches

1874 Practice at USNO

1874 - 1875



Observations

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

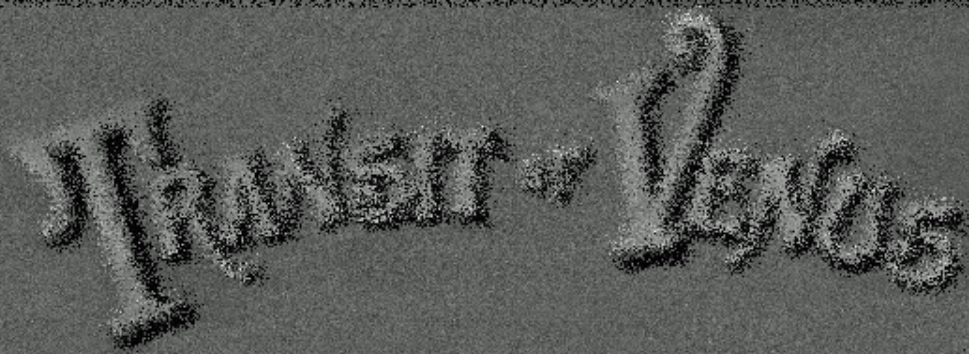
Huguenot Seminary,

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

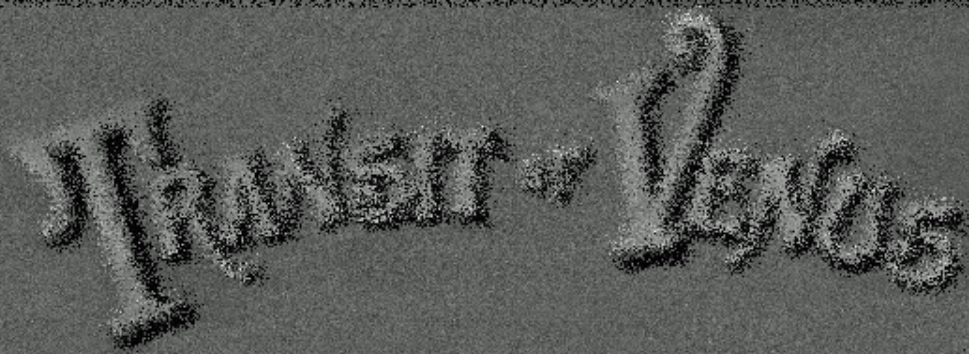
Afterwards



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."

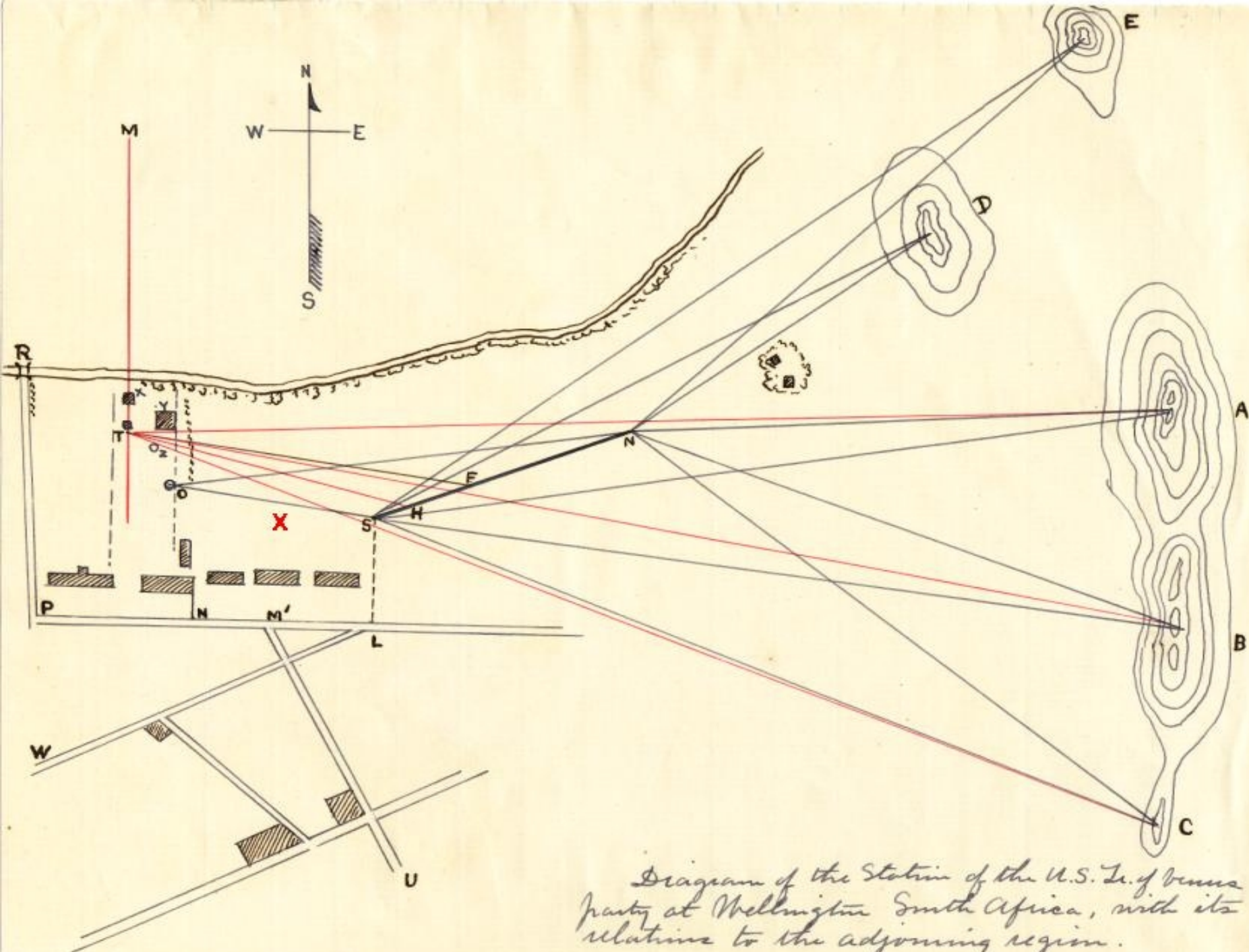
Wood's Iron Post?

