THE MUNNS REPORT

Release Number One - The Digital Site Model and Lens Analysis

This Report reflects an ongoing analysis by Bill Munns
of the 1967 Patterson - Gimlin Film.

www.themunnsreport.com

Introduction to The Munns Report

I have been aware of the Patterson-Gimlin film since it was first announced over 40 years ago, and I have kept a passing interest in it over the years. But in January 2008, I decided to take a more focused look at the film, and discussions about it on the internet. My original intention was to simply study the film's subject from the standpoint of a professional artist who had made creature suits for films, TV and commercials for many years, applying my knowledge of suits, masks, prosthetics, and the like to this analysis.

But as I immersed myself in the discussions and reviewed the film and still image material, I began to see that there were issues and controversies of the film beyond the mere discussion of the subject walking through that film. And I observed that there was an intense debate between people who argue the subject is a real Bigfoot creature, and people who argue that the subject is a human wearing a fur costume and merely performing a hoaxed event for the camera. But what intrigued me the most is that this debate seemed to make no progress either way, regardless of how passionately people on both sides of the issue argued their evidence and theories. I would have thought that after 40 plus years of intense debate and astonishing depths of research not only on the film but as well in the lives of the people associated with it, the problem would have been solved. It has not.

So my own research analysis shifted to a different level of focus. I chose to approach the film as a problem needing a solution, and I applied problem-solving methodologies to the analysis. My report on this analysis is still a work-in-progress, but I have chosen to release some information in steps, rather than the full and final report in one release. This PDF document contains the first report release material.

A new website has been established for my report of this film, and you may view it at:

www.themunnsreport.com

This website will be the centralized location for information about the report, and information about any programs, lectures, or other media projects where the report may be described.

If you have any questions about this report, you may contact me at:

wmunns@gte.net

Summary of Background and Qualification

In terms of my qualification and professional background, I have a separate website of my career achievements (The Bill Munns Creature Gallery) and invite the reader to visit it, if you are online. However, this PDF version may be circulated and read by people who may not wish to go online, and would prefer at least a summary of my background herein.

I am generally described as a "movie makeup effects man" and this description does certainly encompass a significant portion of my career and accomplishments, but far from the totality of my professional accomplishments and capabilities. A resume of the various films and TV projects I've done is on the Creature Gallery website, along with ample career work photographs. This work allows me to appraise issues of costume suits, masks and similar movie effects with an experienced eye.

I am also a wildlife artist who pioneered a new form of wildlife sculpture, recreations of endangered species depicted with all the realism of world class taxidermy, but without using any natural remains of the species portrayed. This recreation work lead me to be awarded two **"Best In World"** Recreation awards at the World Taxidermy Championships (1988 and 1992), an event regarded by many as the "Olympics" of taxidermy and wildlife art. And at the next two events, I lectured and judged in my specialty. This work allows me to appraise the anatomy of real living wildlife species with an expert's background.

I am a 3D computer graphics professional who has pushed the envelope in 3D visualizations of ancient architecture, and my visualizations of the Seven Ancient Wonders of the World were named as a "Milestone" in computer graphics, in the 2002 Special Retrospective on major milestones in the 25 years that computer graphics have been technically possible, featured in Computer Graphics World magazine. This work prepared me well for the Digital Visualization of the Bluff Creek Site which I have reconstructed in a 3D visualization software, and have described in this report.

I have designed exhibit models and animatronics for exhibits, for museums and theme parks alike, and I developed a complete exhibit in joint collaboration with the San Diego Museum of Man, called "Faces on Fossils". This exhibit presented an educational display of how human ancestral figures are visualized from the fossil remains, and it reflects my strong (self-taught) academic background in paleoanthropology.

Finally, I am an inventor of a digital character lip sync animation software, and hold the patent as sole inventor, which reflects my capacity to solve problems, because the very process of invention is a classic problem-solving endeavor. We find solutions that elude other people who think only in terms of what has been done, or what established paths one should take to reach a successful solution. This is applicable to my research in the Patterson-Gimlin film because the film represents a classic problem in search of a solution, to resolve the question of what it is we see walking away from camera in that film.

For more information on my professional and artistic endeavors, go to:

www.billmunnscreaturegallery.com

Licensing and Copyright

The Digital Site model I have developed may be used freely by other researchers for verification of the data I've included herein. For any publication of their results, appropriate credit will be to note "Digital Model Developed by Bill Munns"

If you modify the model, but still my material is your starting source, the appropriate credit is to use the phrase "After Munns" which implies your effort follows or derives from mine.

Work will continue on a high quality Bluff Creek Digital Site Model which may be used for Media animations and similar presentation, including animations with the PG Film Figure walking through the site model, replicating the film. Use of my digital model data for any such Media Presentation will require licensing the model from me. The License will include the full site data, quality polygonal models of the trees and objects, high resolution Texture maps, and a more complete terrain mesh object. Inquire by e-mail with description of project and or program.

The Patterson Film copyright is held by Patricia Patterson, and all inquiries about licensing the film or imagery from it should be directed to her.

Acknowledgments - I want to extend my appreciation to the following people for their assistance in my research and this report:

Chris Murphy, for his invaluable advice, photo archives, knowledge of the film, and graciously loaning me the K-100 camera for my filming tests.

John Green, for consenting to let me scan one of his film copies showing the film in its original full frame form, essential for the photpogrammetry work.

Patricia Patterson, for her consent to allow me to do the scanning work

Daniel Perez, for providing me with the 15mm lens needed for my camera tests, so essential to verify my lens discovery, and for his invaluable assistance during the filming tests I conducted.

Matt Thomas, a friend, who helped in the filming tests

and I reasonably should acknowledge the Skeptical community, because they have on occasion asked an intelligent question which challenged me to re-think my work and assumptions, and strengthen my research work.

The Munns Report - Release Number One
The Lens Analysis and Site Model

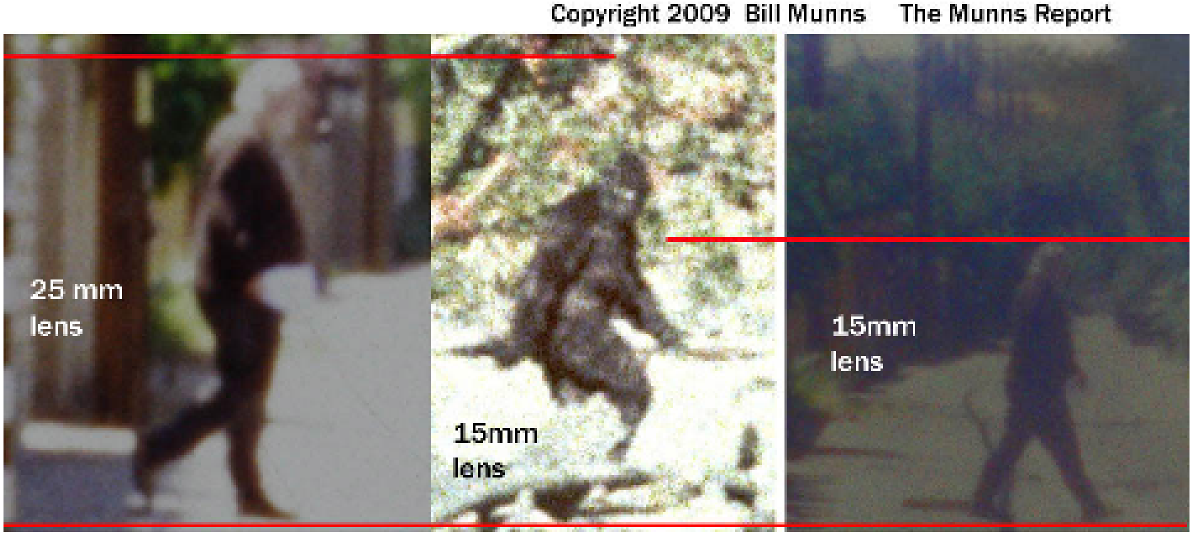
Release Date: May 15, 2009

One of my primary goals in trying to solve the problem of the Patterson-Gimlin film (and the issue of what is it that we see walking through the scene) was to build a digital model of the site for 3D visualization research, to locate the camera positions, locate the subject, and calculate height of the subject based on an optical analysis.

In the process of that attempt to build the digital model, I have discovered something about the film which has been mistakenly assumed by one and all for the last 41 years, and it does impact significantly on any analysis of the film. All assumption has been that the lens on Roger Patterson's camera was a 25mm lens, the standard issue lens for the Kodak K-100 camera.

My analysis indicates that the camera has a 15mm lens on it instead (presumption being a Kodak Cine Ektar 15mm lens with S mount to C mount adapter, as per the Kodak camera user's guide, because the camera requires a companion viewfinder lens of same focal length, which Kodak only supplied for it's Cine Ektar lenses.

Testing the 25mm lens and 15mm lens.   These tests were filmed with a Kodak K-100 camera, using the standard Kodak Cine Ektar 25mm lens, shown at left, and with a 15mm Ektar lens, shown far right. The PG Film subject is centered. For the camera tests, the subject is a man measured to be 6' 2" in shoes, and the distance of subject to camera was a measured 102', based on the report in Chris Murphy's book that the PG Film subject was estimated to be 102' from camera for this frame.



This does impact on any height analysis of the subject, because the lens focal length is one of the numbers used in the optical formula which defines the relationship between the subject height on film, the lens focal length, the actual subject height in real life, and the distance from camera to subject. Above is a photographic analysis of how a man 6' 2" tall (in shoes) appears with both the 25mm lens and 15mm lens, as compared to the PG Film subject.

The 15mm lens on Roger's camera effectively establishes that the subject seen in Patterson's film is over 7 feet tall, the exact measurement still undergoing documentation, as well as a review of some new scan material of the film which may allow for a finer determination. Notes on the status of this issue are included, but the issue of height is not finalized yet. Preliminary data has yielded a preliminary conclusion, but the margin of error is still under study, and additional analysis is being applied to corroborate the preliminary findings.

This Report release will maintain it's focus on the site model and the lens determined by that analysis. Subsequent releases of additional Report sections will elaborate on the subject height analysis, and other issues. A study of the PG Film footage using a matchmove software called boujou 4.1 is also being used and has yielded a preliminary corroboration of the 15mm lens, but the documentation on that will be in a subsequent Report segment release.

The intent of this release is to give other researchers the necessary data to construct a similar 3D model in a 3D modeling or CAD software package, and verify the data. In order for the data to be incorporated into other software tools, some foundation information is necessary. Once the foundation material is completed, then the actual 3D data for objects and camera will be noted. Additionally, for some of the tree objects, image texture maps and corresponding alpha channel mask images are included for download, to assist others in any visualization effort. Finally, I will complete this segment with a summary of the analysis and conclusions I have drawn from it.

