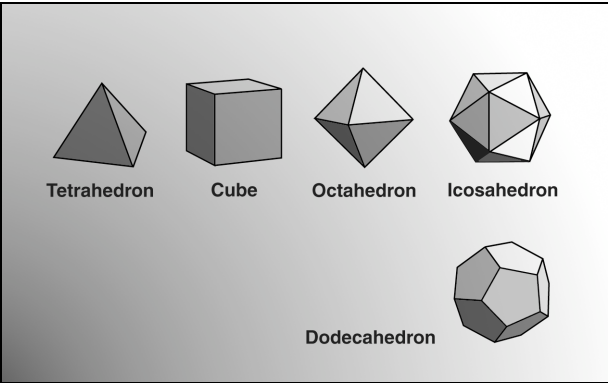


Appendix



An infinite number of regular polygons, but only five regular ‘perfect’ solids—see Prologue.

Chapters One and Two

NASA DATA

Hasselblad 500 EL/70 Lunar Surface Camera

Some details are at variance with other sources

This electrically powered camera, carried on the LM, featured semiautomatic operation. It used a 60mm Biogon lens exclusively. The operating sequence was initiated by squeezing a trigger mounted on the camera handle. *A resseau grid was set in front of the image plane to provide photogrammetric information in the analysis of the photography.* The camera was bracket mounted on the front of the astronaut’s suit. The settings and ranges for equipment on this camera were:

Lens focal length	60mm Biogon
Focus:	3ft to infinity
Aperture:	f/5.6 to f/22
Shutter speed:	1 sec to 1/500 sec
Field of view:	49.2° side, 66° diagonal

Films

The films used throughout the Apollo 11 mission were as follows:

SO-368 Film (CEX)	
Description:	Ektachrome MS color reversal, ASA 64
Use:	Terrain and general photography
SO-168 (HCEX and CIN)	
Description:	Ektachrome EF high speed color reversal, ASA 160 for surface and interior photography; no filter required
Use:	Surface and interior photography at low light levels

Accessories

Accessories for the Apollo 11 photographic equipment included the following:

A polarising filter was used on the lunar surface superwide-angle camera for the photo-geology experiment.

NASA DATA

Apollo 15 lunar photography—extract from Data Users Note December 1972

Lunar surface TV camera

Regarding the RCA television camera color was achieved by using a rotating disk driven by a synchronous 600 rpm motor. Lunar color scenes were scanned, field sequentially, and down-linked serially to the Manned Space Flight Network (MSFN). Video was received and recorded from lunar distances at any of the three Deep Space Stations: Goldstone (California), Madrid (Spain), and Honeysuckle [Creek] (Australia). Color conversion was required at the Manned Spacecraft Center (MSC) *in order to provide commercial standard signals for display monitors.*

NASA DATA

Apollo 17 lunar photography—extract from Data Users Note December 1974

Some details are at variance with other sources—see Chapter Two.

RCA TV camera

The scanning rate for the RCA TV camera was the commercial 525 scan lines/frame. Scan conversion for black and white monitors was not required.

All of the TV coverage was recorded on black and white 16mm kinescope roll film.

Chapter One
Apollo Photographic Analysis
David Groves PhD

***Determination of the direction of illumination
in the image of the Astronaut Descending
Ladder***

The best estimate of the horizontal direction of illumination using (Photograph D[38]) can be determined from the position of the highlight on the heel of the right hand boot. The calculation requires knowledge about the dimensions of the boot, the focal length of the camera lens and film format and the ability to identify the centre of the image. Other reasonable assumptions are made and stated at the point of application.

The plane of the sole of the boot is approximately parallel to the direction of view of the camera and approximately parallel to the horizontal axis of the image. In photograph D the distance (d1) in the plane of the sole between the furthest left point visible on the bottom of the sole and the point directly below the bottom corner of the Velcro fastener can be measured.

$$d1 = 5.00\text{mm}$$

Similarly, the distance between the bottom corner of the Velcro fastener and the furthest right point visible on the bottom of the sole (d2) can be measured.

$$d2 = 3.15\text{mm}$$

The ratio is $\frac{d1}{d2} = 1.5873$

(I had no close up of this portion of the image, limiting the accuracy of the ratio determination. However, this turns out not to be critical due to the curvature of the sole at the point through which the highlight passes.)

Photographs and photocopies of a 'sample' boot were provided. The sample boot was a larger 'shoe size' than the one in photo D, the latter having fewer 'tread bars' on the sole. However, the 'actual size' photocopy of the sole (Photocopy F) of the sample can be used to determine the rotational orientation of the boot in the image, if it is assumed the width and length of the boots have the have the same ratio for both sizes.

The photocopy was used to determine the 'direction of view' required to give the same ratio of visible sole each side of the bottom corner of the Velcro fastener, measured in the plane of the sole. The required direction of view is shown on photocopy F. (The given direction of view drawn onto photocopy F yields a ratio of 1.5817 (i.e. 126.3mm/79.85mm), demonstrating a reasonable estimate of boot orientation).

Using photograph D, the distance (d3) in the plane of the sole between the furthest left visible point of the sole and the point on the sole directly below the highlight can be measured.

$$d3 = 2.15\text{mm}$$

Using photograph D, distance (d4) in the plane of the sole between the furthest right visible point of the sole and the point on the sole directly below the highlight can be measured.

$$d4 = 5.95\text{mm}$$

The ratio $\frac{d3}{d4} = 0.3613445$

(The total distance (d5) across the visible sole of the right boot in photo D is 8.1mm).

In photocopy F, the distance (d6) across the visible sole in the plane of the sole (measured at 90° to the direction of view) is 206.4mm.

Therefore, the distance (d7) of the highlight in photocopy F from the inside of the boot is

$$d7 = \frac{d3}{d5} \cdot d6 = 54.7851\text{mm}$$

This point is marked on photocopy F on the line at 90° to the direction of view. A perpendicular is dropped to the edge of the sole to show the position of the 'highlight'.

At the point of intersection with the edge of the sole, a tangent has been carefully constructed. The normal to the tangent is measured to be at an angle of (B1) 1.1 ° to the direction of view of the camera imaging the heel protector. Now we can trace the ray's path, projected onto the horizontal plane parallel to both the horizontal edge of the image and the optical axis of the camera. The ray has travelled from the light source, been reflected in the heel (at a known position and angle reflection) and onto the camera lens.

To carry out the ray tracing accurately, we need to know details about the camera lens and the distance between the camera and the highlight on the boot.

The camera lens has a focal length of 60mm recording an image on square format 70mm film. Camera/lens data sheets tend not to have scientific accuracy and the 'angle of view' of a lens can be quoted ambiguously, either across the image or across a diagonal of the image.

The angle of view of a 60mm lens on a 70mm film camera was determined practically by measuring the angle of view across a 70mm film image recorded using a 120 Bronica camera fitted with a 75mm lens. The angle of view that a 60mm lens would exhibit on a 120 film/70mm camera was then calculated by virtue of the inverse linear relationship between width of object imaged and focal length of the lens.

A ruler, placed 897mm from the imaging plane, parallel to the horizontal edge of the image and passing through the centre of the image was recorded using the Bronica, as shown in Figure 1. The width of ruler imaged was 494mm.

The 'half angle' of view (B2) is simply

$$B2 = \tan^{-1} (247/897) = 15.39^\circ$$

DARK MOON

For a 60mm lens on a similar 70mm film camera the distance across the ruler imaged is inversely proportional to the focal length of the lens.

Therefore β_3 , the 'half angle' of view of a 60mm lens on a 120film/70mm camera is

$$\beta_3 = \tan^{-1} \frac{247 * 75}{60 * 897} = 18.99^\circ$$

Therefore the angle of view across the image (β_4) is

$$\beta_4 = 37.989^\circ$$

The full width of the image (d_8) is shown in photograph D, measured (close to the bottom, passing through the 'United States' emblem, parallel to the lower horizontal edge of the image) to be

$$d_8 = 185.6\text{mm}$$

Assuming the lens on the 500 EL/70 camera has insignificant barrel or other non-linear distortions, the angle of view will vary linearly with distance across the image. For photograph D the change in angle of view (relative to the centre of the image) per unit distance from the centre of the image G is:

$$G = \frac{\beta_4}{d_8} = \frac{37.987}{185.6} = 0.2046713^\circ \text{ mm}^{-1}$$

or, converting to radians

$$G = 0.00357219 \text{ radians mm}^{-1}$$

From photograph A, given the (approximate) length of the boot, the distance from the bottom of the sole to the top of the 'heel protector' (d_9) is approximately 68.4154mm.

(A direct measurement could be used for better accuracy. As well as being unsure if this dimension is the same in both the sample boot and the boot in the NASA transparency, the photograph of the sample boot has significant distortion from the use of a wide angle lens, contributing additional inaccuracy in the estimation of d_9).

In photograph D, the top of the heel protector and the bottom of the sole are clearly visible. The horizontal part of the centre of the image reticle 'cross' is visible and the vertical line of the cross can be determined by geometric construction from other reticle crosses in the image.

As the variation in angle of view with distance along the image has been determined relative to the centre of the image (i.e. relative to the optical axis of the camera) the difference in angle of view between the top and bottom of the heel protector can be determined.

The distance between the centre of the image and the top of the heel protector in the direction parallel to the vertical edge of the image was measured to be 7.95mm and the distance between the centre of the image and the bottom of the heel protector in the direction parallel to the vertical edge of the image was measured to be 10.5mm.

Let the angle between the optical axis of the camera and the ray passing between the top of the heel bar and the camera lens projected onto the vertical plane (the plane which is parallel to both the vertical axis of the image and the optical axis of the camera) be β_5 , determined as

$$\beta_5 = 7.95 \cdot G$$

Similarly, the angle between the optical axis of the camera and the ray passing between the bottom of the heel bar and the camera lens projected onto the vertical plane be β_6 , determined as

$$\beta_6 = 10.50 \cdot G$$

If it is assumed in figure 2 the distance between the camera and heel protector(R) is much greater than the distance between the top and bottom of the heel protector (d_9) and the difference in angle of view between the top and bottom of the heel protector ($\beta_6 - \beta_5$) are related by

$$d_9 = R \cdot (\beta_6 - \beta_5)$$

or

$$R = d_9 / G \cdot (10.50 - 7.95) \\ (\text{Where } G \text{ is expressed in radians mm}^{-1})$$

Therefore $R = 7510.70\text{mm}$ (i.e. 7.5107 metres)

This is the distance of the heel protector from the camera. The only 'questionable' measurement is the actual height of the heel protector. To cross check, the range calculation can be repeated using the extreme left and right edges of the sole visible in the image of the right hand boot. The sample boot, according to the direction of view determined on photocopy F, has a width in this orientation of 206.4 mm.

Therefore the range (of the mid point of the sole) by the method used above

$$R = 206.4 / G \cdot (21.3 - 12.85) \\ (\text{Where } G \text{ is expressed in radians mm}^{-1})$$

$$R = 6837.8\text{mm}$$

The discrepancy in estimates is an indication of the difference between the dimensions of the sample boot and the boot in the transparency. As it is the major cause of uncertainty in the calculation the two estimates (one determined across the boot and one determined vertically through the boot) it will be used later in the estimation of the accuracy of the final result of the position of the source of illumination.

We now have enough information to trace the ray of light (in the horizontal plane, the plane parallel to the optical axis of the camera and parallel to the horizontal edge of the image) emanating from the light source, being reflected in the heel protector and entering the camera lens at a known orientation to the optical axis of the camera. Consider Figure 3, the projection of the ray path onto the defined plane.

As the distance in photograph D between the centre of the image and the highlight on the heel protector in the direction parallel to the horizontal edge of the image can be measured (15.35mm), the angle between the optical axis of the camera and the ray emanating from the illumination reflecting in the heel protector (β_7) can be determined as

$$\beta_7 = 15.35 \cdot G$$

(Where G is expressed in $^{\circ}\text{mm}^{-1}$)

$$\beta_7 = 3.1417^{\circ}$$

Now the beam from the source of illumination is reflected in the heel protector such that the angle of incidence is equal to the angle of reflection, measured relative to the 'normal' to the surface (i.e. the line perpendicular to the tangent of the surface of the heel protector at the point through which the 'highlight' passes).