Handwritten text, possibly "Huntley - Lewis"

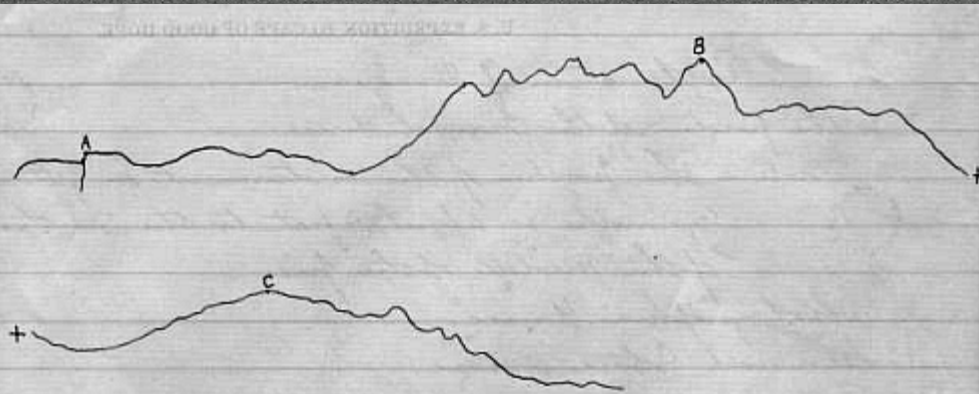


Wood's
Iron Post?

Seminary
Observatory



Newcomb's report



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.

TRANSIT OF VENUS, 1882 DEC. 6.

U. S. EXPEDITION TO CAPE OF GOOD HOPE.

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 = $95^{\circ} 00'$

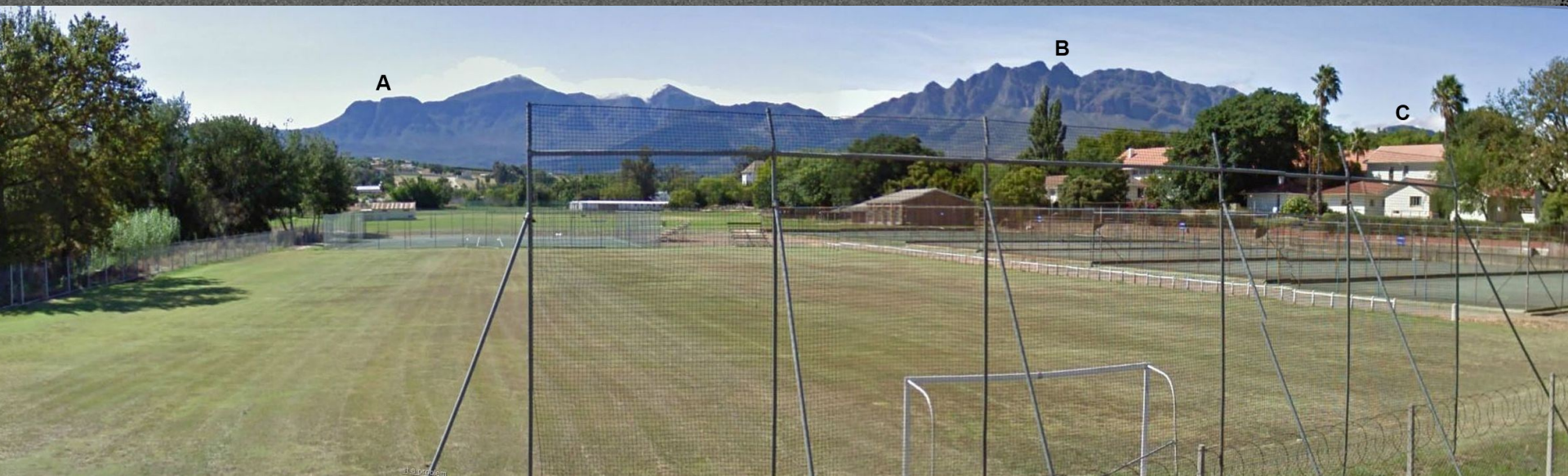
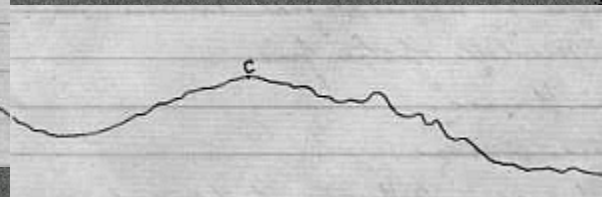
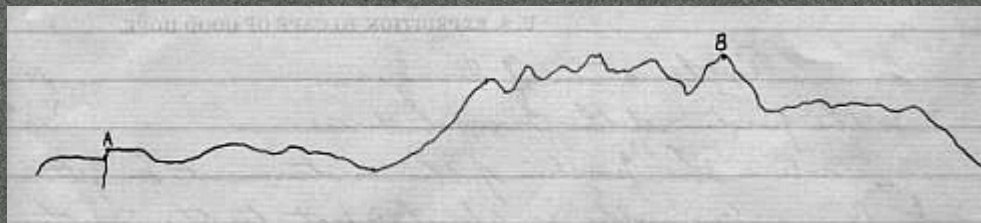
PR = 696 feet.