Explanation of Discovery and Subsequent Analysis

Originally, my intention was simply to build a digital site model of Bluff Creek to assist me in my analysis. I considered several options and decided to explore two. One was to use a 3D visualization software (Bryce) which I am a very strong, proficient user of, and the second method was to employ a Matchmove software (specifically boujou 4.1 from 2D3 LTD.) because of it's stated capability of analyzing film footage and locating objects, cameras and determining the lens focal length on the camera at each frame.

Negotiating for the educational license for the boujou software took time, so I proceeded with my visualization in Bryce in the interim. I stated with the generally assumed report of a 25mm lens on the camera Roger had, and tried a multitude of methods and techniques, essentially a trial and error experimentation method, to position objects, particularly the center trees (T - C1 through T - C5, as I have identified them in this report) so they matched the film image frames in size and position, for multiple camera positions.

For two months, every effort using a 25mm lens specification failed to solve. In analyzing the failure, I saw some objects which needed to be moved closer for a potential better match or alignment, but if so, then a wider angle lens would also need to be tested. At that point, I researched lens options for the Kodak K-100 and found the listed 15mm lens in their inventory.

So I chose to test a 15mm lens as well, in this method of assembling tree objects and trying to align them in multiple views. The basic model assembled successfully in a matter of hours. So I chose to give my emphasis to refining this model, using a 15mm lens specification, to see how effectively it can match multiple frames of the PG Film showing distinctively different camera positions.

The license for the use of the boujou software was finally approved and the software packet sent to me, and I began learning the software and testing the film footage. I have gotten a preliminary verification of the 15mm lens from their software's analysis, but that verification is still undergoing further analysis, and the people who actually developed the software have kindly offered to assist me in running their own analysis of the footage through the software, and their expertise with this software is unparalleled, since they are the actual developers and designers of it. That is in progress.

So I have continued to build and test the digital site model in the 3D visualization software where I am a generally acknowledged proficient user, and I have continued to refine the model and methods. But precisely because this is a trial and error methodology, I have chosen to offer the results, with precise coordinate data for objects and camera positions, as the material for other researchers to test for reliability and verification. In other words, use the object data to build the 3D model, put your cameras where my position coordinates say they should be, set the horizontal angle of view as I specified, and use the images provided in the website as backdrop images to compare, and see if things match up as I have shown. If so, then the 15mm lens is definitely correct.

The issue becomes a question of whether it is singularly correct, to the exclusion of other lens focal lengths. As there are an infinite number of possibilities for this alternate idea, I cannot test them all. And my two months of complete failure with the 25mm lens failing to solve, using the same methods as used for the 15mm lens to succeed splendidly, gives me confidence this is the factual solution. As much as I know about photography and geometry (which encompasses triangulations and their unique shapes), and the photogrammetry process which essentially creates traingulated shapes between objects and the camera position for any given image, the more points that match, across more camera positions, the more likely the determination is the prevailing one to the exclusion of other options. I believe I have met that threshold with seven different camera positions from the PG Film (plus two from other cameras) and anywhere from 4 to 12 objects aligning well in these varied camera positions, to confidently say that both the model is correct, and the PG Film camera has a 15mm lens on it.

On my website, I have provided all the data necessary for others to test this statement, first to verify the data as disclosed is true and correct, and second, I have provided the tools to assist others who may want to test other model object positions, other camera positions, and other lens focal lengths, to see if another solution will provide a similarly good alignment of objects to the film frames. This will also allow others to test the model in other 3D visualization software programs, to check for the prospect the software I used may be a mitigating factor in the determination.

Lens Issues

Introduction

The claim I am offering herein, that Roger Patterson had a 15mm lens on his camera that day at Bluff Creek, will be subjected to rigorous examination and challenge by others in the coming months. I anticipate this and given the potential of how it reframes the whole discussion of the subject in the film, it should be challenged and examined by as many people as possible, people who have technical expertise to determine the fact or error in the claim.

My goal here is to offer up as much supporting material as I now have, and continue to add to it in the coming months, so that others have as much data to test and evaluate as possible. This section presents both the general concept foundation ideas anyone evaluating this issue should be aware of, first, and then explains specifics that I have done or considered in my analysis.

Foundation Information on the Camera and Lens

The K-100 Camera - This camera is a spring-driven standard 16mm camera which takes a 100' daylight load of film stock. In it's standard configuration, it holds one lens for the camera proper, and a companion lens for the side viewfinder. It is not equipped for viewing through the camera lens. In general principle, this restricts the camera to using the lenses supplied by Kodak, with their companion viewfinder lenses, and precludes the prospect of using a zoom lens. This is not a mechanical restriction, so much as question of reason and intent to use the camera successfully.

Mechanically, the camera accepts lenses with a "C" mount, and also an "S" mount with an adapter (Kodak's 15mm lens for this camera is an "S" mount, with a Kodak-made adapter for "S" to "C" mount attached, as one example). So in theory, any "C" mount lens can be put on the camera, and should render an acceptable picture. But if you do not have the companion viewfinder lens, then what you see in the viewfinder is not the composition you get on the film. So we must ask, what logical purpose would a camera user anticipate to deliberately configure the camera to insure what he/she sees in the viewfinder is guaranteed NOT TO BE what will result on film?

And when you consider the camera was a rental, what would motivate the rental person to even allow the renter to take out the camera under these circumstances, when the resulting footage, not to the camera user's liking, could put the blame on the rental company for failing to equip the camera properly with the correctly matching camera and viewfinder lens pair?

So on this issue, one can argue for the mechanical possibility of using any "C" mount lens on the camera and successfully filming, but in the practical sense, the sheer irrationality of using a camera and viewfinder lens pair that are deliberately mismatched in focal length, suggests to me the prospect is unlikely and testing for this is simply not a high priority in my research effort. Far more likely and probable things have priority for my research time. So with this in mind, I have given priority to the Kodak 25mm lens and the Kodak 15mm lens that do have companion viewfinder lens available for that camera. Other researchers may, of course, test for lenses of other focal lengths, if they feel that the effort is a worthwhile pursuit.

There will continue to be arguments that the camera used by Roger for the PG Film had the 25mm lens on it, because rental documents and some type of police report (when he apparently failed to return it in a timely manner) specify a 25mm lens on those documents. It is reasonable to say, when he rented it, months before, it did have a 25mm lens on it. But changing a lens requires about one minute of time, and so the prospect that he changed lenses on the camera somewhere between the time of the rental and the filming at Bluff Creek is a perfectly reasonable expectation. And from an argumentative standpoint, the 15mm lens is a better lens for scenic outdoor photography, and that is substantially what Roger had been filming in the months he had the camera.

Ultimately, however, the lens determination must be made by optical science and mathematics, not arguments of speculated human behavior. So while all the above notes are relevant to the discussion, they are not being used in any proof of the lens focal length.

Verifying the Lens

There are several approaches to verifying the lens used on Roger's camera. The methods I am intending to use in this analysis are Replication, Mathematical Model, and Photogrammetry Software Processing.

Replication - This is the process of duplicating the process of filming, with a model or mockup of the original scene of Bluff Creek, using specified camera positions and lens specifications to correspond to specific frames of the real film. The greater the number of camera positions used, and the greater the number of objects which match in position and size, the greater the likelihood that the replication is a truthful determination. An example, in ballistics, would be to look at a bullet slug recovered from a crime scene, and studying the bullet deformation from impact, and then replicate the event by firing the same type bullet into various physical substances to study the deformations on impact of the study bullets, as compared to the deformations of the crime scene bullet. A replication of deformation argues for the study criteria as being consistent with the crime scene criteria.

In this case, a digital model has been constructed of the Bluff Creek site, and matched to seven film frames representing seven different camera positions. And 15 objects, most representing multiple points (which allows for comparing both their position and size relative to the objects in the film images), have been used. A score sheet charting the points or objects which match in varied film frames has been developed, and a full data sheet of object coordinates (dimension, position and rotation) has been provided for other researchers to test the model independently. Camera coordinates (position and rotation) have also been provided.

This replication method first allows me to compare my site model to the film, and determine that an excellent match of objects and camera positions occurs for the lens specification I am testing (the 15mm lens), and also allows for other researchers to replicate my efforts independently and verify the results. It further provides both myself and other researchers with the materials to test other lens specifications with similar model replication, by adjusting the lens angle of view, and them setting different camera and object positions to attempt an alternate replication where we can grade the number of matches. If they do so, their results can be easily documented in a consistent manner for other researchers and myself to verify.

So by this method, a preliminary confirmation of the 15mm lens has been obtained, but this cannot be considered conclusive without the additional testing, documentation and verification.

Verification and Falsification - A correct proof needs both verification and falsification to be complete. Verification is the positive or proactive demonstrating or determination that the fact claimed is correct. Falsification is the demonstration that alternatives cannot be correct. Both are considered strongest in factual certainty when results are replicated by persons other than the claimant of the proof. So I am making the data available for other researchers with that intent, that they may test the models and data, and either concur or contest the results I have obtained.

My primary verification of the 15mm lens claim at this point is the replication, and the high number of matches in multiple objects and multiple camera positions. The compatability of the camera position determinations as compared to site map measurement data and other filming at the site is supportive of this claim. What is currently lacking is the margin of error calculation, still under study.

My primary falsification of the 25mm lens (thus far) is that after two months of attempting to build a digital model of Bluff Creek using the 25mm specifications, the model failed to solve by every effort or method. But at the time I was doing so, I wasn't thinking in terms of trying to falsify the 25mm lens. I was actually trying to prove it valid. I did not maintain the appropriate documentation of the experiments, and so now, these must be redone. The work will be forthcoming, but isn't done yet.

Verifying the 15mm Mathematical Model - A mathematical model should allow for calculations of object positions and camera positions based entirely on the object position and dimension data that can be extracted from the film. This mathematical model should allow for exact computations of relative position of objects and cameras, independent of a viewing angle, so it can be done without a pre-determined lens angle of view put into the process (as the replication method does require). So this method, once accomplished, would be an independent verification of the lens, determined after the mathematical model is complete. Work is currently underway to define the various tree objects in the highest quality image form, as they appear in multiple frames, so the data has a high degree of accuracy and a low margin of error.

Once the data is prepared for this method, it will be released for independent researchers to evaluate and test.

Photogrammetry Software Analysis - Software which performs photogrammetry analysis uses an automated version of the mathematical model described above, with specific algorithms developed first to analyze film footage and identify points, objects or patterns (like pattern recognition or edge detection methods), and then additional algorithms to process the data and determine point positions, camera positions and lens focal length. I have been using one product, boujou 4.1 made by 2D3 Ltd of the UK, for this method. The boujou software is a CGI industry "Matchmove" software which specifically tracks points, objects, cameras and lens data so a digital model or effect can be composited into real film footage effectively. I chose it specifically for its capability of locating cameras and determining lens focal lengths.