From photocopy F we have determined that the 'normal' at the point of the 'highlight' on the heel protector is 1.1° to the direction of view of the beam passing between the heel protector and camera lens. Therefore, as shown in figure 4a, the beam emanating from the source of illumination has the same angle on the other side of the 'normal' to the tangent, a total angle (β_8) of 2.2° .

Therefore, as shown in figure 4b, we have a triangle with two known angles and a known side length.

where

$$\frac{A}{\sin(a)} = \frac{B}{\sin(b)}$$

or

$$A = B \cdot \sin(a)/\sin(b)$$

Therefore X, the distance of the light source to the right of the camera (assuming it is the same distance from the heel protector as the camera) is

$$X = B \cdot \sin(a)/\sin(b)$$

or

$$X = 7510.7 \cdot \sin(2.2)/\sin(90.942)$$

or

$$X = 288\text{mm}$$

Now the (worst) estimate of R was 6837.8mm which would result in an estimate of X of 262.20, an error of approximately 25.8mm

$$e_1 = 25.8\text{mm}$$

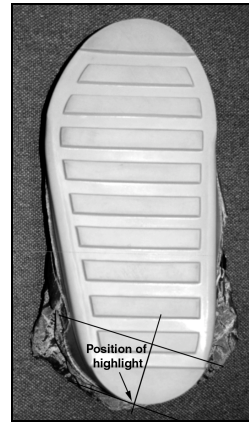
The angle of the 'normal' was measured to an accuracy of about 0.1° (assuming the boot photocopy fairly reflected the shape of the actual boot), therefore the 'error' in the position due to the angle ($S = R \cdot \beta$) is

$$e_2 = 7510.7 \cdot 2.2 \cdot \pi/180 = 26.2\text{mm}$$

The total maximum error on the position of the light source is

$$e + e_1 + e_2 = \pm 52\text{mm}$$

Therefore, the light source is between 23.6cms and 34.0 cms to the right of the camera.



Photocopy F.

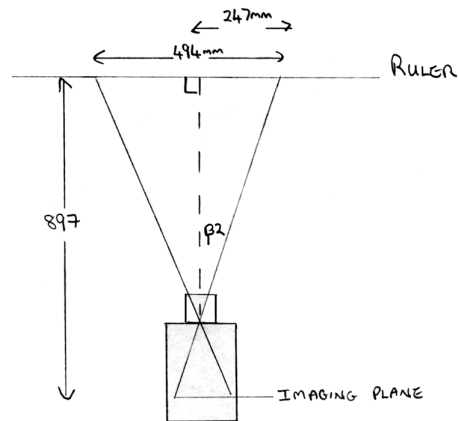


Fig 1. Practical measurement of camera angle of view.

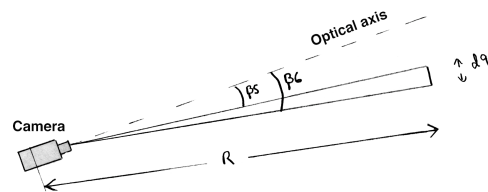


Fig 2. Rays from top and bottom of heel protector projected onto the 'vertical' plane as defined in the text.

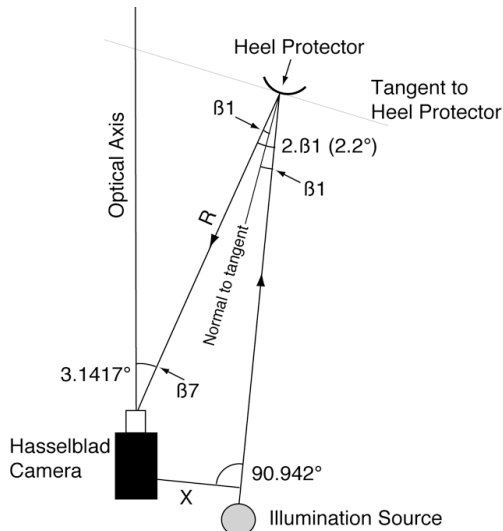


Fig 3. Ray path projected onto the 'horizontal' plane as defined in the text.

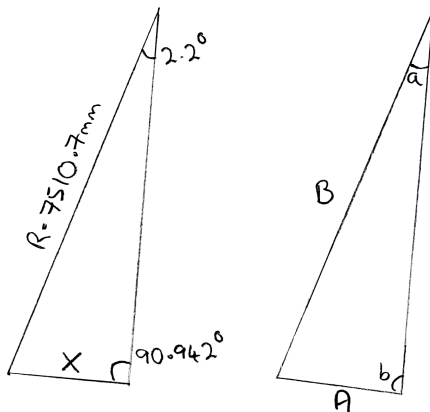


Fig 4a (left).
X, the distance to the right hand side of the camera, of the source of illumination, assuming the same approximate distance away from heel protector as the camera.
Fig 4b (right).
Relationship between angles and 'opposite' side length for all triangles.

Determination of the position of the camera in the image of the Astronaut Standing

Calculation of the Camera's Height from Photograph A[48]

The best estimate of the height of the camera can be deduced from photograph A, using the 'divergence' of the

camera lens (defined by the focal length of the camera lens and the 70mm film format), the angle of declination of the camera (defined by the position of the horizon relative to the centre reticle of the image) and the distance between the camera and the astronaut's visor (defined by the 'divergence' of the camera lens and the actual width of the visor).

I am informed that the focal length of the camera lens used on the Hasselblad 500 EL/70 Lunar Surface Camera was a 60mm (Zeiss Biogon) lens.

1. Camera Height with 60mm Focal Length Lens Used to Record Photograph A[48]

1.1 Divergence of the 60mm focal length lens

To carry our 'ray tracing' to determine the position of the camera, we first require to know the 'angle of view' or 'divergence' of the camera lens. This can never be 'exact' as the divergence varies slightly with focus. As camera/lens data sheets tend not to have scientific accuracy and the 'angle of view' of the lens can be quoted ambiguously, (either across the image or along a diagonal of the image) the angle of view was determined practically.

An image of a ruler was recorded using a 120 Bronica camera fitted with a 75mm focal length lens. The ruler was positioned to pass through the centre of the image, its sides being parallel to the top and bottom edges of the image.

As shown in Figure 1, the imaged width of the ruler was 494mm and the orthogonal distance (i.e. along the optical axis of the camera) between the ruler and imaging plane was 897mm. The 'half angle' of view of the 75mm lens is simply

$$\beta_1 = \tan^{-1} (247/897) = 15.39^\circ$$

For a 60mm lens on a similar camera, the distance across the ruler imaged is inversely proportional to the focal length of the lens. Therefore β_2 , the 'half angle' of view of a 60 mm lens on a 120 film/70mm camera is

$$\beta_2 = \tan^{-1} ((247 * 75)/(60 * 897)) = 18.99^\circ$$

Therefore, the angle of view (through the centre) of an image recorded using a 60mm lens on a 120 film /70mm camera, β_3 is

$$\beta_3 = 37.987^\circ$$

1.2 Angle of Declination of the Camera in Photograph A[48]

Assuming the lens on the 500 EL/70 camera has insignificant barrel or other non-linear distortions, the 'angle of view' will vary linearly from the centre of the image. For photograph A, if taken with a 60mm lens, the change in angle of view per unit distance (mm) (measured radially from the centre of the image) is

$$G_{60} = \beta_3/d_1 = 37.987 / 186.7^\circ \text{ mm}^{-1}$$

were d_1 is the distance measured on photograph A between the edges of the visor intersecting with camera axis 'y'.

$$G60 = 0.2034654^\circ \text{ mm}^{-1}$$

$$G60 = 0.00355114 \text{ radians mm}^{-1}$$

Now, in photograph A, let us assume the line of the horizon is orthogonal to the 'true' vertical in the vicinity of the astronauts. Assuming that the terrain to the horizon is approximately flat and that the Moon is spherical, the angle of the horizon to the 'true vertical' can be determined from the radius of the moon and the (approximate) height of the cameras viewpoint.

Figure 2 shows the Moon of radius $R_m = 1740,000\text{m}$ (ref Philips Atlas of Stars and Planets). The angle of elevation of the horizon to the true vertical β_m at a height of D_2 from the surface can be determined as

$$\sin(\beta_m) = R_m / (R_m + D_2)$$

or $\beta_m = \sin^{-1}(R_m / (R_m + D_2))$

Therefore, in the range of height of viewpoint 2m to 10m, the angle of elevation of the horizon to the true vertical is 89.91 to 89.80°. Taking into account the various uncertainties in the shape of the Moon, flatness of the terrain etc., the horizon can be taken as defining the plane of the true horizontal in all images.

Using the horizon as a 'spirit level' the angle of declination of the optical axis of the camera can be determined. In photograph A, axes 'x' and 'y' have been drawn through the centre reticle of the image, the axes being parallel to the 'horizontal' and 'vertical' edges of the image. Note that the camera is rotated relative to the horizon

The angle of declination of the camera in the true vertical plane can be determined from the distance between the horizon and the centre of the image along the line passing orthogonally through the horizon, d_3 .

$$d_3 = 76.6\text{mm}$$

Therefore, the angle of declination of the camera to the true horizontal in the plane of the true vertical is

$$\beta_8 = d_3 * G60$$

$$\beta_8 = 76.6 * 0.2034654^\circ$$

or $\beta_8 = 15.58544964^\circ$

$$\beta_8 = 0.27202 \text{ radians}$$

Therefore, in the true vertical plane, as shown in Figure 3, the angle of elevation β_9 of the optical axis to the true vertical is

$$\beta_9 = 90 - \beta_8^\circ$$

$$\beta_9 = 90 - 15.58544964^\circ$$

$$\beta_9 = 74.41^\circ$$

$$\beta_9 = 1.2988 \text{ radians}$$

1.3 Distance of the Centre of the Camera's Imaging Plane Above the Moon's Surface

The distance between the centre of the imaging plane and the vertical plane which passes through the left and right hand edges of the visor can be determined from the divergence of the lens and actual width of the visor.

The width of the visor is 280mm. The distance between the edges of the visor d_4 in photograph A[48] is

$$d_4 = 20.5\text{mm}$$

Therefore, the scale of the photograph in the vertical plane passing through the left and right edges of the visor in the vicinity of the visor is

$$\text{scale A} = 20.5/280$$

In photograph A[48], the distance d_5 between the edges of the visor intersecting with camera axis 'y' is

$$d_5 = 19.7\text{mm}$$

Therefore the 'actual' distance between the edges of the visor intersecting with camera axis 'y' is

$$D_5 = d_5 / \text{scale A}$$

$$D_5 = 19.7 * 280 / 20.5 \text{ mm}$$

$$D_5 = 269.073 \text{ mm}$$

Now, the difference in angle between the edges of the visor intersecting with camera axis 'y', as shown in Figure 4, is

$$\beta_{12} = \beta_{11} - \beta_{10}$$

or $\beta_{12} = d_5 * G60$

$$\beta_{12} = 4.0083^\circ$$

or $\beta_{12} = 0.0699 \text{ radians.}$

Now, from Figure 4, the β_{12} and D_5 can be used to determine D_6 , the distance between the imaging plane and the vertical plane passing through the edges of the visor, as

$$\sin(\beta_{12}/2) = D_5 / (2 * D_6)$$

or $D_6 = D_5 / (2 * \sin(\beta_{12}/2))$

$$D_6 = 269.073 / (2 * \sin(0.0699575/2))$$

$$D_6 = 3847.02\text{mm}$$

Therefore, as shown in Figure 5, the distance D_7 in the true vertical between the centre of the imaging plane of the camera and the plane parallel to the true horizon passing through the point on the optical axis which intersects with the vertical plane passing through the edges of the visor is

$$D_7 = D_6 / \tan(\beta_9) \text{ mm}$$

$$D_7 = 3847.02 / \tan(1.29877891517313) \text{ mm}$$

$$D_7 = 1073.05 \text{ mm}$$

From photograph A[48], the distances D_8 and D_9 cannot be determined directly.