R Bridge over small stream near station
MT Meridian of Transit

T. L. Casey

Survey

1/20/2011 - 2/20/2011

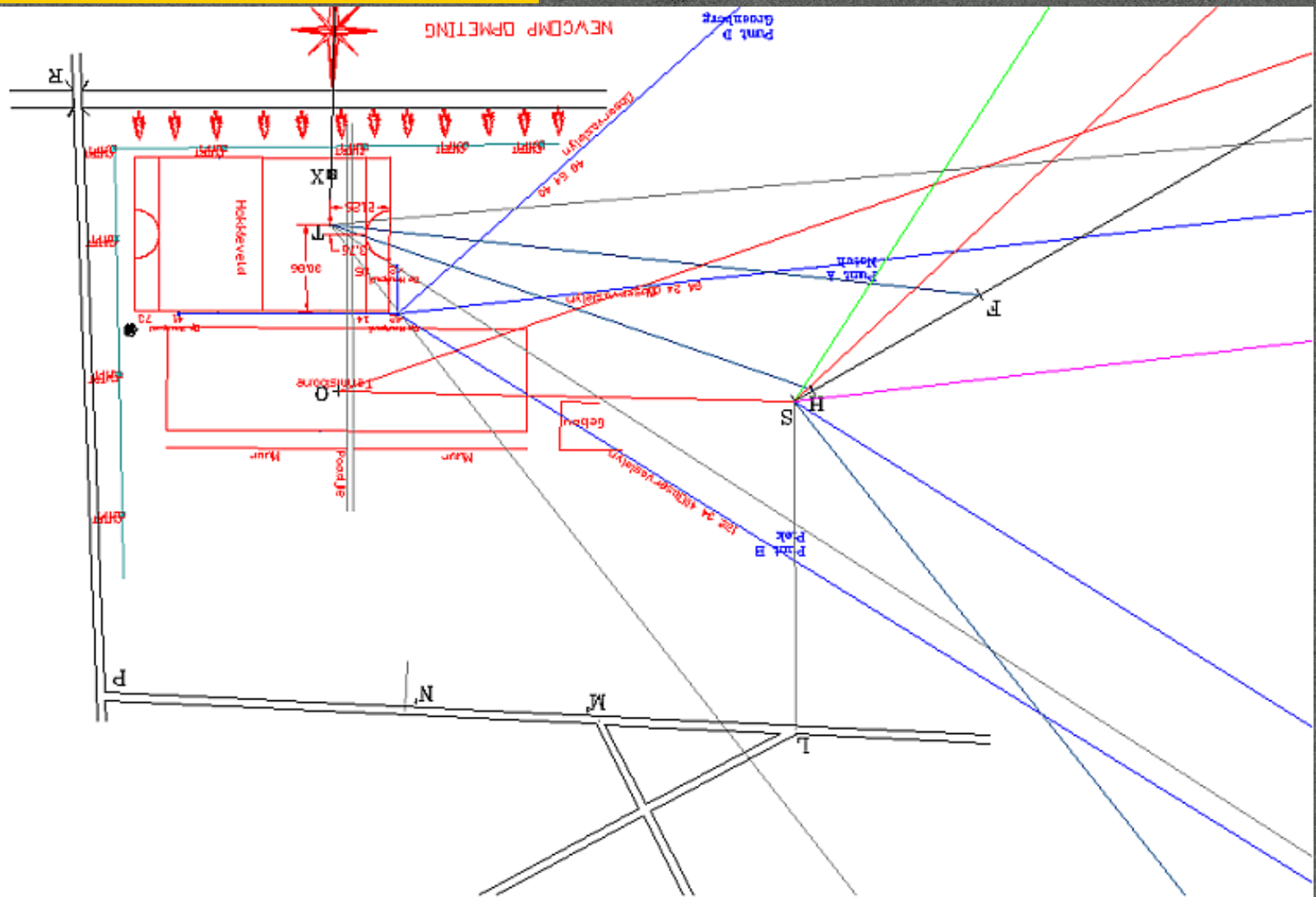


Survey

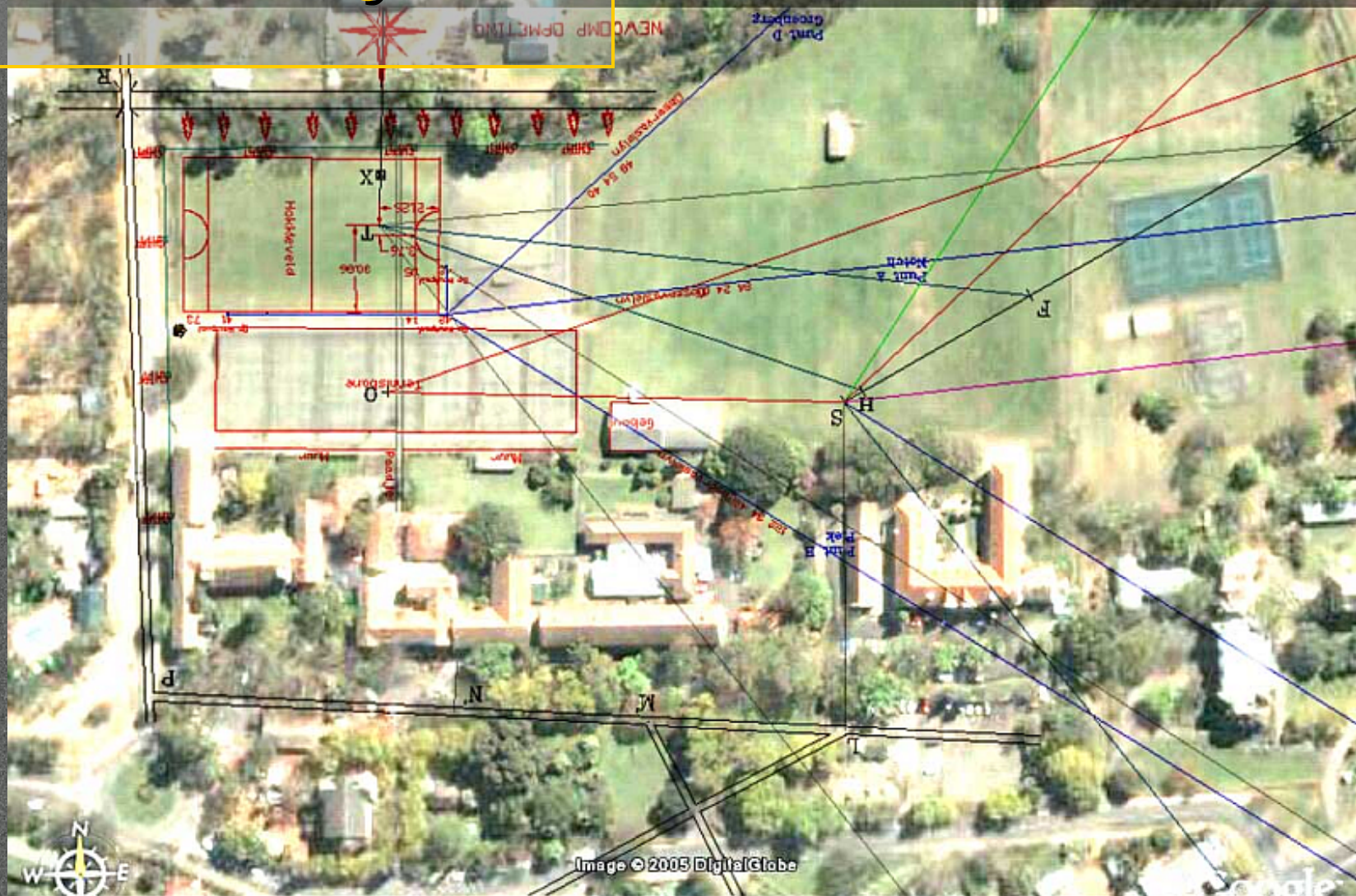
1/10/2011 - 2/10/2011