A preliminary analysis I have done confirmed the 15mm lens on the PG Film camera, and a separate test using footage I generated with a known lens horizontal field of view was tested by the software and determined to be accurate in its lens determination. I am currently running additional tests with more footage, as well as setting up the PG Film frames for a more lengthy and detailed analysis, which I will document thoroughly. The staff of the software developer have also graciously offered to run their own analysis using the footage, and preparations for that effort are being made.

So these are the three methods I am using to determine the lens on the PG Film camera. I welcome any suggestions by other researchers as to additional methods of determining the lens focal length.

Foundation Material

My intention is to provide other researchers with all the material to effectively replicate or refute my digital site model and the 15mm lens specification, by providing all the data and object texturing resources needed to replicate my model in other 3D visualization software tools. These notes that follow are the basic information needed for that putpose.

Original Software Application - The original software application I used for my experiments is Bryce 5.0, a 3D modeling and landscape visualization software I have used for 12 years now (in four versions), and the application I am most proficient with. I chose this application because my proficiency allowed me to quickly and effectively experiment with many 3D model alternatives, test variables, and explore options or ideas in the most effective way. In the boujou software, by comparison, I am slowed down by the learning curve of getting acquainted with the tools and workflow of that application.

The Bryce software was more that sufficient for the development of the digital site model, but if I were to try and create an animation of a digital subject walking through the digital site model, I would use one of the high end animation packages like Maya or Lightwave.

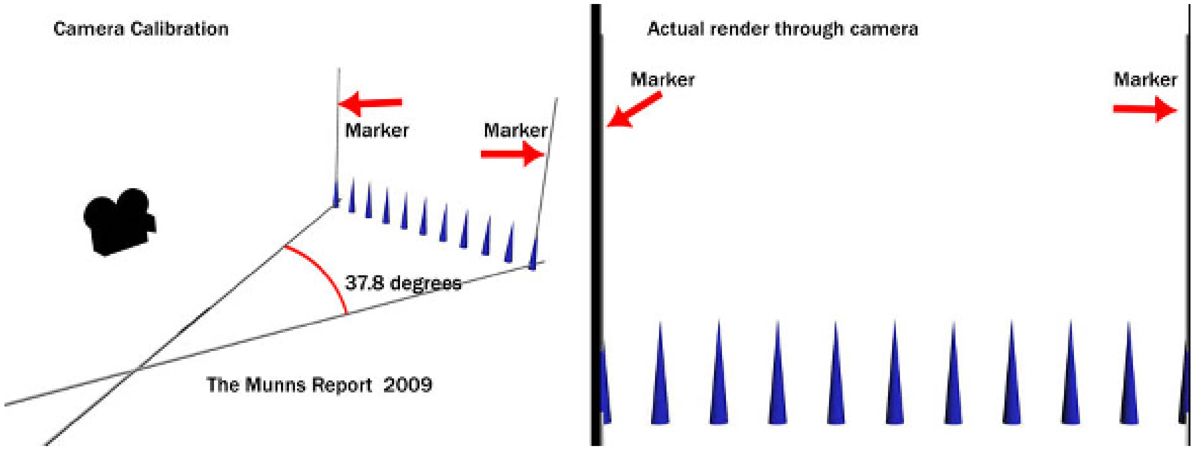
Coordinate System - The coordinate system I used is a world coordinate setting. With a camera set at zero rotation on all axis, X coordinate is left to right. Y coordinate is up and down. Z coordinate is nearer to camera or farther away. If you are attempting to use a software that has View Coordinates as default (3D Studio Max as one example), you may consider setting the system to World coordinates instead, to enter the data I have listed.

Also note, for Lightwave users, that Lightwave has used aircraft pilot concepts of rotation (pitch, yaw, and bank) instead of just X, Y, Z, rotations, so you may have to calculate the appropriate translations. I use Modeler primarily, so I don't deal with the rotational issues in Layout much.

Lens Field of View Issues - There is some confusion about lens field of view angles and specifications, because in basic principle, a lens has a circular field of view, and that circle must be large enough to include the diagonal distances to the corners of a rectangular camera or render field. So true field of view angle is not the same as horizontal or vertical viewing angle.

The true calculated horizontal view angle for a 15mm lens on a 16mm camera with a standard aperture width of 0.402" is 37.8 degrees. But because the theoretical FOV is greater, the Bryce setting used for FOV in the camera attributes is FOV: 47.40

So Step One in creating or replicating the site model is calibrating your camera view horizontal angle to 37.8 degrees. The method I used for the calibration involved creating two bars radiating out from the same XZ position as the camera (but slightly below so the bars were not blocking camera view), one bar rotated 18.9 degrees on the Y axis, the other bar rotated -(minus)18.9 degrees on the Y axis. Then posts were added to each bar as true vertical markers, and the camera FOV was adjusted until those two vertical markers were exactly at the edge of the rendered image sides. This insured the digital camera was capturing the horizontal angle of view of 37.8 degrees.



Similarly, I would advise anyone using a 3D application to similarly calibrate your camera view to insure your horizontal viewing angle is 37.8 degrees.

You may, of course, test the site model with any other lens angle, including the angle for a 25mm lens if you like (horizontal angle of view is 23 degrees, according to ASC Manual), and see if you can find camera positions which effectively replicate the film frames (same position and scale for the site objects). I tested the model with a 25mm lens specification for two months, and it failed to solve every time, but there may be alternatives I did not try (given there's an infinite number of alternatives). I can say conclusively that the 15mm lens angles and positions do produce an excellent match for the real film.

Render Aspect Ratio - Use a 4:3 render aspect ratio (4 wide, 3 high) to match the 16mm film aspect ratio of standard 16mm cameras, including the K-100 used by Patterson.

Background Image - If your software supports a capability of displaying a background image behind the scene objects, the frames from the film showing the seven camera positions can be used as background images. They are identified with text on the image as to which camera position they correspond to.

Black Border on Film Frames - The image frames from the film which are used to test the 3D model have a black border around them. This is because true full frame versions of the film are almost non-existent for general research purposes. I had to go to John Green's location with a portable scanning device to make these frames and they are a copy of a film version which was printed on an optical printer, the same time the more commonly seen zoomed in version was done, the F352 freeze frame segment, and the slow motion segment (all done on an optical printer, not a contact printer). But an optical printer acts like a projector, and the requires an intermittant shutter and pulldown movement, and on the copy film stock side, there is a film gate with an aperture opening, like a camera. This aperture on the copying side masked off a small portion of the true full frame, reducing the visible frame to about 96% of true full frame.

The following image shows a true "full frame" and the redish border is what was missing from the scan's of John Green's full frame copy that I scanned. So this missing section was added with the black border around the frames I used.

A contact print, by comparison, just puts the copy film stock on a roller, puts the source film on top of it, and shines a light through them both as they roll continuously through the printer. You get true full frame with such a copy process.

The result of using the optical printer is that even the "full frame" version I scanned is actually only about 96% of true full frame, compared to some still frame prints that are true full frame, so the black border reconstructs the true full frame size in relation to the image, necessary for a photogrammetry analysis.

Making Trees for the Site Model - If you are attempting to build a site model in a 3D visualization/CAD software, this is some advice on making the trees. In Bryce, there is a wonderful object option called a symmetrical lattice, which is in effect a mirrored pair of mesh objects with the base's joined and then clipped to be invisible. I use a Displacement map to shape the tree, and an image texture map applied object top (since the mesh innately comes as a top and bottom section) for the texture. And the object size notes are for the actual full rectangular mesh, including the clipped invisible part.

But this is a rare object type for many of the other 3D visualization applications, so you may want to make the trees as simple image planes.

Make a 2D image plane (a single polygon with height and width, but no depth) and map the image texture map I've provided, using a simple front planar mapping. Then use the included alpha channel map for the transparency setting, and it will remove everything but the actual tree shape. Use my object position and rotation coordinates, assuming your software puts the exact center of the polygon as the point of origin. That should give you the tree in correct position and scale to the site.
An example is shown below, the forked tree I have identified as T - C4:

Image Maps for T - C4, the Fork Tree. Crop to 247 x 988   Left - Texture, Middle - Alpha, Rt. - Disp.

For each tree, there are three image maps on the page. Each has an image texture map, an alpha channel map, and a displacement map. For an Image Polygon, just use the texture and alpha. If your modeling program supports displacement mapping on meshes, use the displacement map and texture.

Camera Data

Camera Positions - Note that the camera positions start at C3. C1 and C2 are for the beginning sequence, and as work is still underway to connect the beginning sequence to the main site area, this will be shown in a later segment of the report. So C3 is the first camera position showing the main log, the big tree in the background, and such. It is Frame 205 in the PG Film sequence.

Camera/BG image code is as follows:

TMR (The Munns Report)
PGF (Patterson Gimlin Film)
"C" plus number - The camera position on my site map
bg - indicates background image for comparison
"F" plus number - Actual film frame number for reference.

Verification Documents

Seven Images have been included in this report showing seven specific different camera positions in the PG Film, and compare the digital model taken from a digital position proximate to the original actual camera position at Bluff Creek. In each of these image panels, the top image in the actual PG Film frame used for the analysis, and then an image of the digital model superimposed over it, and then a third image of the digital model from same view alone to see the objects clearly.

For any researchers interested in replicating the model and lens study, go to the Report website (www.themunnsreport.com) to download the images necessary for use as background plates, since they will be a better quality than the illustrations in this PDF.

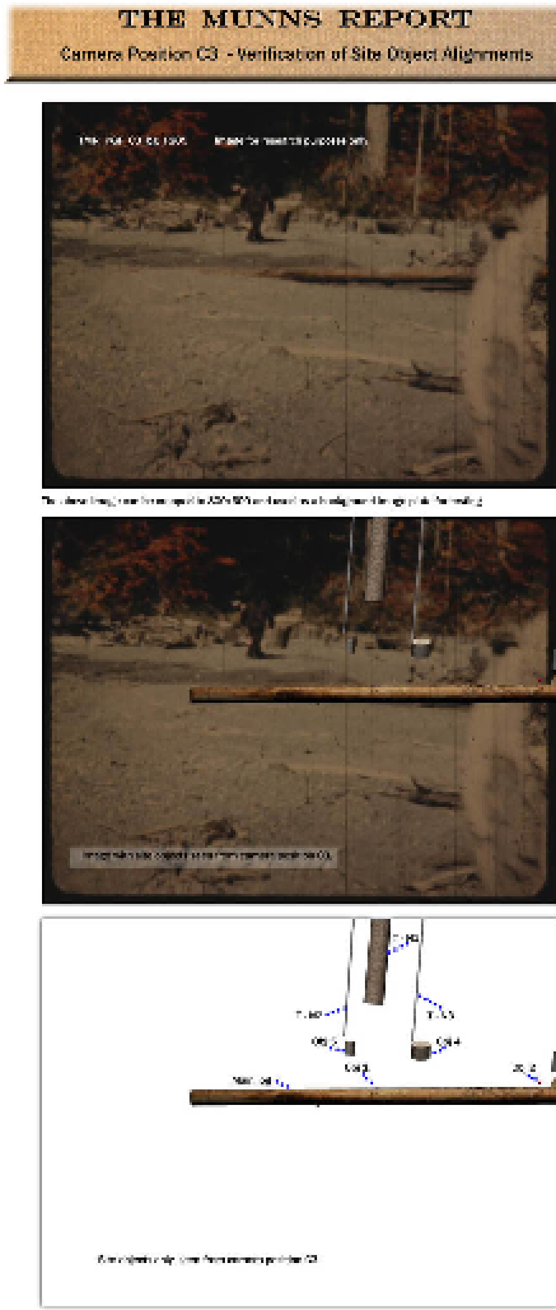
The seven image panels are shown here for reference, although the text is hard to read. On the website versions, the text part is clear. These illustrations show the digital model well, and also show how the model matches the actual film objects. These charts are identified as follows:

TMR_PGF_C3_bg_F205

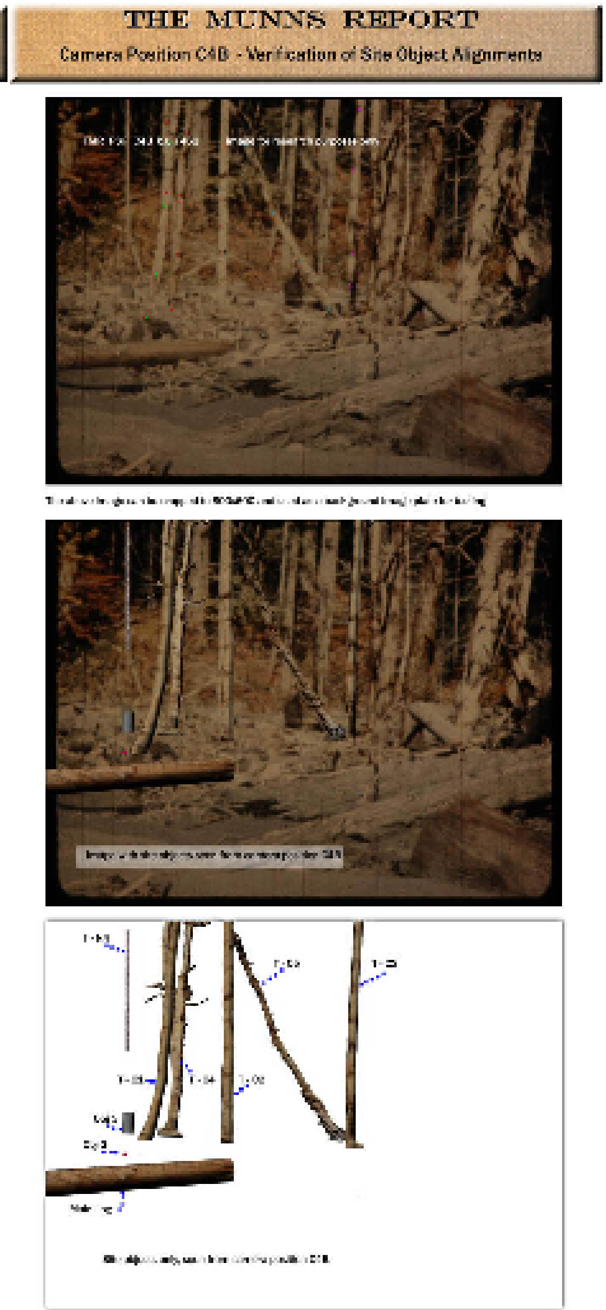
TMR_PGF_C4A_bg_F352

TMR_PGF_C4B_bg_F462
TMR_PGF_C5_bg_F634
TMR_PGF_C6_bg_F715
TMR_PGF_C7_bg_F727
TMR_PGF_C8_bg_F875

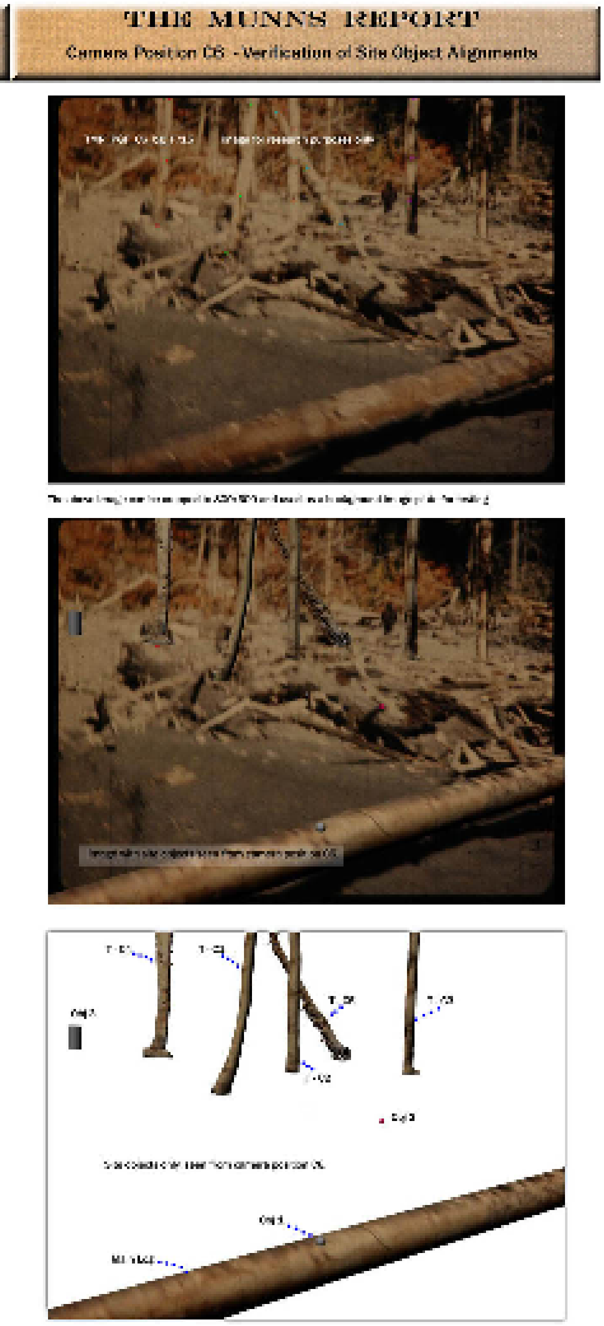
TMR_PGF_C3_bg_F205 is shown here:



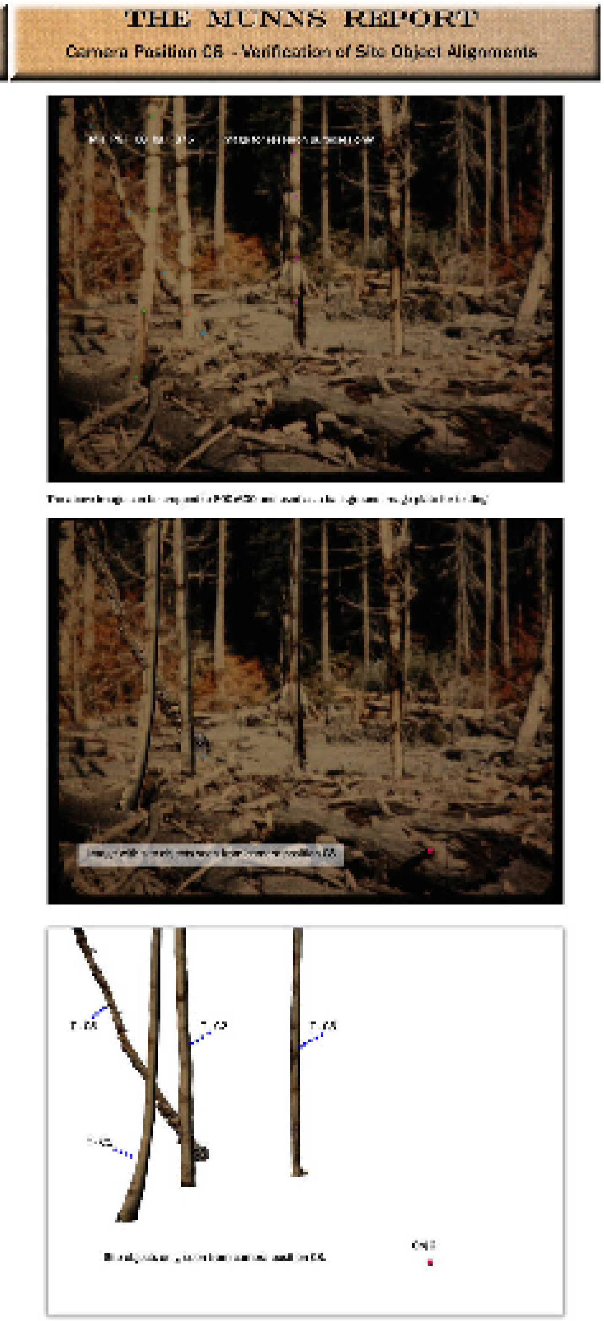
TMR_PGF_C4A_bg_F352 and TMR_PGF_C4B_bg_F462 are shown here:



TMR_PGF_C5_bg_F634   and TMR_PGF_C6_bg_F715 are shown here:



TMR_PGF_C7_bg_F727 and TMR_PGF_C8_bg_F875 are shown here:



Comparing Other Site photos

Aside from the actual site images contained in the PG Film itself, there were other photos of the Bluff Creek site taken in subsequent years by other investigators. Byrne and Dahinden visited the site and took pictures which are available to researchers.

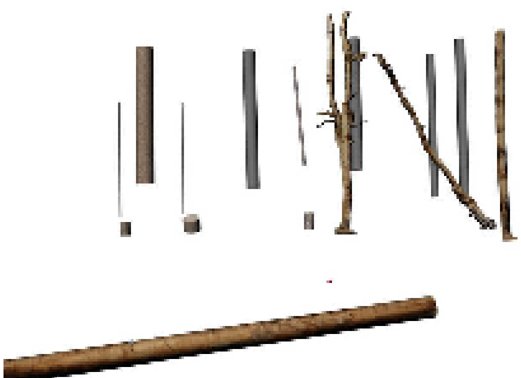
Comparing the digital site model of mine to these photos is a different procedure, because we do not know the camera, lens, or original film image format, whether the image we have has been cropped, etc. But if the location of the camera can be found, and a digital picture (a render) of the digital model is made with simply a wider field of view than the trees and objects seen in the research photo, we can test to see if the digital trees and objects align with the photo trees and objects, in a position and proportional size comparison. If there is an alignment, this lends further credibility to the accuracy of the digital model.

For the two photos compared, I have included a separate data sheet listing the camera position and rotation coordinates used to produce the digital render. These coordinates give us a fine proximate camera position for the people who took these photos on the real site.