However they can be estimated from this data and photocopy B, assuming the astronaut in both images have a

DARK MOON

similar stance, are of similar height and the ground in the vicinity of astronaut and photographer in photograph A is flat. If these assumptions are valid, the data in Figures 4 and 5 can be used to draw the 'rays' and position of the camera onto the (extended) photocopy B. The scale of the photocopy can be determined as the distance between the top and the bottom of the visor is 260mm. The distance between the top and bottom of the visor in photocopy B is 29mm

$$\text{scale } 8 = 29.0/260$$

If the beam in the true horizontal (which intersects with the horizon) is used to 'overlay' the ray trace data, the optical axis intersects with the shins of the astronaut, perhaps a little higher than in photograph A due to departures from the stated assumption. If the optical axis of the camera is drawn on photocopy B so as to intersect with the 'correct' position on the astronaut's shins, a 'range of uncertainty' ($e = 80.7\text{mm}$ from photocopy of known scale) in the height of the position of the camera above the surface can be determined.

From photocopy B of scale 'scale 8'

The height D11 of the centre of the imaging plane above the surface is

$$\begin{aligned} D11 &= D7 + D8 + D9 \\ D11 &= 1073.05 + 453.60 \\ D11 &= 1526.65 \end{aligned}$$

Therefore the range at which the camera is above the surface is between D11 and D11 - e.

That is

THE CENTRE OF THE IMAGING PLANE OF THE CAMERA WAS BETWEEN 1446mm AND 1527mm ABOVE THE SURFACE OF THE MOON WHEN PHOTOGRAPH A WAS RECORDED.

Further, assuming perfectly flat terrain from horizon to horizon, the reflection of the opposite horizon and the centre of the imaging plane of the camera should appear in the same horizontal plane, consistent with (within reasonable variation) visor reflection in photograph A.

Finally, the above calculations provide an accurate estimate of the camera's height above the surface, provided all the assumptions stated are valid. The only assumption which could make a significant difference if not valid is the assumption that the terrain beneath and between the photographer and astronaut is flat. This assumption can be tested and a 'typical' value for the variation in height of the surface between the astronaut and photographer can be estimated using shadow on the surface of the outside edge of the astronaut's left leg.

Consider photograph A. If the ground was flat, the shadow of the outside edge of the left leg should be approximately straight. The curvature of the shadow on the ground is due

to the surface not being perfectly flat. An approximate estimate of the range in height of the surface between the photographer and astronaut can be determined from the distance between the straight line joining the shadow of the left foot and hip and the actual shadow, measured along camera axis 'y'. This is (approximately, by observation) the maximum distance between line and actual shadow, representing the largest discernible 'hill' between astronaut and photographer.

Consider Figure 6. C is the position of the centre of the imaging plane of the camera, B is the position of the shadow if the surface was flat and A is the actual position of the shadow. β_{13} is the angle of the line at the intersection with camera axis 'y'. From photograph A[48] d_{12} and d_{13} can be measured, the distance between the centre of the image and the straight lines intersection with the camera's y axis and the distance between the centre of the image and the actual shadow's intersection with the camera's y axis respectively.

$$\begin{aligned} d_{12} &= 32.9\text{mm} \\ d_{13} &= 25.5\text{mm} \end{aligned}$$

Therefore

$$\begin{aligned} \beta_{13} &= d_{12} * G60 \\ \beta_{13} &= 6.694^\circ \\ \beta_{13} &= 0.116833\text{ radians} \end{aligned}$$

From figure 6

$$\begin{aligned} \beta_{15} &= 90 - (\beta_{13} + \beta_8) \\ \beta_{15} &= 67.7206^\circ \\ \beta_{15} &= 1.18195\text{ radians} \end{aligned}$$

As

$$\begin{aligned} \cos(\beta_{15}) &= D11/D12 \\ D12 &= 4027.709\text{mm} \end{aligned}$$

But

$$\begin{aligned} \beta_{14} &= d_{13} * G60 \\ \beta_{14} &= 5.18836^\circ \end{aligned}$$

From figure 6

$$\begin{aligned} \beta_{16} &= 90 - (\beta_{14} + \beta_8) \\ \beta_{16} &= 69.226^\circ \\ \beta_{16} &= 1.208226\text{ radians} \end{aligned}$$

As

$$\begin{aligned} \cos(\beta_{16}) &= D14/D12 \\ D14 &= D12 * \cos(\beta_{16}) \\ D14 &= 1428.643\text{mm} \end{aligned}$$

Therefore the 'displacement' of the shadow of the outside edge of the left leg on the ground from the straight line joining the shadow at of the foot to the shadow of the hip is due to a rise in the surface height D15.

$$\begin{aligned} D15 &= D11 - D14 \\ D15 &= 99\text{mm} \end{aligned}$$

This 'hill' is seen to fall and rise between the astronaut and photographer. Its maximum height is in the order of only 10cm, indicating that the surface's height beneath both astronaut and photographer is not significantly different.

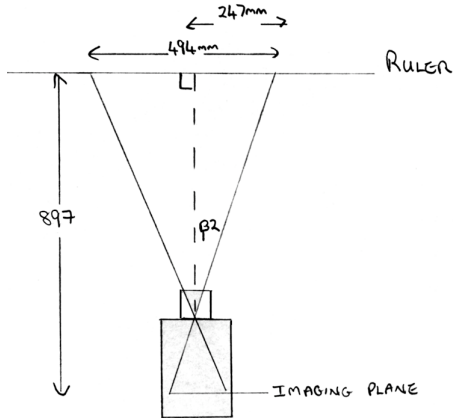


Fig 1. Practical measurement of camera angle of view.

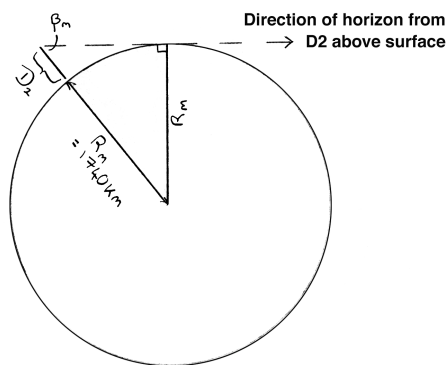


Fig 2. Angle of elevation of horizon to the 'true' vertical on the Moon.

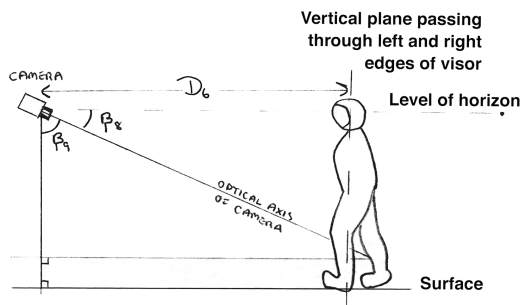


Fig 3. Angles of declination and elevation of the camera relative to the 'true' vertical.

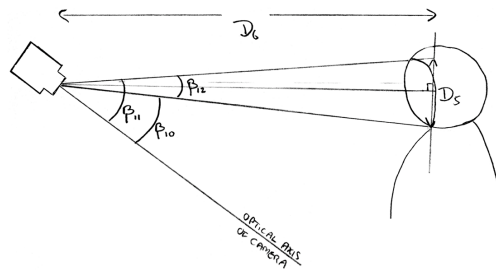


Fig 4. Distance between camera and vertical plane passing through edges of visor.

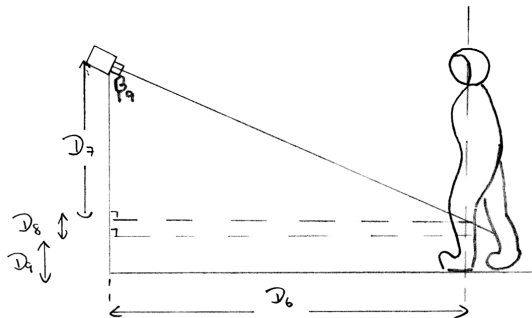


Fig 5. Height of the centre of camera's imaging plane above the surface when 'photograph A' was recorded.

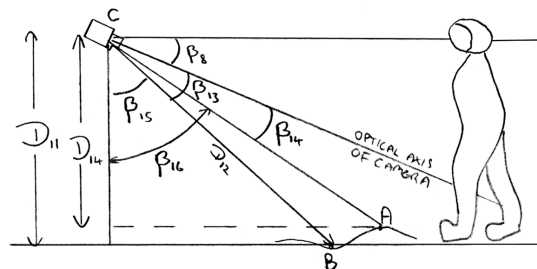


Fig 6. 'Typical' variation in surface height between astronaut and photographer.

Evaluation of Ionising Radiation (X-rays) on Ektachrome ISO 160 Professional 120 Colour Reversal Film—David Groves PhD

1) INTRODUCTION

I am informed that Ektachrome EF ASA (ISO) 160 high speed colour reversal film was used for lunar photography during the Apollo lunar surface EVAs.

2) AIMS

This investigation aimed to establish the effect of ionising radiation on 'correctly' exposed latent images on fresh Ektachrome 160T film.

3) METHODS

A Bronica ETRSi 120 roll film camera was used for the tests. Five rolls of Ektachrome 160T film were exposed at the 'correct' exposure of a JOBO Labortechnik colour test chart. The chart consisted of six colour patches (additive primary blue, green and red and subtractive complementary colours yellow magenta and cyan) and six neutral 'grey scale' patches from white to black with a density difference of one aperture difference (0.3D) between each.

For exposure the test chart was illuminated evenly using two 60 Watt tungsten lights, one placed each side of the camera. 'Correct' exposure (1/60th sec @ f5.6) was determined using a spotmeter on the mid grey tone to an accuracy better than 0.6 of a stop (0.18D).

The exposed films containing latent images of the test chart were then exposed (without any surrounding shielding) to 8 MeV x-rays using a linear accelerator. The film was then E6 processed in the normal manner. The results are given in the next section.

4) RESULTS

Film Strip 8

Film strip 8 contains 'correct' exposures (1/60th sec @ f5.6) of the test chart which were then exposed to 25 rem of ionising radiation (8 MeV x-rays). The film was processed in the normal (E6) manner. The images, although visible are seriously damaged rendering them unusable.

Film Strip 9

Film strip 9 contains 'correct' exposures (1/60th sec @ f5.6) of the test chart which were then exposed to 50 rem of ionising radiation (8 MeV x-rays). The film was processed in the normal (E6) manner. The images are barely visible, the x-rays having near obliterated the latent images.

Film Strip 10

Film strip 10 contains 'correct' exposures (1/60th sec @ f5.6) of the test chart which were then exposed to 100 rem of ionising radiation (8 MeV x-rays). The film was processed in the normal (E6) manner. The images are completely obliterated by the x-rays.

5) DISCUSSION

Ektachrome ISO 160 appears to be significantly sensitive to x-rays. Above 100 rem exposure to x-rays any latent image is completely obliterated. Between 50 rem and 25 rem exposure to x-rays the remaining image is visible but extremely faint. The estimated radiation dose required to degrade the image to the level produced by four hours exposure to the maximum temperature expected on the

lunar surface (+82.2°C—see next test) is estimated from the above results to be in the order of only 5 rem.

6) CONCLUSION

Even a modest radiation dose to the film (5 rem and greater) would produce significant reduction of contrast and image density in the resulting Ektachrome ISO 160T transparencies.

Evaluation of High Temperature on Ektachrome ISO 160 Professional 120 Colour Reversal Film—Extract from report by David Groves PhD

1) INTRODUCTION

The following test was undertaken with fresh Ektachrome 160T film.

According to NASA's own data, the temperature range the Hasselblad 500 EL/700 camera was subjected to whilst on the lunar surface was +180°F (+82.2°C) to -180°F (-117.8°C).

This range of temperature is well outside Kodak's recommendation. The purpose of this investigation was to establish the behaviour of Ektachrome ISO 160 roll film when used at the high end of the temperature range.