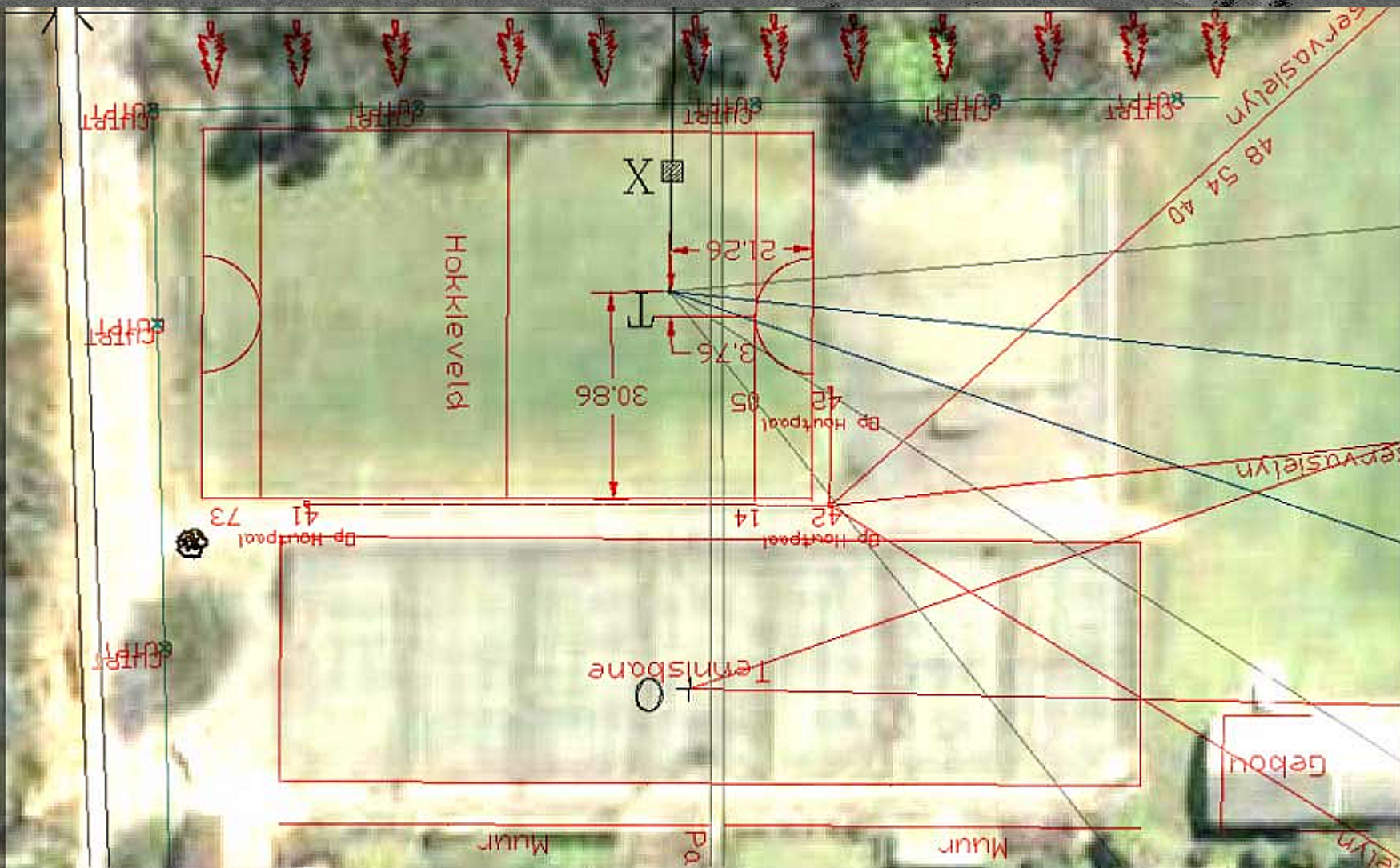


Hubert - Louis



Survey





Seminary Observatory

1/2 hour - 2 days

1935



Newcomb's Site, June 2004



Wellington,
8 June 2004

1/2 hour - 2.5 hrs



Prof. D. Block

1/20/01 - 1/20/01



Prof. D. Block