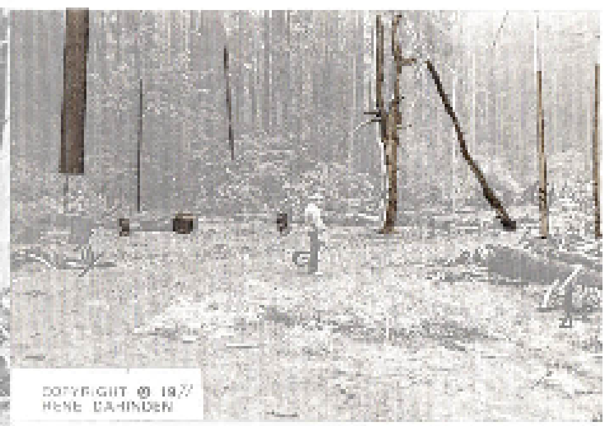
In the digital renders, there are additional gray cylinders for trees in the north rim section of the site. These trees have not yet been fixed in a final position, and have not yet been identified. They are simply additional trees that the continuing effort will try to locate, in the final site model and diagram which will be released in subsequent months with the final report release.

Comparison with Byrne Photo and Comparison with Dahinden Photo follow on the next page. The text is hard to read, so I suggest you see the images on the website to read all the text and fully appreciate the comparison. These mainly illustrate well the digital model and how it matches the objects in the photos.

Digital Site model compared to Byrne Photo. Note that trees T-01 and T-02 are no longer there, when this photo was taken. Also, the gray cylinders in back are more North Rim trees being tested for position, but not finalized yet. Slight shape misalignments of some trees may be accounted for by time, growth, or leaning over the years.
Camera coordinates are noted on "Other Photo Comparisons" data sheet.



Digital Site model compared to one of Rene Dahinden's Photo. Note that tree T-01 is no longer there, when this photo was taken. Slight shape misalignments of some trees may be accounted for by time, growth, or leaning over the years. The Forked tree T-04 is slightly misaligned, but in the PGF it is always seen on a diagonal, so there is a study to consider if the diagonal width needs to be expanded. If so, it would match here better.
Camera coordinates are noted on "Other Photo Comparisons" data sheet.



Grading the Object Model Match

The following chart graphs out the number of objects which match partially or fully to the corresponding objects in the PG Film frames, as well as the two other site photos. This grading chart confirms that a substantial number of objects do match a good number of film frames with varied camera positions.

But this grading does not have a relative value so far. I post this, along with a blank version of the chart, so if other analysts test other model options with different lens specifications, different camera positions and/or object placements, we can compare their results to mine in a point match system.

If a different model with lens/camera/object specifications (as noted on a data sheet provided by that analyst) yields a model with a greater number of matches, it must prevail over mine as more accurate. If there is a tie, equal number of matches, then we must re-evaluate the methodology and resolve the discrepancy, because there should not be two different models that can equally provide as many matches. If there is no alternate model which equals or exceeds the number of matches I have shown here, then my model, and the 15mm lens specification, should prevail as the most accurate model and lens specification.

For any alternate test, the analyst should specify if the tested lens focal length is theoretical (just a number) or a real lens of known make and specification.

Work on the model will continue to see if it can be upgraded further for even greater accuracy, and more objects added to see if additional matches will occur.

The Munns Report

Graph of Object Matches and Camera Views

The following chart gives a summary of the number of digital site model objects which visually match the same objects in the film, with one point (red dot) being a generally complete overlay, and one half point (blue dot) for some overlay but not complete. Blank spaces indicate the object is not in that particular frame to compare.

Camera Views / Object List	TMR_PGF_C3_F205	TMR_PGF_C4A_F352	TMR_PGF_C4B_F462	TMR_PGF_C5_F634	TMR_PGF_C6_F715	TMR_PGF_C7_F727	TMR_PGF_C8_F875	Byrne Photo	R. Dahinden Photo	
T - C1		red	red		red	red	red			
T - C2		red	blue	red	red	red	red		red	
T - C3		red	red	red	red	red	red	blue	red	
T - C4		red	red		red	red		red	blue	
T - C5		red	red	red	red	red	red	blue	red	
T - N1	red	red						red	red	
T - N2	red	red						red		
T - N3	red	red						red		
T - N4		red	red					red	red	
Main Log	red	red	red	red	red			red		
Obj. 1	red	red			red			red		
Obj. 2		red	red		red	red	red	red		
Obj.3		red	red		red			red	red	
Obj.4	red	red						red	blue	
Obj.5	red	red						red	blue	
Object Match	7	15	8.5	4	9	6	5	12	7.5	

PGF 7 frame Match total: 54 Other Site photo match total: 19.5

The Munns Report

Graph of Object Matches and Camera Views

The following chart is a blank version of my match Total Chart, for use by other researchers if they build and test an alternate model.

Camera Views / Object List	TMR_PGF_C3_F205	TMR_PGF_C4A_F352	TMR_PGF_C4B_F462	TMR_PGF_C5_F634	TMR_PGF_C6_F715	TMR_PGF_C7_F727	TMR_PGF_C8_F875	Byrne Photo	R. Dahinden Photo	
T - C1										
T - C2										
T - C3										
T - C4										
T - C5										
T - N1										
T - N2										
T - N3										
T - N4										
Main Log										
Obj. 1										
Obj. 2										
Obj.3										
Obj.4										
Obj.5										

Object Match

PGF 7 frame Match total: **Other Site photo match total:**

About the Photogrammetry Process

Introduction - A sophisticated technique, called stereophotogrammetry makes it possible to estimate the three-dimensional coordinates of points on an object seen in photographs. These are determined by measurements made in two or more photographic images taken from different positions. Common points are identified on each image. A line of sight (or ray) can be constructed from the camera location to the point on the object. It is the intersection of these rays, by triangulation, that determines the three-dimensional location of the point.

Photogrammetry is used in different fields, such as topographic mapping, architecture, engineering, manufacturing, police investigation, and geology, as well as by archaeologists to quickly produce plans of large or complex sites. It is also used to combine live action film footage with computer generated effects in movies.

Algorithms for photogrammetry typically express the problem as that of minimizing the sum of the squares of a set of errors.

Explanation - The Photogrammetry Process requires a lengthy series of experiments, each step reducing the number of options for object position and camera position for the various camera views used in the analysis (you must have more than one, two is probably minimal, three is better, and so on. I used seven.) The recognition of points and objects can be automated by computer algorithms (such as edge detection and pattern detection processes) or the points and objects can be manually designated by a person performing the analysis.

Each step makes some determination about either the objects in the image or the camera in relation to the objects. Each determination reduces the number of options for where an object or camera must be, and if there is enough data in each image, and enough images from varied camera positions, the reduction of options leads to one reliable conclusion.

For example, if you have two photographs of an object, like a tree, and in the first, the tree is a certain height compared to the image frame, and in the second photo, the tree is twice as tall as in the first, we can say the camera taking the first image is twice as far away from the tree than the camera taking the second image, if we are confident the lens focal length has not changed. That determination specifies something about both camera positions, that however far the second one is from the tree, the first one is twice as far.

If you have two identifiable objects in that pair of photos, and the one tree changes by being twice as large in Photo #2 but another tree changes only a small amount, we can confidently conclude that the second tree is much farther away from camera than the first tree, because the change of camera distance is proportionately less in relation to the overall distance.

So, in this process, we look to the way objects change, in size, in position, in relation to each other, and each individual determination reduces some options of where the objects are and the cameras are.

A systematic analysis of this process can, if enough data is present, reduce the objects to one reliable position in a 3D digital space, in proportion to each other, and can determine the position of the cameras that were taking the photos, in terms of position.

The methodology I used manually to evaluate the PG Film images, and the boujou 4.1 software I selected as a corroboration method, use entirely different methods and technology, so that their shared conclusions can give further reliability to the determination, reducing the question of a flawed method, if only one were used.

The final results and documentation of the boujou software analysis will be included in the Report, Release Two.

Model Data

Site Map Object identification - For my site map, here and in later portions of my report, I've standardized the tree, object, and camera identifications as follows:

Object List

T - C1   First close tree subject walks behind
T - C2   Second close tree subject walks behind
T - C3   Tree with distinctive black shadow on trunk lower right side
T - C4   The Fork Tree which splits into two trunk sections like a tuning fork.
T - C5   The Leaning Tree going upward left on a diagonal direction.

T - N1   The Big Tree on the Northward Perimeter.
T - N2   The thin tree to the left of the Big Tree.
T - N3   The thin tree to the right of the Big Tree.
T - N4   The narrow and tilting tree trunk with no apparent branches

Main Log   The near horizontal large log in the foreground
Obj 1   A marker on the Main Log where bark peels upward and has a whitish coloration
Obj 2   A short branch stump on a fallen log, behind the Main Log
Obj 3   A tree stump
Obj 4   Another tree stump
Obj 5   Another tree stump

A note on the coding:

The "T" denotes "tree", the "C" denotes the center group of trees, and the "N" denotes the north back wall of trees. "Obj is the abbreviation for "object"

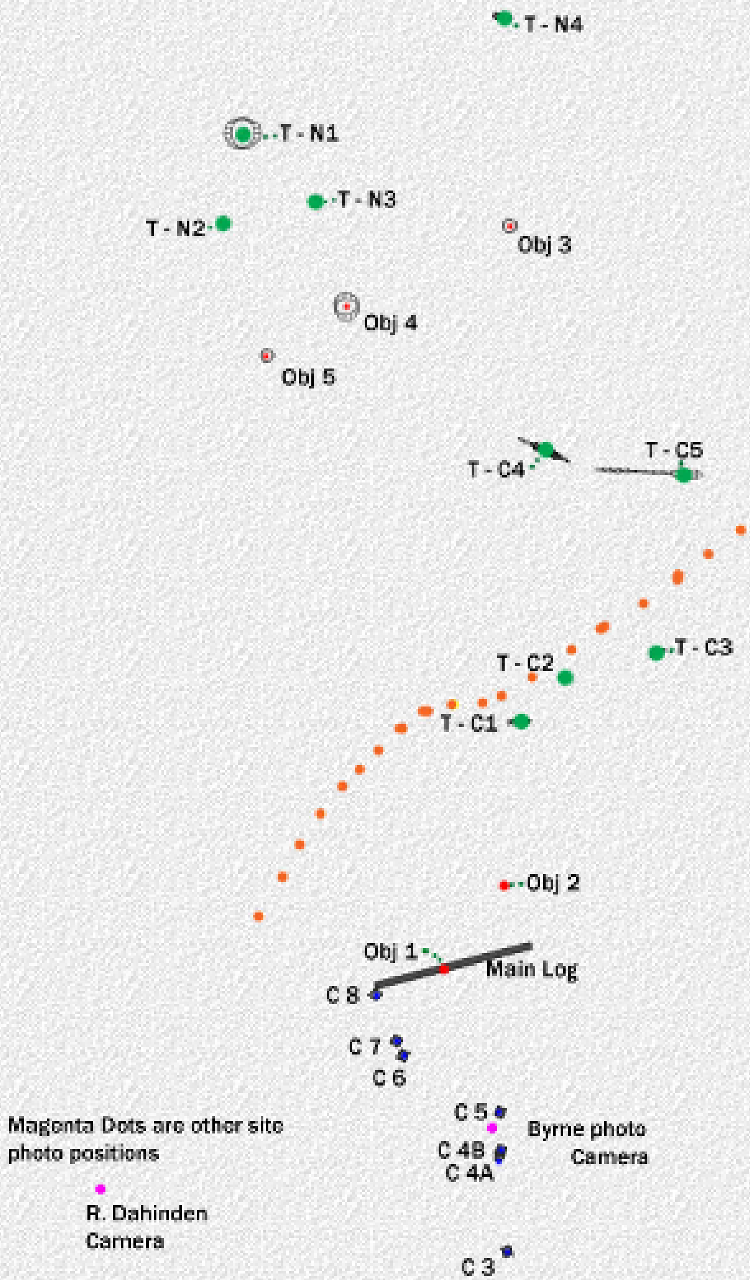
Object Types:

I used symmetrical lattices (displacement mapping a mesh object) for the five center trees in my site model, because Bryce has excellent capabilities in this respect. The North section trees are simple cylinder primitives, but later I will upgrade to polygon modeled shapes for my final site model. These cylinders suffice for camera position analysis. The main log is a simple cylinder, as are the tree stumps. Obj #1 and #2 are simple spheres as markers. Replicating these in another 3D visualization software should be easy, with the option of using an Image Plane object in place of the mesh trees, if your application does not easily create displacement mapped meshes.