2) AIMS

This investigation aimed to evaluate the photographic behaviour of the film at +82.2°C by recording images at the 'correct' exposure to test the effect on image density and colour hue.

3) METHODS

The same Bronica ETRSi 120 roll film camera as was used for the radiation tests was employed for the image density and colour hue tests. Again the JOBO Labortechnik colour test chart was illuminated evenly using two 60 Watt tungsten lights. 'Correct' exposure was determined as before (again 1/60th sec @ f5.6) using a spotmeter on the mid grey tone to an accuracy better than 0.6 of a stop (0.18D).

A test on the effect of persistent high temperature (+82.2°C) on the latent image recorded on Ektachrome 160T was then carried out. A time of 4 hours was chosen as a number of lunar EVAs lasted for this period. Film strip 7 contains 'correctly' exposed images recorded at room temperature as described above. After recording the latent images, the film was baked in an accurate temperature-controlled oven for four hours at +82.2°C.

4) RESULTS

When compared to the control strip the resulting transparencies in test strip 7 show significant 'lightening' apparent both on the test patches and on the unexposed areas of the film between and to the side of each exposed image.

5) CONCLUSION

Extended exposure to the higher end of NASA's anticipated temperature range on the lunar surface may be expected to significantly decrease the image density of the resulting Ektachrome ISO 160 transparencies.

Total number of hours Apollo astronauts spent on the lunar surface—according to the record			
<i>Mission</i>	<i>Crew LM</i>	<i>Time spent on lunar surface</i>	<i>EVA duration</i>
‘Apollo 11’	Armstrong & Aldrin	21 hrs 36 mins	02 hrs 31 mins
‘Apollo 12’	Bean & Conrad	31 hrs 31 mins	1st) 03 hrs 56 mins 2nd) 03 hrs 49 mins <i>Total) 07 hrs 45 mins</i>
‘Apollo 14’	Shepard & Mitchell	33 hrs 30 mins	1st) 04 hrs 47 mins 2nd) 07 hrs 12 mins <i>Total) 11 hrs 59 mins</i>
‘Apollo 15’	Irwin & Scott	66 hrs 54 mins	1st) 06 hrs 32 mins 2nd) 07 hrs 12 mins 3rd) 04 hrs 49 mins <i>Total) 18 hrs 33 mins</i>
‘Apollo 16’	Duke & Young	71 hrs 02 mins	1st) 07 hrs 11 mins 2nd) 07 hrs 23 mins 3rd) 05 hrs 40 mins <i>Total) 20 hrs 14 mins</i>
‘Apollo 17’	Cernan & Schmitt	74 hrs 59 mins	1st) 07 hrs 11 mins 2nd) 07 hrs 36 mins 3rd) 07 hrs 15 mins <i>Total) 22 hrs 02 mins</i>

Hasselblads flown on Apollo missions	
(see Chapter Two)	
‘Apollo 8’	2 pcs 500 EL/70
‘Apollo 10’	2 pcs 500 EL/70
‘Apollo 11’	1 pcs HEDC 500 EL/70—or <i>Super-Wide*</i>
	*according to NASA data
	2 pcs 500 EL/70 (in Command Module)
‘Apollo 12’	2 pcs HEDC 500 EL/70
	5 pcs 500 EL/70 (in Command Module)
‘Apollo 13’	3 pcs HEDC 500 EL/70
	1 pcs 500EL/70 (in Command Module)
‘Apollo 14’	2 pcs HEDC 500 EL/70
	2 pcs 500EL/70 (in Command Module)
‘Apollo 15’	3 pcs HEDC 500 EL/70
	1 pcs 500EL/70
‘Apollo 16’	2 pcs HEDC 500 EL/70
	1 pcs 500EL/70
‘Apollo 17’	2 pcs HEDC 500 EL/70
	1 pcs 500EL/70
<i>This list does not include any other cameras such as the Data Acquisition Camera, stereo cameras or TV cameras etc.</i>	

Chapter Three

Radiation

“The difference between an active Sun and a calm Sun is enormous. For example, if this activity were in the spectrum of visible light—we would all be blind”.
J F Mangin astronomer and laser specialist. Observatories de Nice, France.

Sputnik 3 is rarely mentioned but in the context of the Van Allen belts it is worth noting that Brian Harvey, author of *The New Russian Space programme* asserts that *this* was the Soviet probe that returned the Van Allen data! Sputnik 3 successfully gained orbit on May 15 1958 after a launch failure on April 27 1958—according to Harvey. Interestingly, American space chronologers Baker and Heyman both give February 3 1958 as the launch failure date for this radiation detecting probe. Had it been successful, the Sputnik 3 launch would parallel the US Explorer 1, which was also geared to detect radiation and bears out our claim that both space agencies were probably aware of these zones of radiation since November 1957.

A note on orbital data: 141 x 581 means that the nearest point of the orbit was 141 miles from Earth and the furthest was 581 miles from Earth. The inclination is the angle at which this orbit is inclined to the equator. The end date is the date at which the probe re-entered the atmosphere and burned up, this does not necessarily coincide with the end of data transmission which can have occurred months before. For example Sputnik 1 had power and therefore the ability to transmit data for 14 days and Explorer 3 stopped transmitting at least 12 days before re-entry.

DARK MOON

Chapter Four *Rockets*

We are used to seeing the familiar black and white squares on American rockets—an embellishment designed to aid visibility. However, it is little known that this aid was initially employed by the Nazis at Peenemünde on October 3 1942. The A-4/V-2 rocket (which would later attempt to inflict serious damage upon London and elsewhere) completed a triumphant trial on that October day and was emblazoned with these black and white squares.

Korolëv

On reading of von Braun's Apollo program exploits in the early 1960s Korolëv had remarked that they "should be friends".

Like von Braun, Sergei Korolëv was a charismatic team leader.

Unlike von Braun, Korolëv was not allowed to be a media star, his existence being kept secret by the Soviet government until his untimely death at the age of 59, in 1966.

Also, unlike von Braun, amongst his peers Korolëv was truly unequalled in his sphere of rocketry and space technology.

In 1966 Sergei Korolëv asked his Doctor how long his heart would last. The reply was "about twenty years"—to which Korolëv replied: "Ten years will be enough".

He would be dead within hours of his admission to hospital—of either heart failure or peritonitis, depending on which account you read recording his death.

Suvorov

In *The First Manned Spaceflight* Alexander Sabelnikov, (nephew of Vladimir Suvorov), has collated material from the diaries of his famous uncle and produced an important book which provides a remarkable insight into the Soviet Space program. Suvorov was probably the most important of the photographers and film makers assigned to the Soviet space agency, having already worked on other top secret assignments such as recording the research and technology of the Soviet nuclear program. It was Vladimir Suvorov who took those shots of Yuri Gagarin that (at the time) we all believed were 'live'. However, Suvorov had carefully avoided any mention in his diaries of either a Soviet manned Moon program or even a military space program. Given the very high levels of security clearance under which Suvorov worked, this fact is hardly surprising. But Sabelnikov has also interviewed various retired



Embassy of the United States of America

24 Grosvenor Square
London W1A 1AE

July 7, 1997

Mr. David S. Percy

Dear Mr. Percy:

I have forwarded a copy of your letter to the NASA Representative in Paris, as well as NASA Headquarters in Washington, and asked that they reply directly. There is no one currently at the Embassy with the expertise to answer your specific questions.

Sincerely,

Raymond V. Arnaudo
Science & Environment Attache

cc: James Zimmerman
NASA - Embassy Paris

J. Adamas
NASA, International Affairs Office

Despite this acknowledgement from the United States Embassy in London replies to our questions were never forthcoming from NASA.

participants in the Soviet program in a post-Glasnost attempt to fill the gaps left in history by his uncle. It was not until 1990 and the publication of an article on the subject of the N-1 project in the Russian newspaper *Krasnaya Zvezda* that Sabelnikov considered that he had obtained the level of confirmation required concerning the seriousness of the Soviets' intent to achieve a Moon landing by the late 1960s.

We strongly recommend his book.

Rockets

Referring to the Challenger Space Shuttle disaster, executives from Morton Thiokol were adamant that it was too dangerous to risk the Challenger flight as the ambient temperatures were "outside of their experience".

That being so, surely the conditions in which the Apollo craft were expected to perform could also be described as "outside of their experience"? The CSM/LM engines and fuels were required to operate in ambient temperatures far more extreme than those experienced overnight by Challenger sitting on the launch pad.

***Lunar 'timeshare' launch date schedules for the USSR/USA space agencies
(see text Chapter Four, page 162)***

Space agency	Date	Mission	Space agency	Date	Mission
USSR	Jan 02 1959	Luna 1	USA	Jan 10 1968	Surveyor 7
USSR	Sep12 1959	Luna 2	USSR	Apr 07 1968	Luna 14
USSR	Oct 04 1959	Luna 3	USSR	Sept 14 1968	Zond 5
USA	Aug 23 1961	Ranger 1	USSR	Nov 10 1968	Zond 6
USA	Nov18 1961	Ranger 2	USA	Dec 21 1968	'Apollo 8'
USA	Jan 26 1962	Ranger 3	USA	May 18 1969	'Apollo 10'
USA	Apr 23 1962	Ranger 4	USSR	July 13 1969	Luna 15*
USA	Oct 18 1962	Ranger 5	USA	July 16 1969	'Apollo 11'*
USSR	Apr 02 1963	Luna 4	USSR	Aug 07 1969	Zond 7
USA	Jan 30 1964	Ranger 6	USA	Nov 14 1969	'Apollo 12'
USA	Jul 31 1964	Ranger 7	USA	Apr 11 1970	'Apollo 13'
USA	Feb 20 1965	Ranger 8	USSR	Sept 12 1970	Luna 16
USA	Mar 24 1965	Ranger 9	USSR	Oct20 19 70	Zond 8
USSR	May 09 1965	Luna 5	USSR	Nov 10 1970	Luna 17/ <i>Lunikhod</i>
USSR	June 08 1965	Luna 6	USA	Jan 31 1971	'Apollo 14'
USSR	July 18 1965	Zond 3	USA	July 26 1971	'Apollo 15'
USSR	Oct 04 1965	Luna 7	USSR	Sept 02 1971	Luna 18
USSR	Dec 03 1965	Luna 8	USSR	Sept 28 1971	Luna 19
USSR	Jan 31 1966	Luna 9	USSR	Feb 14 1972	Luna 20
USSR	Mar 31 1966	Luna 10	USA	Apr 16 1972	'Apollo 16'
USA	June 02 1966	Surveyor 1	USA	Dec 07 1972	'Apollo 17'
USSR	Aug 24 1966	Luna 11	USSR	Jan 08 1973	Luna 21/ <i>Lunikhod 2</i>
USA	Sept 20 1966	Surveyor 2	USSR	May 29 1974	Luna 22
USSR	Oct 22 1966	Luna 12	USSR	Oct 1974	Luna 23
USSR	Dec 21 1966	Luna 13	USSR	Aug 09 1976	Luna 24
USA	Apr 20 1967	Surveyor 3	* Matched missions.		
USA	July 14 1967	Surveyor 4			
USA	Sept 11 1967	Surveyor 4			
USA	Nov 10 1967	Surveyor 6			

Chapter Five

The main sources of reference for Chapter Four are listed in the Chapter Notes but here are some further comments and background.

An astronaut in a rocket leaves the Earth at X moment in time on X day for X period and XYZ events occur during the trip. Such facts should be indisputable and therefore all space histories should correspond on these points. Naturally, the *interpretation* of such events will be as individual as the writers themselves. Nevertheless it was astonishing to find numerous discrepancies between the various space histories on fundamental points. These discrepancies do not automatically imply inaccuracy on the part of the authors but they are certainly an indication of a problem—a problem that could stem from the distribution and/or in the content of the space program information that has been made available to the researchers of the Apollo records.

David Baker, the author of two seminal reference books, *A History of Manned Space Flight* and *Spaceflight and Rocketry: A Chronology*, is an acknowledged expert on the history of space and its attendant technology. His attention to detail is unparalleled. The material in his *Spaceflight and Rocketry* took him over thirty years to compile.