Handwritten signature: D. Block

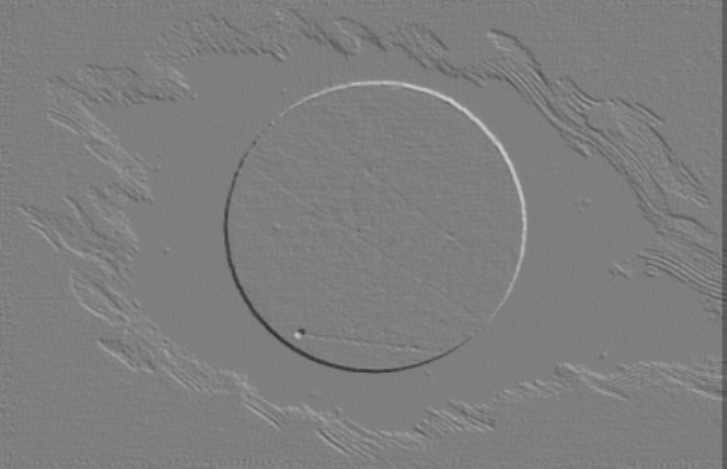


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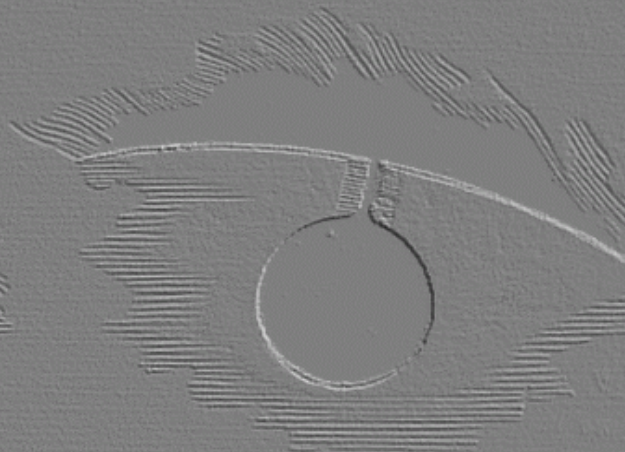
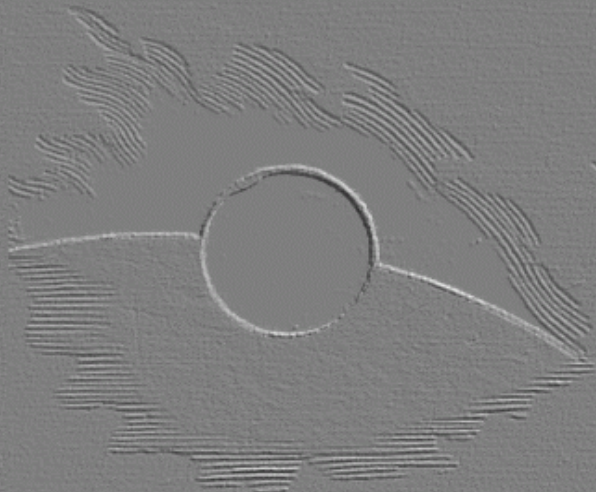
1/2004 - 2005