Digital Model Site Map

The diagrams on the next two pages illustrate the digital model developed from this study, shown in both a top view and a perspective view, with objects and camera positions noted.

The Munns Report - Site Model   May 1, 2009

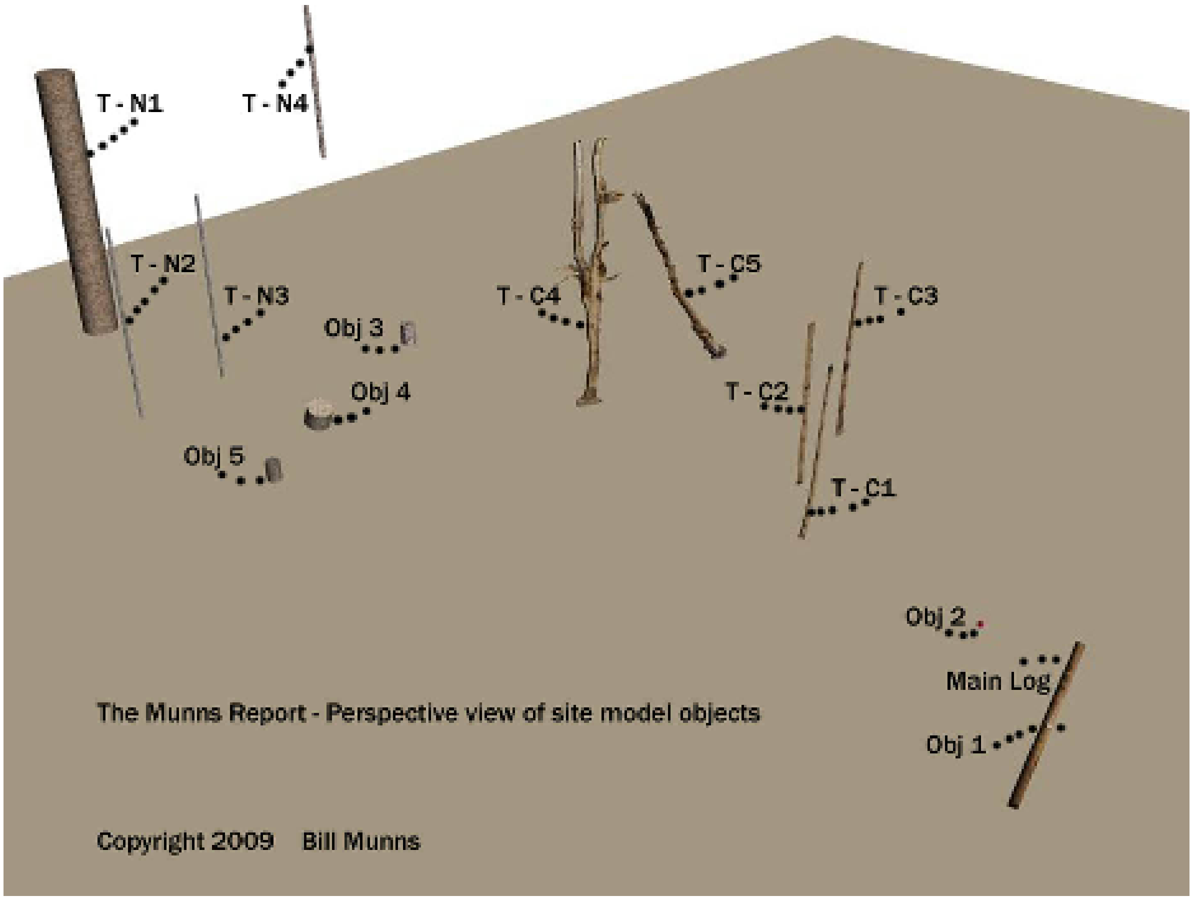


This Site Model diagram illustrates all of the objects used in the site analysis and digital model. This schematic was taken from a top orthographic view of the actual digital model but the object coordinates in the data sheet are the most precise scaling data for positions and any angle calculations.

Also shown are the camera positions. Note C 4A and C 4B are so close that their markers tend to overlap.

C5 is the position Roger held when the subject was blocked by the cluster of trees, and he was waiting for the subject to step out in a visible position.

The subject's path shown here with an orange dotted line is simply a representation of the proximate path for reference. A final path determination is in progress.



Texturing the Models

For researchers who want to replicate the digital site model and make their own evaluations, the Report website has all the necessary texture map images for the main center trees to be made, as well as mapping information to apply these to objects to replicate the objects shown herein.

An example, of the forked tree, is shown on Page 9. There are five main tree texture maps plus the main log map on the website.

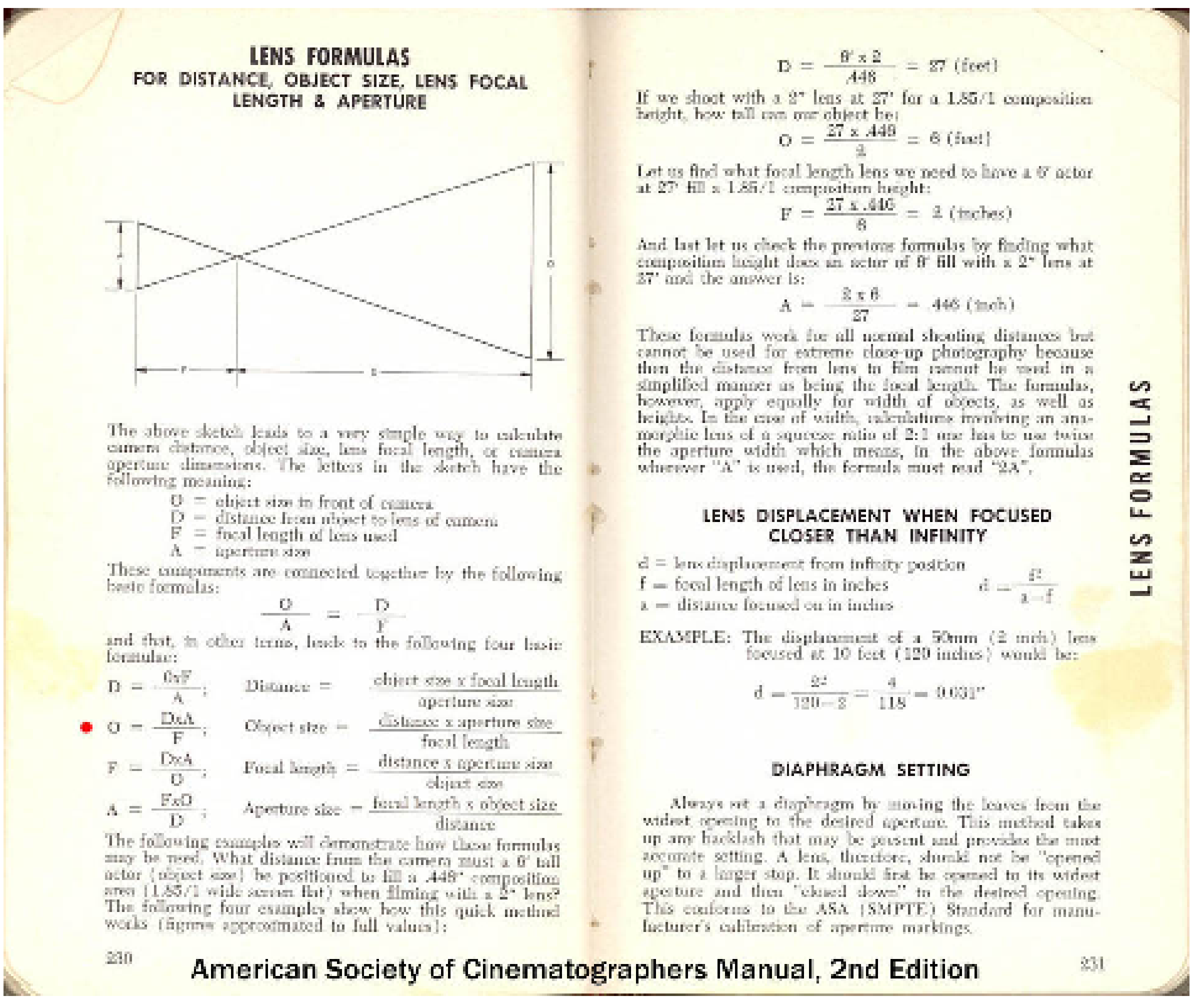
Mapping the Main Log - The main log is a simple cylinder. The mapping of the enclosed texture should be cylindrical, with one complete map around the cylinder circumference. The image of the log was repeated three times in this map, so each repeat will map about 120 degrees of the circumference. There is a small red dot on the map which corresponds to the position of "Obj 1" the marker for the whitish bark on the log. Bryce creates all cylinders with the cylinder length on the "Y" axis (Up/down) so once it has been created and sized for proportion, it will be rotated over 90 degrees to it's position. The mapping of the texture is done in its original vertical position.

Height Analysis Information

A Height Scaling of the subject in the film is underway, based on scaling the model in real world measurements, integrating measurements taken by Rene Dahinedn, John Green, and potentially other sources. As this is work in progress, there is still the consideration of obtaining more data to integrate into the final determination. Data accumulated to date is highly consistent and allows a preliminary determination, although the documentation will need to be thorough. So the best that can be disclosed at this point in time is that the data in thus far indicates a height of about 7' 4" for the figure, as posed, in Frame 352. This may be adjusted as the analysis continues.