Heinz Gatzmann, author of *The Men and The Rockets* was assistant to Zborowski, the German rocket scientist and engineer at BMW's Rocket Technology Research, and Gatzmann worked for German Rocket Program throughout the Second World War. Encompassing the years from 1895 to 1956 his book is a translation from the German by the Science Book Club.

James Harford, author of *Korolev*, is the Executive Director Emeritus of the American Institute of Aeronautics and Astronautics and formerly Verville Fellow at the US National Air and Space Museum. This biography, published in 1997, was a key reference for this chapter (although we cross referenced with other published material and also used the fruit of our own 1997 meetings in Moscow).

Ernst Stuhlinger and Frederick I Ordway III have written an invaluable biographical memoir of von Braun. Stuhlinger was a veteran of Peenemünde and one of the 127 men shipped to the United States after WWII. The American-born Frederick I Ordway III worked with Wernher von Braun at ABMA and at NASA's Marshall Space Flight Center.

Dr. Helen B Walters, author of *Wernher von Braun, Rocket* intended this book to be read by the younger reader and was produced with the approval of von Braun—who penned the introduction.

The *Hutchinson Dictionary of Scientists* was published in 1994. In this book von Braun is named Wernher Magnus, instead of Wernher Frieher. Magnus was actually the name of his father and his younger brother, the latter worked with WvB both in Germany and in the United States.

Willie Ley always said that he left Germany for the States in 1933 due to the fact that he detested fascism. He maintained lifelong close connections both professional

and personal with Oberth, Fritz Lang and von Braun. Ley wrote several books on space exploration while in the US and ended his career in charge of the National Air and Space Museum.

Willie Ley's works include:

Bombs & Bombing, 1941;

Exploration to Mars (with Wernher von Braun), 1946;

Ranger to the Moon, 1965;

Watchers of the Skies, 1963;

Rockets, Missiles and Men in Space, 1963.

BIS

Although a clearing house of astronautical information, do not confuse the BIS with that other BIS (the Bank of International Settlement). Founded with just five members on October 13 1933, the British Interplanetary Society grew to a modest fifteen members within ten weeks of its birth. In the opinion of Heinz Gatzmann the BIS has been the single most influential society to bring about a state of "space consciousness" in the world population. Gatzmann cites others who have contributed towards the reputation of the society, men such as the 1948 and 1949 Chairman AV Cleaver, the rocket engineer, and Arthur Clarke, a leading English writer on astronautical subjects and chairman of the BIS no less than five times. Cleaver states that at the time of writing (the mid 1950s), its founder Philip Cleator was the only survivor of the original fifteen members.

Chapter Six

The Roswell cast

Major Jesse Marcel	Staff Intelligence Officer, Roswell Army Air Field.
Lt Col Joseph Briley	Operations Officer, Roswell AAF from mid July 1947.
Col William Blanchard	Commanding Officer, 509th Bomb Group, Roswell AAF.
Major Edwin Easley	Provost Marshall, 509th Bomb Group, Roswell AAF.
First Lt Walter Haut	PR Officer, 509th Bomb Group, Roswell AAF.
Colonel Thomas J Dubose	Chief of Staff, 8th Army, Fort Worth AAF.
Brig-Gen Roger Ramey	Commanding Officer, 8th Air Force, Fort Worth AAF.
Col Al Clarke	Base Commander, Fort Worth AAF.
Brig-Gen Arthur Exon	Brig-Gen, Wright AAF (now Wright Patterson AFB).

The VLA with its *nine* dishes per Y-shaped arm is sited on 'the Playa' (as it is known locally) and is located north-west of Bat Cave, the most ancient agricultural site in North America, where 4,500 year old corn kernels were discovered. This 'Y' layout is similar to that of the Tetrahedron Crop Glyph which was activated in a 1991 wheat field at Barbury Castle, Southern England.

Had that particular tetrahedral design (featuring the top view of a tetrahedron) already been seen at that particular place in 1947?

Chapter Six *ET update*

In the late 1990s during a British TV program chaired by TV personality and presenter Michael Aspel and devoted entirely to the subject of UFOs, a representative of the American military declared that there had been no UFO (as in ET spacecraft) investigations going on—since 1969! This cut-off date conveniently encompasses ‘Apollo 11’. However, given the contents of *Title 14*, July 16 1969 it would be surprising if many of the armed forces personnel desired to inform their superiors of a sighting, which therefore would make the foregoing statement correct—from a military point of view. Never mind that according to these same people, there were no such things as ET spacecraft to investigate in the first place!

Other books by UFO researcher Timothy Good:

Above Top Secret, 1987;

The UFO Report, 1991;

The UFO Report, 1992;

Alien Update, 1993;

Alien Base, 1998.

Chapter Eight

Lasers

In 1998, during a conversation with the astronomer and laser specialist, J F Mangin of the Nice Observatory, France, we were advised that the laser used in France at the time of Apollo “was not around any longer”. Mangin was unable to tell us what had become of it, but thought that it had been dismantled. The personnel who were at the observatory at that time were no longer working there and he was unable to fulfil our request for either the time it was first used or for the exact Earth/Moon distance then recorded by this laser. We were led to believe that although this laser was installed at the time of Apollo with much celebration between America and France, the results had been less than glorious. Today a YAG (yttrium /aluminium/grenat) laser is in use, rather than the ruby lasers used during Apollo. The YAG laser is a continual pulse laser which emits in the infrared range and has an accuracy that far exceeds the ruby laser.

Laser ranging—

conflicting reports from the same source

In his *Apollo Journal* Eric Jones tells us that Bruce McCandless wanted to give the crew the news that the laser ranging had been successfully achieved by scientists at Lick Observatory—but that it was decided by the flight director they should not be distracted.

As stated by Jerry Wiant of McDonald Observatory, no readings were received from ‘Apollo 11’ at McDonald due to bad weather and as stated in *National Geographic* Lick Observatory was unable to get a ranging during July 1969 on account of the prevailing sunlight. Yet *despite* these facts, NASA tape transcripts demonstrate that Houston did tell Collins (in the CSM) that at about 29 after the astronauts had installed the LR³, apparently Lick *had indeed* received a reading!

According to Eric Jones this laser ranging readout “could refine the position of the landing site”.

Here is the NASA transcript of that conversation:

112:34:29 McCandless: You might be interested in knowing, Mike, that we have gotten reflections back from the laser reflector array they deployed, and we may be able to get some information out of that a little later.

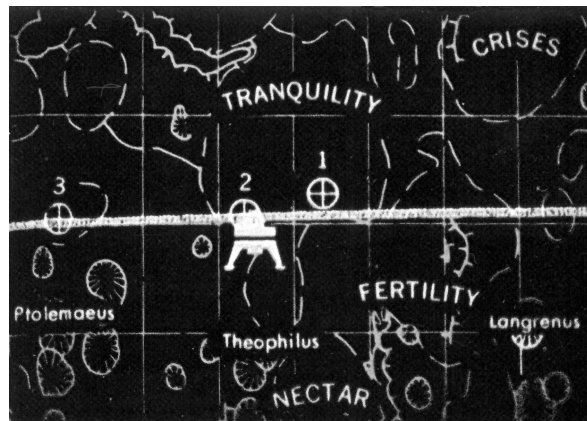
But according to *Time* July 25 1969, Lick Observatory were 50 miles off target.

What does all this say about the comms/navigation links between the CSM, the LM and Mission Control on Earth? From the above reported speech by Capcom Bruce McCandless, we must deduce that the tracking data and the LM guidance telemetry during ‘Apollo 11’ were virtually useless. Collins, orbiting the Moon in the CSM, was equally unable to ‘see’ the Eagle from the sunlight reflecting off its mylar covering. Even when Houston allegedly had the Lick Observatory laser reading they still did not know *even approximately* the area that the LM Eagle had landed in and were unable to locate the ‘Apollo 11’ landing site using that method. (Which is hardly surprising when we know that this laser reading did not officially happen at all.)

The fact of the matter is *nobody on Earth knew exactly where on the Moon these intrepid astronauts were*, and as it later turned out, neither were the EVA astronauts sure of their own position either!

Jones also states that ‘Apollo 14’ and ‘15’ erected LR³s. But the otherwise very detailed and timed-to-the-minute EVA reports for these two ‘mission impossibles’(?) totally neglect to slot in this LR³ activity—to date!).

How surprising is that?



Three alternative landing sites for Apollo at Tranquility.

NASA MAP

Further comments on table 39, page 376

The Gemini dose readings were taken *below* the Van Allen belts and can only compare with the ASTP flight which took place within the same region.

The Skylab dose readings were taken just inside the *lower* Van Allen belt and the daily dose rate apparently reflects this difference.

DARK MOON

Apollo missions, '8','10','11' through to '17' were said to have taken place principally *beyond* the Van Allen belts. Therefore they *cannot* be compared with either the Gemini, Skylab or Apollo 9 flights.

This matter being firmly established—the figures for the nine claimed lunar orbital flights (and six of those supposedly placed crew members on the even more exposed lunar surface) are actually *lower than the average daily dose rate of Skylab*.

How can that possibly be the case?

Are these figures only relating to the orbits made around *the Earth* by the CSM?

Furthermore, to make it all the more difficult for the lay person to equate rads, rems or sieverts, the doses in table (39) are expressed as:

1 mGy equalling 100 millirad.

1 mGy = 100millirad = 0.1 rad.

Taking readings from the above table as an example, 1.80 mGy = 0.18 rad purporting to represent the total mission dose for 'Apollo 11', we find this 0.18 rad figure corresponds with the data in Eric Jones' *Apollo Journal*. Jones also summarises the situation by stating in his commentary that neither Armstrong nor Aldrin's radiation readings changed since landing. (But omits to state whether this means since landing on the Moon or landing back on Earth.) He also informs us that the total uncorrected dosages received by the 'Apollo 11' crew were about 0.25 rad but again this is for three astronauts—yet conditions for two of them were completely different to that of the CSM pilot. He then states that the adjusted readings were evaluated as being 0.18 (the "post-mission corrected true reading") but that most of that was received on the trips through the VABs. Thus apparently implying that deep space is safe!

Below are the personal radiation dosimeter (PRD) readings (as published by NASA). They are in fact two different conversations, one from the CSM and the other from the LM but they appeared in the following format in the Jones journal:

112:48:27 Collins: I say again, I am manoeuvring to the P52 attitude, and do you want a crew status report?

112:48:34 McCandless: Roger. And go ahead with your crew status report.

112:48:40 Collins: Roger. No medication. Radiation 100 point 16.

112:59:39 Armstrong: Houston, Tranquility Base. The CDR's PRD reads 11014.

112:59:51 McCandless: Roger. 11014 for the CDR.

113:00:01 Aldrin: Roger. LMP reads 09018. Over.

113:00:06 McCandless: Roger. 09018.

Presumably Armstrong and Aldrin's readouts, like Collins actually read 110 *point* 14 and 090 *point* 18 respectively.

Chapter Eight Communications

Bill Wood, the USB Engineer at Goldstone stated:

"The signal coming from the LM was a much stronger than had been expected, so it ran into clipping. As the

signal was inverted—that is white on black instead of black on white, and as the clipping was on the black side, the picture was coming down to Goldstone almost completely black, with very little white, there was no detail. When we saw the switch from Goldstone to Honeysuckle Creek there was a pronounced improvement in video quality."

Ed von Renouard was the TV technician at Honeysuckle Creek (HC) during the Apollo period and informed us that the B&W picture from 'Apollo 11' was 800 lines but at only 10 frames per second. In order for it to be converted to the US (EIA) TV standard of 525 lines at 60 frames per second it had to be displayed on a monitor and the 'scanned' off the monitor by a vidicon 525 line TV camera pointed at the screen. From this set-up the 10 frames per second were recorded onto a magnetic disc, and then replayed *five times* from the disc to make up the 60 frames per second.