TRANSIT OF VENUS



The British Expeditions



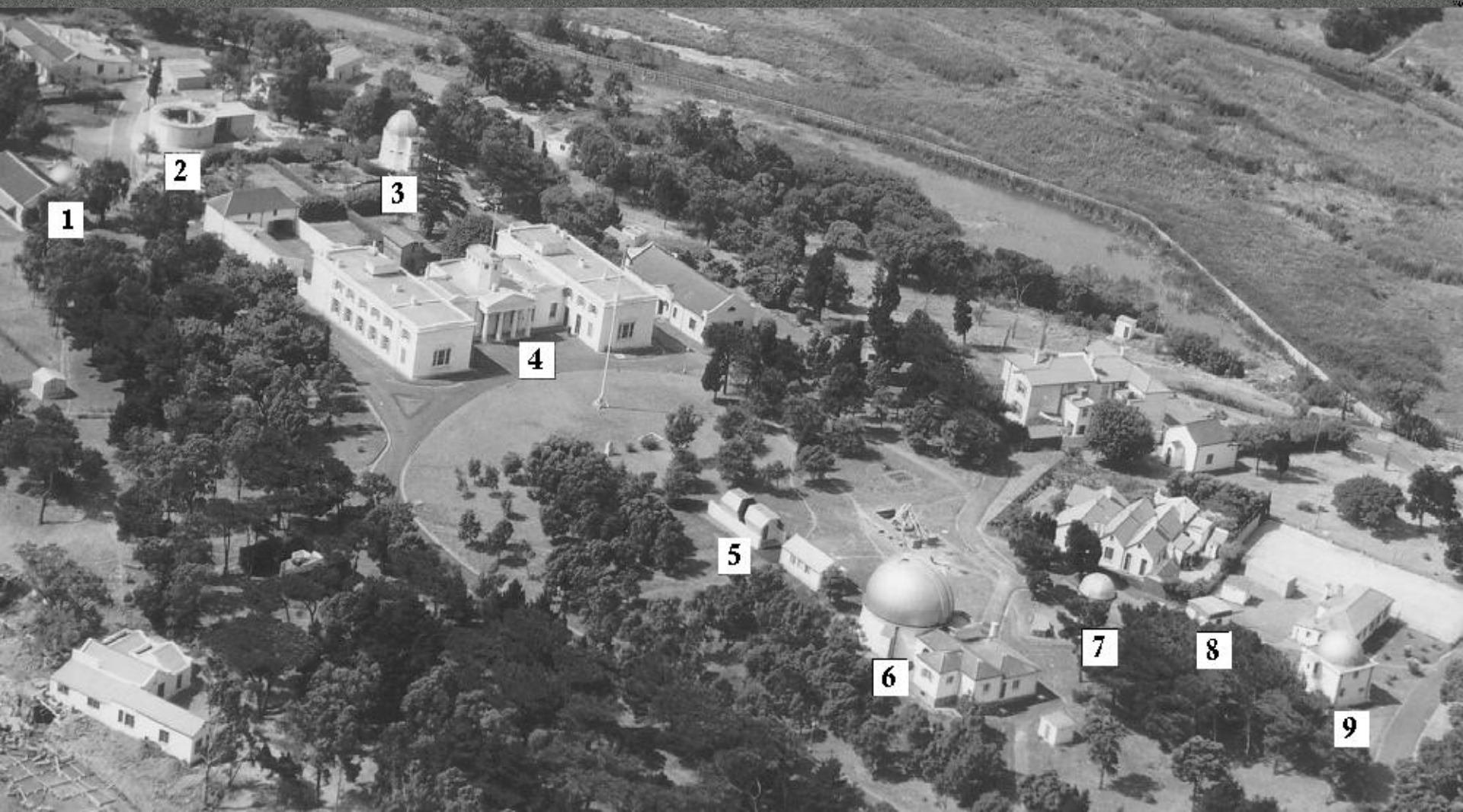
British & local observations

Handwritten: Hunter - 1845

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

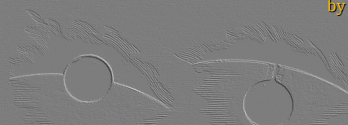
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TRANSIT OF VENUS

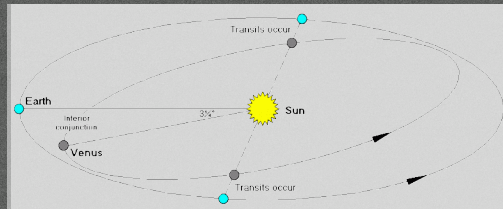
Transit of Venus
relics in South Africa

by Willie Koorts



What are Transits?