Establishing a real world dimensional scaling of the model, and establishing a path walkway location of the subject, will allow for a calculation of distance from subject to camera, at various designated frames. This work is in progress and is being vetted for reliability and there is consideration of how best to calculate the margin of error factor.

When this is completed, the following optical formula will be applied to determine subject height.



LENS FORMULAS
FOR DISTANCE, OBJECT SIZE, LENS FOCAL LENGTH & APERTURE

The above sketch leads to a very simple way to calculate camera distance, object size, lens focal length, or camera aperture dimensions. The letters in the sketch have the following meaning:

O = object size in front of camera
D = distance from object to lens of camera
F = focal length of lens used
A = aperture size

These components are connected together by the following basic formulas:

$$\frac{O}{A} = \frac{D}{F}$$

and that, in other terms, leads to the following four basic formulas:

$D = \frac{O \times F}{A}$; Distance = $\frac{\text{object size x focal length}}{\text{aperture size}}$

$O = \frac{D \times A}{F}$; Object size = $\frac{\text{distance x aperture size}}{\text{focal length}}$

$F = \frac{D \times A}{O}$; Focal length = $\frac{\text{distance x aperture size}}{\text{object size}}$

$A = \frac{F \times O}{D}$; Aperture size = $\frac{\text{focal length x object size}}{\text{distance}}$

The following examples will demonstrate how these formulas may be used. What distance from the camera must a 6' tall actor (object size) be positioned to fill a .448" composition area (1.85/1 wide screen flat) when filming with a 2" lens? The following four examples show how this quick method works (figures approximated to full values):

$$D = \frac{6' \times 2}{.448} = 27 \text{ (feet)}$$

If we shoot with a 2" lens at 27' for a 1.85/1 composition height, how tall can our object be:

$$O = \frac{27 \times .448}{2} = 6 \text{ (feet)}$$

Let us find what focal length lens we need to have a 6' actor at 27' fill a 1.85/1 composition height:

$$F = \frac{27 \times .446}{6} = 2 \text{ (inches)}$$

And last let us check the previous formulas by finding what composition height does an actor of 6' fill with a 2" lens at 27' and the answer is:

$$A = \frac{2 \times 6}{27} = .446 \text{ (inch)}$$

These formulas work for all normal shooting distances but cannot be used for extreme close-up photography because then the distance from lens to film cannot be used in a simplified manner as being the focal length. The formulas, however, apply equally for width of objects, as well as heights. In the case of width, calculations involving an anamorphic lens of a squeeze ratio of 2:1 one has to use twice the aperture width which means, in the above formulas wherever "A" is used, the formula must read "2A".

LENS DISPLACEMENT WHEN FOCUSED CLOSER THAN INFINITY

d = lens displacement from infinity position
f = focal length of lens in inches
x = distance focused on in inches

$$d = \frac{f^2}{x - f}$$

EXAMPLE: The displacement of a 50mm (2 inch) lens focused at 10 feet (120 inches) would be:

$$d = \frac{2^2}{120 - 2} = \frac{4}{118} = 0.031''$$

DIAPHRAGM SETTING

Always set a diaphragm by moving the leaves from the widest opening to the desired aperture. This method takes up any backlash that may be present and provides the most accurate setting. A lens, therefore, should not be "opened up" to a larger stop. It should first be opened to its widest aperture and then "closed down" to the desired opening. This conforms to the ASA (SMPTE) Standard for manufacturer's calibration of aperture markings.

American Society of Cinematographers Manual, 2nd Edition

Using the derived formula variation (above, with red dot to identify it) that solves for subject height, the necessary input numbers are

A) Size of subject's image height on the film

B) Lens focal length

C) Distance from subject to camera

For F352, the following chart shows possible height calculations, for various distances from camera to subject.

The (A) value, estimated figure height on film, is here designated as being 15% of frame height (determination shown at end of this report document)

So 0.292" (the 16mm frame height) x 0.15 = 0.0438"

The (B) Value, lens focal length, is 15mm or 0.59"

If the Distance is:	Then the Subject Height is:	
110'	8.16'	97.92"
108'	8.02'	96.24"
106'	7.86'	94.32"
104'	7.72'	92.64"
102'	7.57'	90.84"
100'	7.42'	89.04"
98'	7.27'	87.24"
96'	7.13'	85.56"
94'	6.98'	83.76

Preliminary measuring analysis indicates that debris obstructing the walking path of the subject is up to 94' from camera, so closer path distances are negated by this obstacle.

Documentation on model scaling and Path location analysis are still in progress,
and will be included in a subsequent Report Release Segment

For people who may persist in the assumption the 25mm lens data is valid, this illustrates how a 25mm lens affects the height analysis:

A. - Remains the same, subject height in the film image 0.292 x 0.15 = 0.0438"

B. - Changes to : 25mm lens which converts to 1.016"

Alternately, here are height calculations if the camera has a 25mm lens on it:

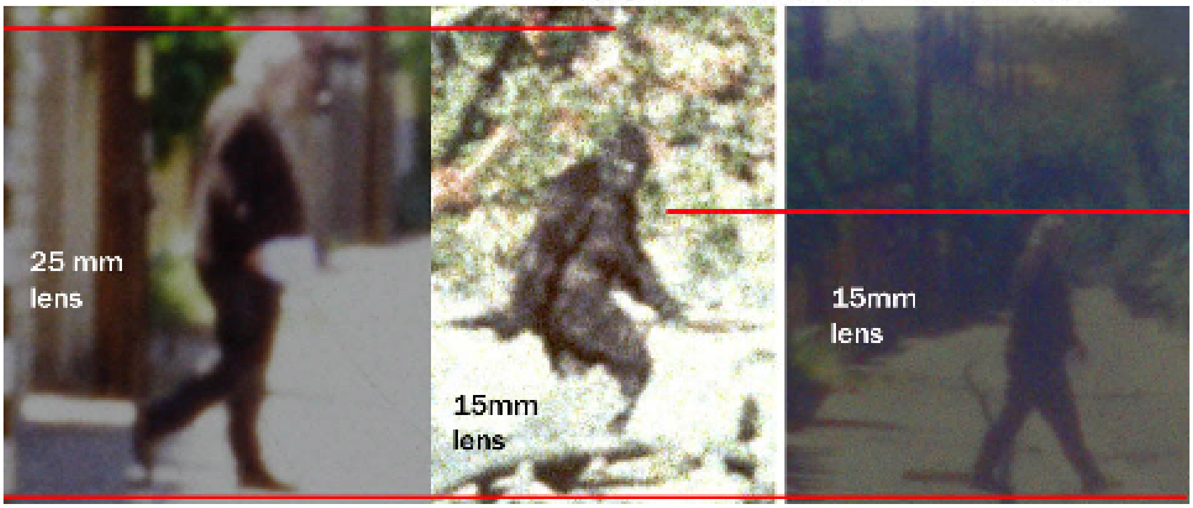
If distance is:	Height is:	
110'	4.74'	56.88"
108'	4.65'	55.8"
106'	4.56'	54.72"
104'	4.48'	53.76"
102'	4.39'	52.68"
100'	4.31'	51.72"
98'	4.22'	50.16"
96'	4'14'	49.68"
94'	4.05'	48.6"

Testing the Lens Formula:

The above calculations, for both 15mm and 25mm lens, are theory. In a film test, I chose to verify it with an actual filming test, using a Kodak K-100 camera and each of the lenses, filming a man known to be 6' 2" tall (in shoes), and at a measured distance of 102' from the camera. The 102' distance was specifically chosen for illustrative purposes because in Chris Murphy's fine books on the PG Film, one diagram specifically estimates the distance from Roger's camera to the film subject as being 102' for Frame 352.

Below is the comparison illustrating the discrepancy between the 25mm lens and the 15mm lens, with actual photographs of a man, 6' 2" tall, at a measured distance from camera of 102', and then compared to frame F352 of the PG Film.

Testing the 25mm lens and 15mm lens. These tests were filmed with a Kodak K-100 camera, using the standard Kodak Cine Ektar 25mm lens, shown at left, and with a 15mm Ektar lens, shown far right. The PG Film subject is centered. For the camera tests, the subject is a man measured to be 6' 2" in shoes, and the distance of subject to camera was a measured 102', based on the report in Chris Murphy's book that the PG Film subject was estimated to be 102' from camera for this frame.



Other Height Analysis Methods and Concerns of their Lack of Accuracy:

The Foot as Ruler - Basically, in frame 061 and 072 (both of which were copied as Cibachromes and are widely distributed among researchers) one of the subject's feet is bent back so the sole appears to be full on view to camera. This apparent foot is then measured and estimated to be 14.5" because that is the stated measurement of footprints taken from the site. This measurement is then compared to apparent subject height and the calculation is made.

Proponents of this theory argue for its reliability, but my analysis of the method has yielded the following concerns which question its accuracy:

1. - Film Resolution, since the foot being measured is only about 10 lines of resolution, so an error of one line of resolution is 1 1/5 inches. That would calculate to 7.5" or more in added full body height.

2. - Motion Blur, because the foot is in motion greater than the body (the foot and the hand are the two fastest moving objects on the body during a walk cycle) and the foot measurement of toe to heel is on the line of motion, meaning the motion can easily (in fact likely will) expand the apparent size. So the actual foot is almost assuredly shorter in length. You may think, because the toes seem so sharp (in F061, for example) that there is no blur, but the toes are below one line of resolution in size, so the apparent sharpness is likely a result of the next point, below.

3. - The Cibachrome Print everybody uses to measure the foot from has a false level of detail introduced by the Cibachrome photography process. In effect, it creates detail which was not actually in the original camera master Patterson took, which means it may (emphasis on "MAY" not proven "IS") have introduced false detail.

4. - Sole/Heel Color. There apparently is pale skin color going up the back of the heel, in frames that immediately follow the studied ones, and from the view of the foot, it may be that some of what is presumed to be sole of foot is actually heel behind the foot, and thus doesn't count as measurable foot base. The lack of resolution and false detail introduced by the Cibachrome duping may prevent us from determining this one way or another. If some is the heel back, that may shave another inch off the foot length. (that would add 5.5" to 6" to body height)

Finally, the body is hunched over considerably in the photo, and no one has yet established a fully reliable way to calculate how far bent over the subject actually is, which also makes the body height calculation suspect.

So far, no one has effectively studied these elements, with actual filming tests, so far as I know.

A more reliable way to measure the body is using a full body measurement, first because it is a larger measurement in proportion to grain or resolution lines (larger image means less error) and because that measurement is not affected by walking motion blur, because the walking motion blur for the body is lateral (side to side) and the measurement is vertical (head to toe) so blur along the lateral vector does not skew the measure of a vertical dimension.