But surely the US TV standard then, as now, requires 30 FRAMES per second and at two fields making up each full picture that would be 60 FIELDS per second. Something not quite right here?

Apparently this replaying delay is the explanation for the pictures we all saw at the time manifesting a ghostly appearance whenever the astronauts moved about.

- Bill Wood at JPL/Goldstone describes the Goldstone 210ft Mars link as the *backup* support to the tracking of the Apollo spacecraft (whilst in another paper he refers to it as the *primary* receiving station).
- Apparently it was considered unnecessary for this type of prime support for the crews of 'Apollo 8' and 'Apollo 10' (who seemingly flew before completion of the link installation)? Despite the fact that they were not landing (allegedly) on the lunar surface they were still using TV and voice transmissions and on 'Apollo 10' they were flying a LM just off the surface *for the first time*.
- Apparently HC were ready and able to cope with the "higher than expected" FM downlink deviation (which initially resulted in the high contrast inverted image at Goldstone.)
- Jodrell Bank could only pick up the Apollo craft once they were "near to the Moon". This turns out to be a distance of around 1,000 miles out from the lunar surface. Jodrell Bank used a 50ft radio telescope at a frequency of 2300Mhz with a **B**lth degree beam width.
- According to Goldstone's Bill Wood, the MSFN (Manned Space Flight Network) operating frequencies were:
for the CSM (transmitting voice data) 2287.5 Mhz;
" (TV) 2277.5 Mhz;
for the LM (ALL) 2282.5 Mhz.
- As these frequencies were *below* the Deep Space Tracking Network's (DSTN) normal range, namely 2290Mhz-2295Mhz—it was therefore necessary to retune the low noise amplifiers.

All these frequencies were *well below* the stated Jodrell Bank frequency.

Chapter Eight

Plaques and medals

According to Eric Jones, in Buzz Aldrin's 1989 book *Men From Earth* Aldrin detailed the items that he tossed onto the lunar soil in memory of those who had gone before. Eric Jones describes this event and lists the objects which were allegedly thrown onto the surface at the very end of the EVA (apparently almost as an afterthought) by Aldrin and nudged into place by Armstrong's moonboot.

On that list two items are rather more specifically described:

A **Soviet** medal commemorating the Soyuz cosmonaut Vladimir Komarov who died during re-entry on April 23 1967.

A **Soviet** medal honouring the Vostok cosmonaut Yuri Gagarin, who died in an aircraft accident on March 27 1968.

The inference has always been that this little 'in memoriam ceremony' was to be NASA's homage to all those from 'both sides' who had died in the 'space race'. Indeed other sources certainly describe a medallion, but omit to state its provenance.

QUESTION: If there was truly a race to the Moon in a Cold War situation, why did the Soviets not put their medals on their own probe Luna 15, which ostensibly left Earth before 'Apollo 11'? After all, the Soviet's Luna 15 was present on the Moon at the same time as 'Apollo 11' and it too contacted the lunar soil.

Or were these accounts actually the actions performed by an astronaut from the Luna 15/LM during that unforgettable month of July 1969?



Items taken to the Moon 1969. Note that the Soviet medals were not included in this official NASA presentation.

NASA

Chapter Nine Radiation Data

Apollo Journal

We are specifically informed by Eric Jones that the ‘Apollo 14’ crew received an average dose of 1.14 rad (as compared with the 0.18 rad for ‘Apollo 11’) “in part because their trajectory took them closer to the *centre of the belts* than any of the other crews”.

Let us unstitch that remark:

The Van Allen belts are rather like sausage shapes wrapped around the Earth, there is no specific centre but these belts do vary in intensity according to altitude. As the Saturn V rockets were launched from a location near to the equator the Apollo craft passed through all of the various slices of intense radiation that are within this area. The only way of minimising *the length of time* spent in the belts (when on a Saturn V rocket) would have been to leave Earth from a launch site as near to the North or South Pole as possible, where the belts are at their thinnest.

However, if the intended trajectory for ‘Apollo 14’ required a longer time in the Van Allen belts, that is another matter. Equally, if the designated trajectory from Earth required transit through the Starfish Prime artificial radiation belt, that too is another matter.

Eric Jones is at pains to point out that the ‘Apollo 14’ doses were not indicative of “significant medical risks”—especially when compared to all the other risks that a trip to the Moon entailed. In relation to the figures published in the Gemini/Skylab/Apollo table (39) on page 376 he is no doubt correct.

‘Apollo 13’ oxygen tank inconsistencies

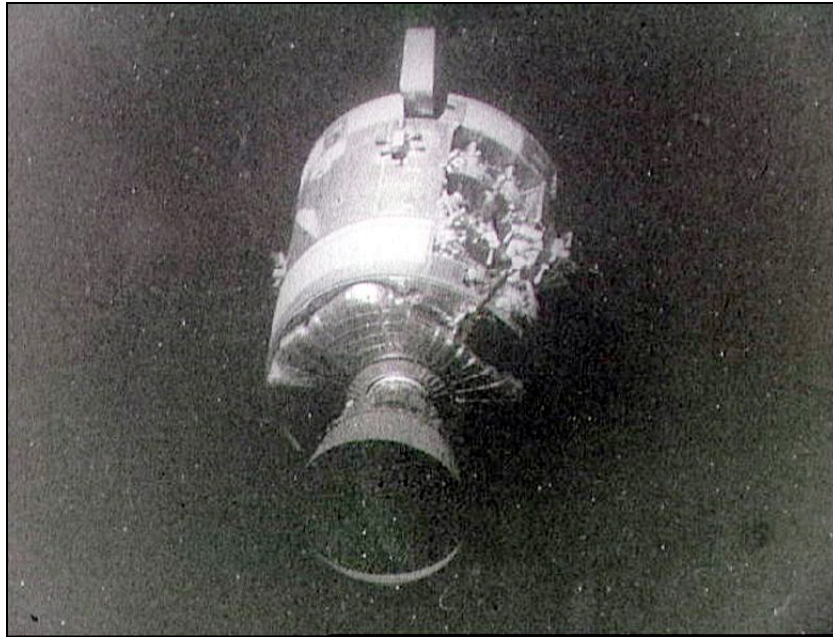
Observations by Stephen Clementson

Exposing a hoax becomes more difficult when the evidence burns-up in the Earth’s atmosphere, so ‘blowing-up’ the service module was very convenient!

There would have been no story if the CSM had vaporised, so NASA must have cooked-up the entire scenario. The agency ensured that the ‘explosion’ would appear to take place at a non-return distance, providing a more nail-biting plot.

How, one might ask, can a pressurised oxygen tank explode, when in a vacuum, without completely destroying the CSM. Whilst under Earth’s atmospheric pressure, the level of damage that can be inflicted by an exploding oxygen tank is considerable. The totally inexplicable thing about the ‘Apollo 13’ story is the fact that ***it did not even result in a rocket fuel explosion***. There should have been an explosion of such a magnitude that the electrical system and the cryogenic oxygen supply would have completely failed. Filled with pressurised liquid oxygen, to a level which was undoubtedly greater than 50%, the ***potential to cause havoc would have known no bounds***. Bits of metal, accelerated to supersonic speeds, would have *smashed through the structure as though it was made of putty*.

It was truly a media epic, the operation was deemed a total success, with the general public now aware of the difficulties of space-flight, and any suggestions that the previous missions might have been hoaxed were also dispelled.



The ‘Apollo 13’ Command Module showing damage following the explosion ‘accident’ on April 13 1970.

NASA

The table below lists the total time spent in space by the Apollo astronauts over their careers. An asterisk indicates that the mission time was in relative safety, i.e. below the radiation belts. Although these figures give the impression of much exposure to the hazards of space travel, in our

view only the flights *below* the Van Allen belts are of interest. We maintain that the named Apollo astronauts would have been vulnerable to potentially lethal radiation in deep space beyond the Van Allen belts, if they were in the CSM and/or LM built to the published specifications.

<i>Name</i>	<i>Year</i>	<i>Spaceflight</i>	<i>Mission duration</i>
Anders	December 1968	Apollo 8	147hrs 0min 42sec
Aldrin B	November 1966	Gemini 12*	94hrs 31min 34sec
	July 1969	Apollo 11/LM	195hrs 18min 35sec
			289hrs 50min 9sec
Armstrong N	March 1965	Gemini 8*	10hrs 41min 26secs
	July 1969	Apollo 11/LM	195 hrs 18min 35sec
			206hrs 0min 1sec
Collins M	July 1966	Gemini 10*	70hrs 46min 39sec
	July 1969	Apollo 11/CM	195hrs 18min 35sec
			266hrs 5min 14sec
Conrad P	August 1965	Gemini 5*	190hrs 55min 14sec
	September 1966	Gemini 11*	71hrs 17min 8sec
	November 1969	Apollo 12/LM	244hrs 36min 25sec
	May 1973	Skylab 1*	672hrs
over a period of 8 years Conrad totals			1,117hrs 49m 12sec
Bean A	November 1969	Apollo 12/LM	244hrs 36min 25sec
	July 1973	Skylab 2*	1,416 hrs
over a period of 4 years Bean totals			1,660hrs 36min 25sec
Borman	December 1965	Gemini 7*	330hrs 35min 0 sec
	December 1968	Apollo 8	147hrs 0min 42sec
over a period of 2 years Borman totals			477hrs 35 min 42 sec
Gordon R	September 1966	Gemini 11	71hrs 17min 8sec
	November 1969	Apollo 12/CM	244hrs 36min 25sec
over a period of three years Gordon totals			315hrs 53min 33sec
Haise F	April 1970	Apollo 13	142hrs 54min 41sec
plus further missions with the Space Shuttle.			
Lovell J	December 1965	Gemini 7*	330hrs 35min 0sec
	November 1966	Gemini 12*	94h 31min 34sec
	December 1968	Apollo 8	147hrs 0min 42sec
	April 1970	Apollo 13	142hrs 54min 41sec
over a period of 5 years Lovell totals			713hrs 1min 57sec
Swigert J	April 1970	Apollo 13	142hrs 54min 41sec
Mitchell E	January 1971	Apollo 14/LM	216hrs 01min
Roosa S	January 1971	Apollo 14/CM	216hrs 01min
Shepard A	May 1961	Mercury 3/ MR-3*	0hrs 15 min 22 sec
	January 19	Apollo 14/LM	216hrs 01min
over a period of 10 years Shepard totals			216hrs 16 min 22 sec
Irwin J	July 1971	Apollo 15/LM	295hrs 11 min 53 sec
Scott D	March 1965	Gemini 8*	10hrs 41min 26sec
	March 1969	Apollo 9*	241hrs 0min 54sec
	July 1971	Apollo 15/LM	295hrs 11 min 53 sec
	over a period of 2 years Scott totals		546hrs 54min 21sec
Worden A	July 1971	Apollo 15/CM	295hrs 11 min 53 sec
Duke C	April 1972	Apollo 16/LM	265hrs 51min 05sec
Mattingley K	April 1972	Apollo 16/CM	265hrs 51min 05sec
	?	Shuttle STS-4 *	no data
		Shuttle STS 51-C*	no data
in one year Mattingley accrued			265hrs 51min 05sec Contd.