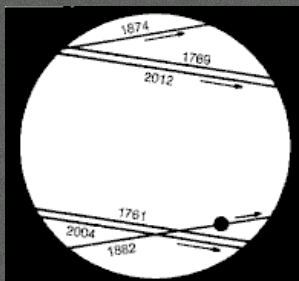
Planet - Venus



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What are Transits?

Howell-Venous



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Transit of Venus

Hear it for Harriet



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Transit of Venus

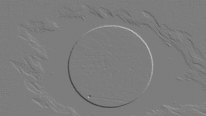
SA's Transit History

Howell-Venot

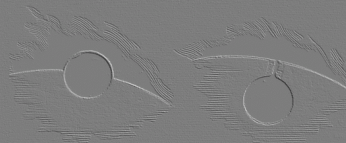
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TRANSIT OF VENUS



The American
Expedition



American expedition

Howden - 1890s

- 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.
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Transit of Venus

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6-inch Fitz

Hewlett-Packard



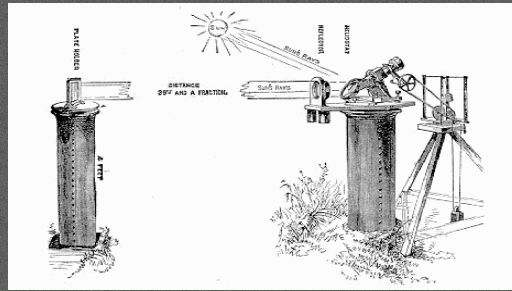
Seminary
Observatory

Hansen & Rex
1932



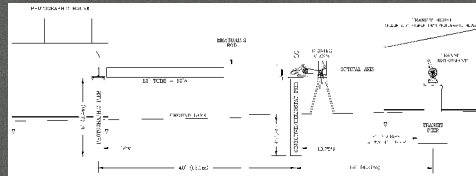
Horizontal Photoheliograph

Hewlett-Packard



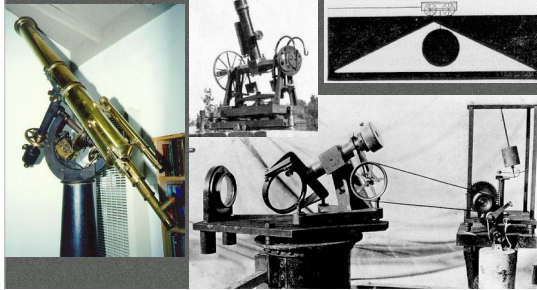
Horizontal Photoheliograph

Howell - Davis



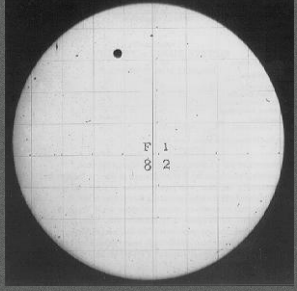
American Instruments

Howell-Versos



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

Howell - 1874



Observations

Howell - 1905

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. Fritchett.					1	1
Mr. John J. Steveson.					1	1
Total for S. Hemisphere.	738	587	10	10	6	7
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Observations

Hughes - 1905

*Reminiscences of Huguenot Seminary,
1877-1887*

Huguenot Seminary,

Wellington

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Afterwards

Newcomb - 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

Howell - 1905

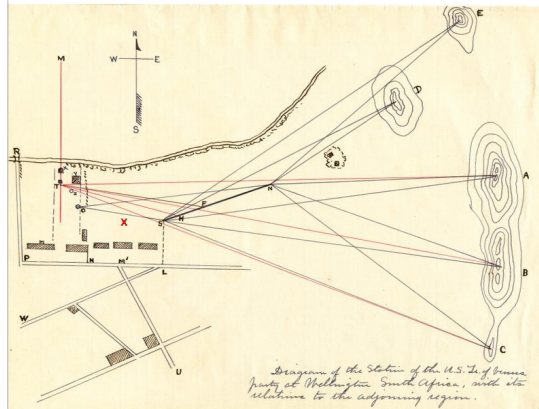
Another 30 years later, H.E.Wood (Union Observatory, Jhb) reads Newcomb's wish, visits Wellington & writes:

"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."

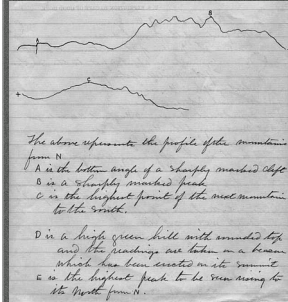
Wood's Iron Post?

Howell - Jones





Newcomb's report

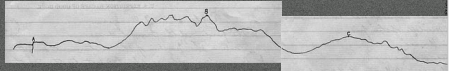


TRANSIT OF VENUS, 1882 DEC. 6. U. S. EXPEDITION TO CAPE OF GOOD HOPE.