DARK MOON

Continued from previous page:

<i>Name</i>	<i>Year</i>	<i>Spaceflight</i>	<i>Mission Duration</i>
Young J	March 1965	Gemini 3*	4hrs 53min
	July 1966	Gemini 10*	70hrs 46min 39sec
	May 1969	Apollo 10	192hrs 2min 23sec
	April 1972	Apollo 16/LM	265hrs 51min 05sec
	1980	Shuttle STS-1*	no data
		Shuttle STS 9/spacelab 1*	no data
	to 1972 a period of 7 years Young totals		533hrs 33min 7sec
Cernan E	June 1965	Gemini 9*	72hrs 56min
	May 1969	Apollo 10	192hrs 2min 23sec
	December 19	Apollo 17/LM	301hrs 51min 59sec
	over a period of 7 years Cernan totals		565hrs 54min 22sec
Evans R	December 1972	Apollo 17/CM	301hrs 51min 59sec
Schmitt H	December 1972	Apollo 17/LM	301hrs 51min 59sec

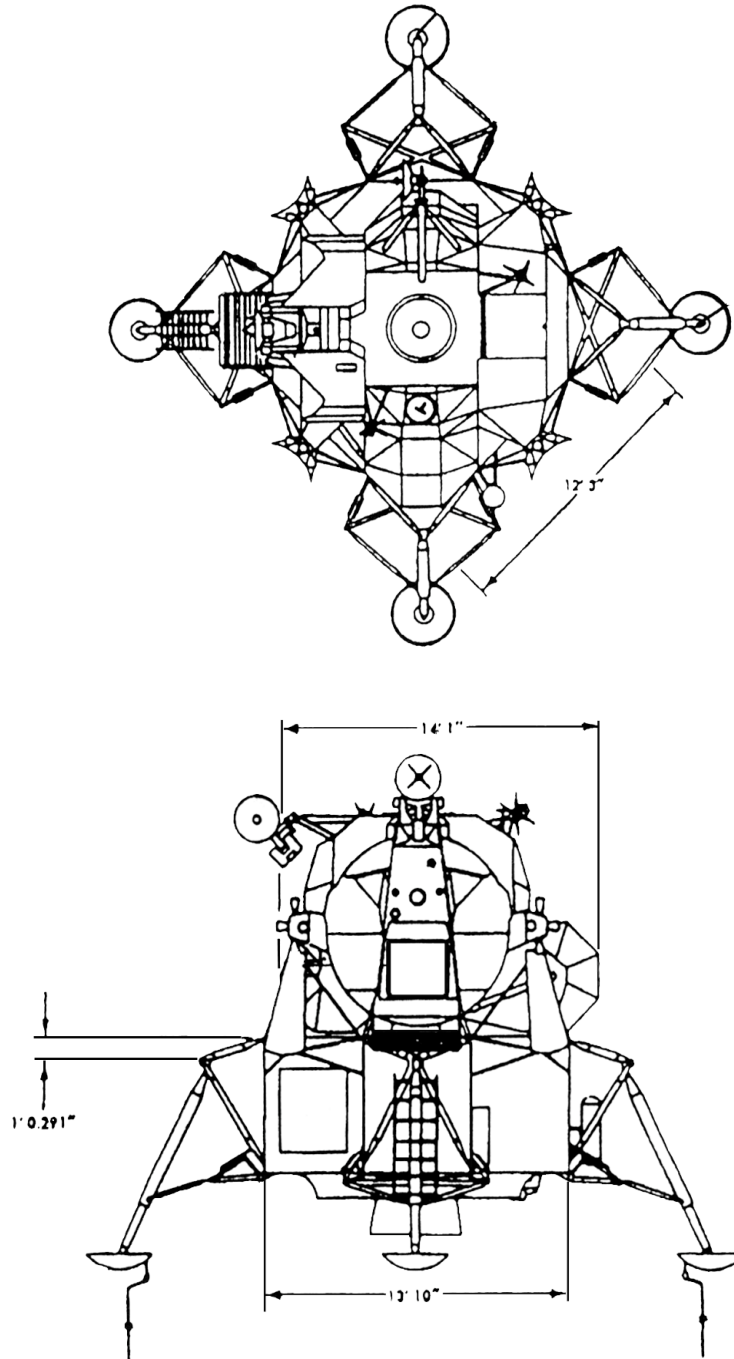
NASA DATA

19.47° and the sites of energy upwellings on planets in the solar system

Latitudes of emergent energy phenomena

PLANET	FEATURE	LATITUDE	COMMENT
Venus	Alta Regio	19.5° N	Current volcanic region.
	Beta Regio	25.0° S	Current volcanic.
Earth	Hawaiian Caldera hot spot	19.4° N (now active 19.6° N)	Largest shield volcano.
Moon like'	Tsiolkovsky	19.6° S	Unique, far side 'mare-lava extrusion.
Mars	Olympus Mons	19.3° N	Largest shield volcano (non active).
Jupiter	Great Red Spot	22.0° S	Vast atmospheric vorticular upwelling'.
	(The surface of Jupiter is hidden from sight)		
	Voyager confirmed that this feature is a hurricane-like disturbance in Jupiter's atmosphere, surrounded by smaller vortices.		
Saturn	North Equatorial Belt	20.0° N	Region of storms
	South Equatorial Belt	20.0° S	observable from Earth.
Uranus	Northern IR 1-2K	20.0° N	
	Southern IR 1-2K	20.0° S	
Neptune	Great Dark Spot	20.0° S	Similar to Jupiter's Great
	Red Spot, the scale of this feature is immense Earth is approximately the same size as Neptune's Great Dark Spot.		
	Some of Jupiter's moons have also provided data:		
	Io /Loki:2	19.0° N (Voyager 1&2 recorded volcanic plumes)	
	Maui: 6	19.0° N	
	Pele:1	19.0° S	
	Volund: 4	22.0° N	

Source: NASA & US Geological Survey



NASA

Top view and side view of the LM with overall dimensions from the
LMA790-3-LM APOLLO OPERATIONS HANDBOOK SPACECRAFT (see Chapter Nine)

DARK MOON

Chapter Ten

The Neutral Point

The precise difference between the CNP and the ENP at the time of the 'Apollo 11' trajectory was 18,759 miles. WvB's co-author on *The History of Rocketry and Space Travel* was Frederick I Ordway III, who worked with WvB at ABMA and then at the Marshall Space Center and was a member of von Braun's team until 1964. Thereafter Ordway joined the faculty of Huntsville's University of Alabama and subsequently the Department of Energy in Washington. Ordway co-authored another four books with WvB and is co-biographer, along with Ernst Stuhlinger, of the posthumous biography *Wernher von Braun: Crusader For Space*. In this biography Ordway states that he was aware of WvB's work since 1947 and that he first met him in 1952 and retained "close personal and professional" ties with WvB throughout his life. Interestingly, Walters (the author of *Space Age*) lists the original Crowell publishing date as 1967 and also lists a reprint from New York publishers Harper and Row that appeared in 1985, after WvB's death. This reprint was titled: *Space Travel: A History—An Update of The History of Rocketry and Space Travel*.

Chapter Ten

The speed of light

Between the years of 1928-1945 the speed of light was found to be 3% slower than the accepted value of 186,282 miles per second. In fact it was only in 1947 that the speed of light returned to the values of 1927.

During that period many major historical events occurred—marker points in the history of our planet. The Wall Street crash and great depression in America. Ghandi's opposition to the British in India, Mao Tse Tung's long march in China. The Spanish Civil War, the rise of the Nazis, the Second World War and the development of the A-bomb. The period from 1945 through to the mid 1950s was one of transition and then regrouping after much horrific conflict. The activity of a significant proportion of the world's population, taken together with this fluctuation of the speed of light, is truly worthy of note—especially when considered from the viewpoint of quantum physics.

Further details of the three speeds of light

In illustration (20) on page 404, the circles along the axis of the two glyphs have been marked from right to left A, B, B1, C, D and E. All the above circles have been telescoped down the axis and superimposed over the largest circle E, in order to illustrate the way in which the three light speeds were encoded. The diameter of the circles and other measurements within these glyphs are in most instances the average, or the near average, of these two *almost identical* formations.

For example, the true average between the two circles marked C on the two glyph surveys, namely 18.6666' is a close approximation to the value of 18.6282' for circle C. *The History of Rocketry and Space Travel* was first published by Thomas Y Crowell, New York, USA in 1966 with reprints in both 1969 and in 1975. 186,282.3959 is the speed of light in miles per second as defined by a team led by Kenneth M Evenson during tests in Boulder, Colorado during October 1972 deploying a chain of laser beams.

$$\begin{array}{rcl} \text{Circle C is } 18.6282 & \times 2 = & 37.2564 \\ \text{Circle B is } 8.0944 & \times 2 = & 16.1888 \\ \text{Circle A is } 11.3100 & \times 2 = & 22.6200 \\ & & \hline & & \mathbf{76.0652 \quad (E)} \end{array}$$

$$\begin{array}{rcl} \mathbf{C \times 2} & = & 37.2564 \quad \mathbf{(D)} \\ \mathbf{B \times 1} & = & 08.0944 \\ \mathbf{A \times 1} & = & 11.3100 \end{array}$$

$$\begin{array}{rcl} \mathbf{B \text{ namely } 8.0944 \times 7} & = & \mathbf{56.6608 \quad (B1)} \\ 8.09441624 + 11.3100 & = & \mathbf{19.40441624 \quad (A+B)} \end{array}$$

24/25ths or 96% (the maximum percentage of local light speed physically attainable—see text *Two-Thirds*) of **A + B x 10** namely **194,044.1624** is **186,282.3959 = C¹**
Solar System light speed in miles per second, the speed of light in a vacuum anywhere within a solar system.

$$\begin{array}{rcl} \text{And } 19.40441624 \times 2 & = & 38.80883248 \\ 96\% \text{ of } 38.80883248 & = & 37.25647918 \times 10 = \\ 372,564.791 = \mathbf{C^1 \times 2} & & \\ \mathbf{E} & = & \frac{76.06531166}{18.62823959} = \mathbf{4.08333333} \end{array}$$

408,333.333 is the interstellar factor (see *Two-Thirds* text references to interstellar light speed over 400,000 times faster than solar system light speed).

$$\begin{array}{rcl} \mathbf{408,333.333 \times C^1 \text{ namely}} & & \\ \mathbf{186,282.3539} & = & \mathbf{7.60653116^{10}} \\ \text{the Interstellar speed of light } \mathbf{C^2} & & \end{array}$$

B1 namely

$$\mathbf{56.6608 = 8.0944 \times 7}$$

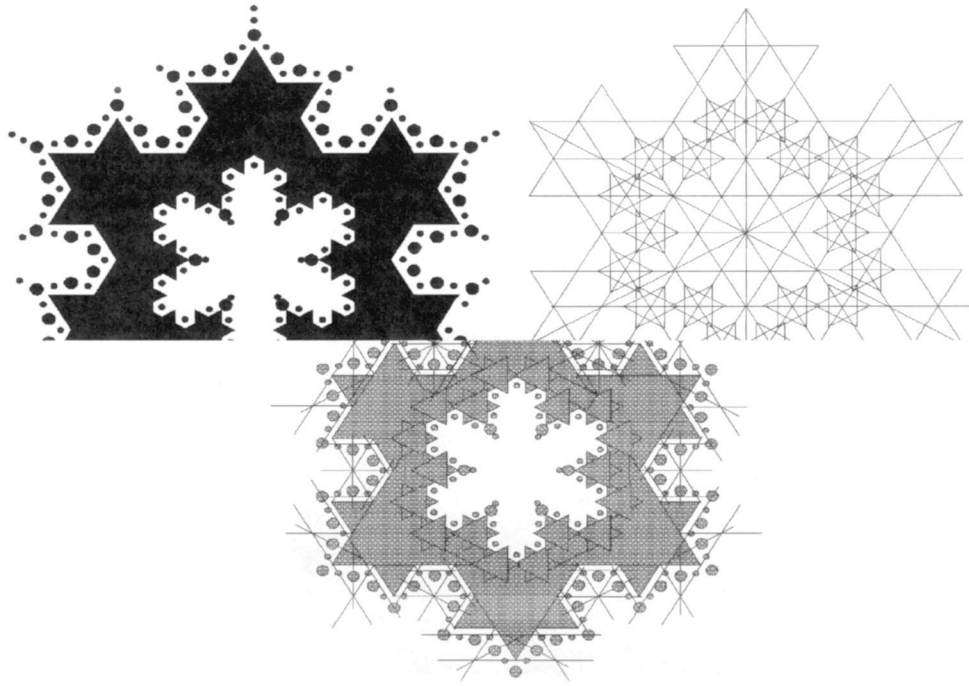
7 is the factor applied to calculate the Intergalactic speed of light C³ (see also text *Two-Thirds*).

Summary

C¹ Solar system light speed
= 186,282.3959 miles per second.

C² Interstellar light speed (186,282.3959 x 408,333.333)
= 7.60653116¹⁰ miles per second.

C³ Intergalactic light speed (7.60653116¹⁰ x 7)
= 5.32457181¹¹ miles per second.



Analysis of the Fractal *Two-Thirds* Crop Glyph activated at Alton Barnes, England in 1997. The small circles are 2/3rds the size of the larger circles and similarly the triangles decrease in size by 2/3rds. Calculations by Martin Noakes. Many Crop Glyphs form part of what we call the ancient Topogly Matrix (see text Chapter Thirteen).

Chapter Ten

Neutral Point calculations

The Earth/Moon distance at the time of 'Apollo 11' (measuring centre-to-centre) was:

246,322.134 miles/396,654 kms.

Applying Newton's Law of Universal Gravitation

- Y = distance from Moon's centre to the neutral point
- T = centre to centre distance between the Earth and the Moon
- R_e = radius of the Earth = 3,960 miles
- R_m = radius of the Moon = 1,080 miles
- X = distance from the Earth's centre to the neutral point
- Y = distance from the Moon's centre to the neutral point
- G_e = Earth's surface gravity
- G_m = Moon's surface gravity
- T = 246,322 (miles)
- Y = 24,736 (miles)
- X = 221,586 (miles)

$$G_e \frac{R_e^2}{X^2} = G_m \frac{R_m^2}{Y^2}$$

$$\frac{G_m}{G_e} = \frac{R_e^2 Y^2}{R_m^2 X^2}$$

$$= \frac{(3,960)^2 (24,736)^2}{(1,080)^2 (221,586)^2}$$

Therefore, G_m = 0.167 G_e

However, the distance from the Moon to the Neutral Point in July 1969 was stated to be (see text): 43,495 miles from the Moon's centre.

The new calculation therefore would be:

$$\frac{(3,960)^2 (43,495)^2}{(1080)^2 (202,827)^2} = 0.61825$$

We know that the G_m of 0.61825 is incorrect for the true gravity on the lunar surface—it is known to be or $Z \ln G_e$ or 0.167 G_e.

DARK MOON

Chapter Twelve

Mars 'timeshare' launch date schedules for USSR/USA				
USSR	1960			2 launches
USSR	1962			3 launches
USSR	1964	November 3		1 launch
USA	1964	November 5		2 launches
USA	1964	November 28		
USA	1969	February 24		1 launch
USSR	1969	March 27		2 launches
USSR	1969	April 2		1 Launch
USA	1971	May 8		2 launches
USSR	1971	May 10		3 launches
USA	1971	May 30		1 launch
USSR	1973	July x 2 & August x 2		4 launches
USA	1976	August & September		2 launches
USSR	1983	failed on arrival around Phobos		
USA	1993	Mars <i>Observer</i> -failed		1 launch
RUSSIA	1996	November <i>Mars 96</i>		1 launch
		failed to leave Earth orbit		
USA	1996	November <i>Mars Global Surveyor</i>		
USA	1996	December <i>Pathfinder</i>		2 launches
				total

Pyramid construction findings

1) In 1979, Dr. Klemm, a qualified mineral expert, analysed 20 different rock samples from the Great Pyramid and concluded that each stone had come from a different region in Egypt. However, each sample contained a mixture of ingredients from the various regions. Furthermore on testing granite samples, instead of the uniform density that such material possesses naturally, he found too many air bubbles and that the density of the material was massed to the original base of the block.

2) The Director of the Institute for Applied Archaeological Science at Barty University, Miami, Florida, Professor Joseph Davidovits thinks that the arguments about scaffolding, ramps, sleds of tree trunks, ropes and pulleys are irrelevant. He suggests that the builders of these monuments used some material not unlike concrete.

Joseph Davidovits, in the *Revue des Questions Scientifiques 1986* stated that the Great Pyramid has also been subjected to electromagnetic readings. High frequency waves were shot through the rock, which scientists thought to be completely dry. The scientists expected to receive 'bounce-back' from the waves (which could help discover anomalies and/or additional passageways. They failed to get the result they were anticipating, in fact they found the opposite effect. The rock absorbed the HF waves 100%. The building blocks of the Great Pyramid contained more moisture than natural rock. Therefore, it is the conclusion of Professor Davidovits that these stone edifice are made of artificial stone. i.e. concrete. Professor Davidovits used ancient Egyptian recipes to mix cements and concretes. He found that the result was a quick drying well-balanced concrete, which made it more resistant to the environment in which it had to perform—more so than any concrete currently in use. One French and one American company have already started manufacturing concrete according to these old recipes.

Rotation/revolution				
ed = Earth days; ey = Earth years; rp = retrograde precession; rr = <i>retrograde</i> rotation east-west.				
Planet	Rotation	Revolution	Axis tilt	RP
Mercury	58 ed 15 hrs 36 mins	088.0 ed	002.00° approx.	no
Venus	243 ed/rr	224.7 ed	177.30°	no
Earth	23 hrs 56 mins	365.3 ed	023.45°	yes
Mars	24 hrs 37 mins	687.0 ed	025.19°	no
Jupiter	09 hrs 55 mins	11.86 ey	003.12°	no
Saturn	10 hrs 39 mins	29.46 ey	026.73°	no
Uranus	17 hrs 20 mins/rr	84.0 ey	097.86°	no
Neptune	16 hrs 6 mins	16.0 ey	029.56°	no
Pluto	06 ed 9 hrs 18 mins/rr	248.0 ey	122.46°	no

Chapter Thirteen

Topogly

In order to see how Topogly actually works, we will take the example of the Face on Mars and allow Carl Munck to guide us through its relationship to sites on both planets:

We *know* where this Face is—on planet Mars, staring at us from its nearest point of just over thirty five million miles at 41 degrees, 11 minutes and 10.0308 seconds north of the Martian Equator and at 00 degrees 06.890283706 minutes east of Cydonia's gigantic five-sided pyramid [the D&M, the Tor].

In math, we have certain well-established *constants*: such as the 360 degree system for reckoning such geometric shapes as circles and spheres.

The 'radian' (57.29577951) of these same spheres and circles.

Then we have Pi (3.14159255363).

We also have the fractions of these constants such as 1/3rd Pi; 2/3rds Pi. Together with their multiples such as double Pi (or $\text{Pi} \times 2 = 6.283185307$); the double Radian; these are all *constants* and can be used with one another, for example:

$$1/3\text{rd Pi} \times 2/3\text{rds Pi} \times \text{Pi} = 6.890283706$$

Which is a number that should look familiar to you. Of course! It is the grid longitude of Cydonia's *Face*—which tells us that *intelligence* placed the Face on Mars. To argue against it is to mandate the idea that nature sculpts according to mathematical law.

Now, we do not know who it was that left us Cydonia's Face. What we do know, and can prove, is that intelligence was behind it.

How can we prove it?

By way of our own Great Pyramid over in Giza, Egypt: a four sided, four cornered, single apex monument which shows *everyone* a total of NINE features. Ever wondered why? There are *many* reasons, and among them is what we find when we raise the grid longitude of the Cydonia *Face* to the 9th power (for those whose math is rusty that simply means to multiply a number by *itself* nine times.)

Doing so for the *Face* we get:

$6.890283706 = 35,005,310.83$, which is of course, precisely the closest approach Mars makes to Earth—expressed in terms of our statute mile—*not* meters or any of the other degenerated astrological units of measure that have been forced on us over the ages.

Anyway, now we know why the Face *had* to be centred on its meridian of 6.8902837 minutes longitude.

Next we have its latitude to contend with.

Why is it at 41 degrees 11 minutes 10.0308 seconds north of the Martian equator?

Why do we not find this Face anywhere else? Indeed what is it doing over there anyway?

Again, it doesn't really matter just yet, because demonstrating that this positioning is the product of intelligence is quite easy.

$$\text{Pi} \times 1/3\text{rd Pi} \times 2/3\text{rds Pi} = 6.890283706$$

$00^\circ 06.890283706'$ = the precise Longitude of the Face on Mars.

The angles of a tetrahedron, $720^\circ \times 2 = 1440 \times \text{Pi} = 4523.893421$ encoding $41^\circ 11' 10.03080581''$

= the precise latitude of the Face on Mars

verified by $41 \times 11 \times 10.03080581 = 4523.893421$.

Most clear thinkers today realise that primary in the construction of nature—wherever we find it—is the *tetrahedron* (a three-cornered pyramid featuring a total of 720 degrees of surface angle and when two tetrahedra meet we have a *double tetrahedron* —1,440 degrees of reality! And again basic mathematical law involving constants.

Munck then asks:

What happens when we merge the double tetrahedron with Pi? $1440 \times \text{Pi} = 4523.893421$.

Of course, when any two *constants* merge, the outcome is always another constant. In this instance, it's quite enlightening, because the ancient *cryptographers* used it to 'hide' data from the wrong eyes. This answer encodes another three figures, which we find by:

4523.893421 divided by 41 then divided by 11

= 10.03080581 . 41° , which is the actual latitude of the Cydonia Face, namely

$41^\circ 11' 10.03080581''$.

Which, one again, demonstrates that the Face on Mars was placed by intelligence.

Extract from

Anatoly I Kandiew's calculations regarding the accuracy requirement for Topogly codification

Through the decoding of the various locations, a message comes out loud and clear:

$$\text{R (real)} = \text{T (transcendental)} * \text{N (whole)} * \text{I (irrational)}$$

That is, any real number R(real) (with finite representation), is the UNIQUE product of a transcendental number T(transcendental), a whole number N(whole) and an irrational I(irrational) within a prescribed accuracy.

Let us look at the 'magnitude' of our R number: Since R is a product of degrees, minutes and seconds with two digits for fractional seconds (with $P = A * B * C$), then to measure C within two digits after the decimal point would require absolute accuracy in equatorial degrees, minutes, seconds and fractional seconds.

The longitude (or latitude) of any site would require a measurement accuracy within 1 foot. Since, most measurement involves measure above the equator, that accuracy would have to be greater—let us say it could be performed to within 1/12th of a foot (one inch). Then, the minimum P could be: 0.01 and the maximum for P would be: $129,587.40 (360 * 60 * 59.99)$.

That is, more than six places of resultant accuracy.

Since the most frequent transcendental number encountered in the Topogly Matrix is Pi, the square root of

DARK MOON

(2, 3 and 5), all these numbers need to be known to 12 places of accuracy—Why?

Since their product would be affected by half as many digits, and we require a minimal six digit result, we would require 12 digits of accuracy for each and every one of them.

Finally, we notice that even if we could produce such pin-point accuracy for the transcendental and irrational numbers we still have N choices left, with which to make a mistake!

Even for a relatively small N of 100 or so, we would require a total of 14 digits of accuracy.

Anatoly I Kandiew concludes that:

“Thus the chances of properly positioning two structures, to conform with this [Topogly] Grid Matrix Relationship—would be approximately 1 in 100 TRILLION.”

“Now do you think that the Topogly Matrix was an accident, or does the work arise from intelligence?”

These odds do not include the odds for more than two structures maintaining these relationships!”

It is important to bear in mind that many of the significant **Crop Glyphs** also are activated on sites that are part of this Topogly Matrix.

Bibliography

Carl Munck is author of the book on The Code: *Whispers from Time*. Published 1998 and obtainable from the author, the ordering details including postal rates are listed in the Chapter Notes.

Crop Glyphs

A selection of books which document the Crop Glyph phenomenon:

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Thomas, *Vital Signs*, SB Publications, 1998—(includes a personal comment on each book, plus information on specialist journals, videos, web sites, and conferences.



Moonorama

This LM 7 badge is extraordinary in that it illustrates a LM actually having landed on the Moon beneath which is the descent engine's crater.

It is surrounded by mountains very like the sharp peaks of the *Frau im Mond* film set but totally unlike the soft rounded highlands of NASA's **Fra Mauro** location. The hugely out of proportion Earth suggests that the LM was indeed not so very far away.

Lucky LM 7 was assigned to unlucky 'Apollo 13'—the mission that *NEVER* landed on the Moon.