Angle SNC = $94^{\circ} 42'$	
SNB = $116^{\circ} 3'$	
SNB = $136^{\circ} 25'$	
SNB = $164^{\circ} 12'$	
SNB = $192^{\circ} 19'$	
SNB = $10^{\circ} 44'$	
NSO = $194^{\circ} 34'$	
Pyramid MTA = $90^{\circ} 15'$	
MTB = $121^{\circ} 38'$	
MTB = $160^{\circ} 38'$	
MTB = $107^{\circ} 1'$	
HS = $26.28'$	
Angle NSL = $119^{\circ} 35'$	
SL = 343 feet	
Angle SEP = $97^{\circ} 17'$	
SEN = $114^{\circ} 4'$	
LM = 250 feet	
Angle LWU = $99^{\circ} 56'$	
NR = 245 feet	
NP = 355 feet	
Angle RPL = $91^{\circ} 34'$	
PR = 496 feet	
K. Briggs and Smith Station near Station	
MT. Mercurius of Transit	
T. L. Green	

Survey

Handwritten text: "Hansen - 1905"



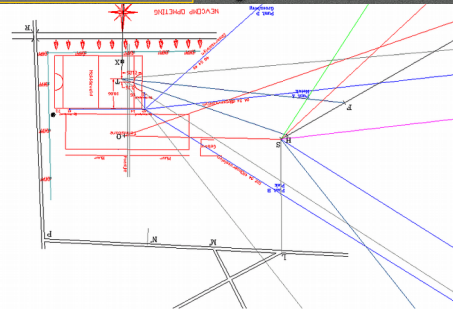
Survey

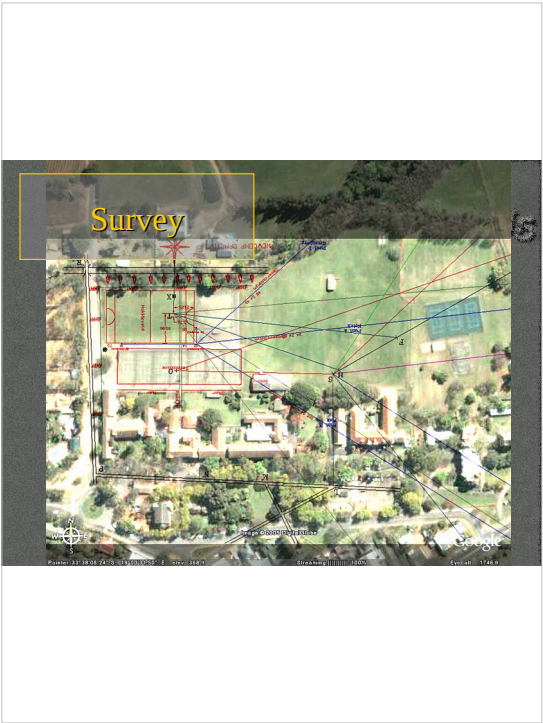
Howler - Lexus



Survey

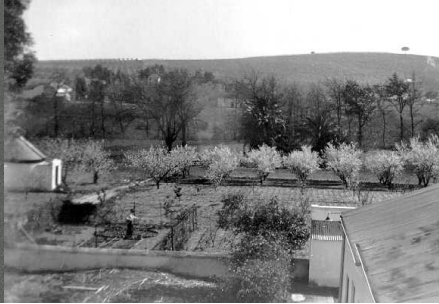
11/10/2017 - 1/10/2018





Seminary
Observatory

Heaven & Earth
1935



Newcomb's
Site, June 2004



Wellington,
8 June 2004

Heaven - Venus



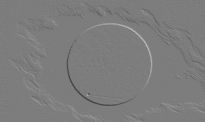
Prof. D. Block



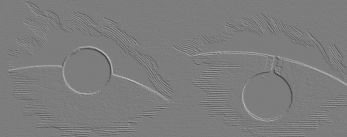
Prof. D. Block



TRANSIT OF VENUS



The British
Expeditions



British & local observations

Howell - 1905

Station	Observer	Assisted by	Telescope	Power	Chronometer
Durban 31° 00' 17" S E 29° 20' 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° 45' 30" 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° 20' 23" E	Mr A. Marth	Coop. Thornton	6" Grubb Equatorial	180	Burchall 308
	Mr C.M. Stevens	Mr J.E. Willis	4 1/2" Dallmeyer Equatorial	145 & 185	Arnold 227
Cape Observatory 18° 28' 41" S E 35° 56' 03" E	Dr (later Sir) D. Gill	Mr Gumble & Mr Fry	6" Grubb Equatorial	110	Dress 1681 Molyneux 3299
	Mr G.W.H. Maclear	Mr Coakes	7" Merz Equatorial	184	Parkinson & Bouts 801
	Mr (later Dr.) W.L. Ekin		4.2" "Dun Eckh" Heliosmeter	180	Gill
	Mr J. Freeman		3 3/4" Theodolite	74	Arnold 1167
	Mr C.R. Fillans	Mr M.W. Theal	3 3/4" Equatorial	120	Barraud 618
	Capt M. Junich		2 1/2" Reinfelder & Hertel Telescope	135	Murray 753

Royal Observatory

Howell - 1905