So the foot as "ruler" to scale the body height is potentially flawed by these considerations, and I have not seen any analysis that uses the foot measure as the "ruler" which fully and effectively addressed these other factors. **Until the above four variables are factored into the analysis, with documentation as to the extent of their impact on the conclusion, no reliable conclusion can be achieved by this method or process.**

Green/MacLarin Filming Comparison - After the actual PG film was taken, researcher John Green went to the site and a man identified as Jim MacLarin was instructed to walk through the estimated subject path while John filmed this experiment. MacLarin's height is known, and so photographic comparisons between him and the subject of the PG Film have been made, to try and determine PG Film subject height.

However, there are variables to this experiment which have not been fully accounted for.

1. A photo of the PG Film, such as F352, compared to a scan at full frame of John Green's film, shows unmistakable proportional differences between foreground and background object proportion, leading to the firm conclusion that John Green's camera must be further back than Roger Paterson's camera was. So subject to camera distance is different, by about 10' based on the current site model analysis.

2. - John's camera lens was slightly longer in focal length than Roger's 15mm lens, again validated by the discrepancies of foreground and background proportion, and object size in frame.

3. - John's camera is being held higher than Roger's camera, another variable introduced to this comparison and not properly addressed.

4. - Finally, we cannot certify either that MacLarin is in the exact location of the PG Film subject, not can we certify that if he were, that the ground would be the same elevation. Rain could have washed earth away eroding it by a few inches, or sediment could have been deposited raising the elevation. This is impossible to determine, yet it remains a factor or variable which could affect outcome.

So we have four variables which will affect the outcome of any height comparison, and as far as I can determine, no one has fully analyzed these variables and determined what impact they may have in the height comparison. **Similarly, until the above variables are factored into the analysis, with documentation as to the extent of their impact on the conclusion, no reliable conclusion can be achieved by this method or process.**

Both of these issues will continue to be studied and a subsequent release of my report will document this analysis in detail, with appropriate documentation.

Scaling the Digital Site model

Previously noted in the Height Analysis segment is this paragraph, *"A Height Scaling of the subject in the film is underway, based on scaling the model in real world measurements, integrating measurements taken by Rene Dahinedn, John Green, and potentially other sources. As this is work in progress, there is still the consideration of obtaining more data to integrate into the final determination. Data accumulated to date is highly consistent and allows a preliminary determination, although the documentation will need to be thorough."*

I anticipate that there will be requests to disclose this information, and so I have chosen to include it in this report release, with a fair appraisal of its status. I am not currently using this data for the stated conclusion herein (the site digital model or the lens specification), because there is some refinement and consideration of margin of error still in progress. The status of this dimensional data could be regarded as compelling and illustrative, moreso that conclusive, at this point in time. The following points are noteworthy:

1. The measurements of the two men, measurements taken independently, do tend to conform to the site model's geometry well, and the triangulations created by both men's measurements connecting John Green's position with trees T-C1, T-C2 and T-C4 are particularly distinctive.

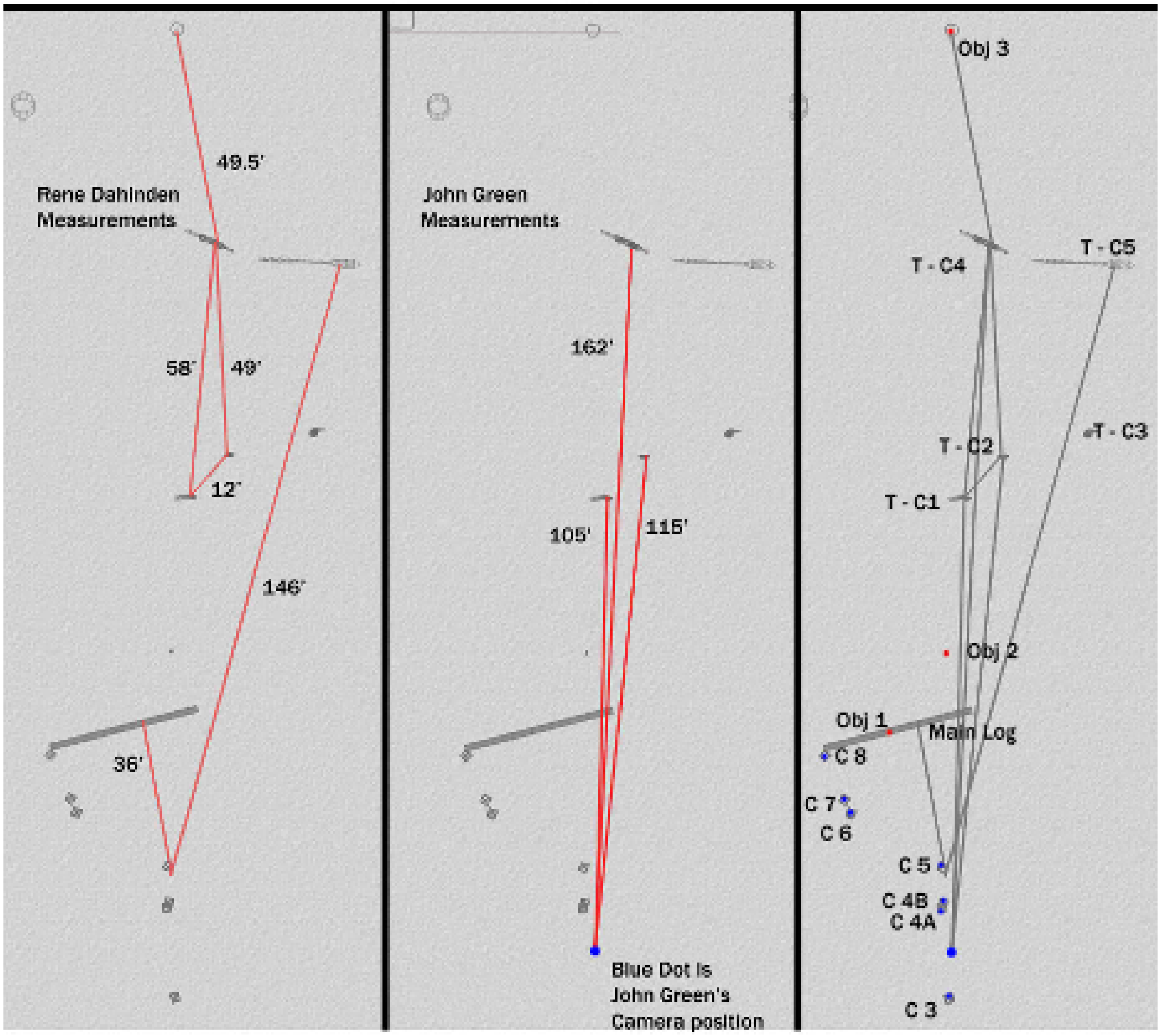
2. John Green's measurements do tend to place himself and his camera (for the MacLarin re-enactment footage)at a position consistent with image comparisons of his film and the PGF which indicate he must be further back than Roger was at the C4A position filming F352, and this diagram (John's own measurements) places John about 8-10 feet behind Roger's C4A location. The position discrepancy (between John's camera and Roger's) is noted further in this document.

3. These measurements conform to the site scaling of a digital model validated by render camera with the horizontal viewing angle of 37.8 degrees, consistent with a 15mm lens on a standard 16mm film camera.

For the diagram below, the measure bars were not drawn on the site map image. They are actual objects in the site digital model with the exact length as specified. A separate panel giving their object dimensions and position coordinates is included (below), so any person attempting to make a site model from my data, may also include these measurement bars as well. Since no two measurement bars are of the same length, the long dimension will suffice to identify the bars conclusively. Please note I was not using a CAD software and the positions of these measure bars could be adjusted slightly if you zoom in on them.

Illustration of some known Bluff Creek Site measurements, taken by Rene Dahinden, far left below, and John Green, middle below. A composite of the two is at right below. These measure bars are in the same digital model used for all the model/PG Film composite comparisons, and so the dimensions listed here will be the same dimensions if they are brought into any digital model built using the coordinates on the data sheet.

The Munns Report   Chart - Copyright 2009   Bill Munns



There will, no doubt, be arguments of precision and margin of error in the use of these measurements as a device to scale the digital model, and those issues are currently being studied.

Site Measurements Discussion

To scale a digital model with real world measurements, some real world measurements must be introduced into that model and identified with some of the digital elements. This will be a point of contention in this report, so this discussion is important to establish a perspective for your evaluation of the material.

The Bluff Creek site today does not resemble the site 42 years ago. All the distinctive trees in the center cluster are reported to be gone. I had hoped to visit the site and simply make an evaluation of it, and try to determine if anything remained which could be positively identified as being the same as 42 years ago. But that goal has been hampered by logistical setbacks.

So in my analysis, at this point, I must rely on the prospect of other measurements previously taken by other investigators. And precisely because I know the measurement issue will be contentious, I must discuss this with anticipation of the debate which will follow.

The known site measurements were made by John Green and Rene Dahinden in the months or years immediately following the report of the filming. These measurements are at least 38 years old. In that context, they should be regarded as "historical measurements" moreso than modern ones. Critics like to talk about how a site survey and measuring should be done today, but that is an unfair standard, to hold an effort of the past to any standards and technological sophistication of today. Measuring devices based on laser technology, considered essential by today's standards, did not exist then. At the time, the technology was most likely a simple tape measure.

Technology aside, the context in which measurements were taken is also relevant to any discussion of the reliability of measurements. We cannot judge men as having failed to meet our current specifications if these men, nearly 4 decades ago, did not forsee the debate today on the film, or did not anticipate the advent of computer graphics which would allow for a digital site model to be made and thus would need their measurements to scale such a digital model.

We can only judge the men and their measurements on the context of their time and their intent, and in that regard, judge if they succeeded or failed.

A similar dilemma is faced with any scientific or analytical study of historical sites and measurements. One example, from my experience visualizing the Seven Ancient Wonders of the World, is the Pharos Lighthouse of Alexandria. It was built about 2300 years ago, and measured for historical reference about 1000 years ago, and then destroyed by an earthquake, it's rubble cleared and some other structure rebuilt on its foundation. So all we have is those measurements taken a thousand years ago, for any estimation of it's size, shape, and design. Can we rely on those measurements to any extent, or simply say they are so old and unreliable that we do not know what the Lighthouse looks like? Scholars, authors and scientists do study the Lighthouse, and frequently publish factual reports and descriptions of it, and the measurements are generally included. That would indicate that there is some merit to those measurements, and we may rely upon them for some understanding of how tall the Lighthouse was.

But every criticism of the Bluff Creek site measurements could be equally applied to criticize the Pharos Lighthouse measurements.

A. They are all whole numbers in feet (even though at the time of the lighthouse construction, the measurement in cubits was more common, and there's no precise translation of cubits to feet as there is meters to feet). So are the measurements accurate to a fraction of an inch, or were they rounded to the foot? Does the lack of apparent precision below the 1' level invalidate the measurement?

B. The measurements cannot be replicated today. Does that invalidate them?

C. The person taking the measurements has no known "certification" as a skilled and reliable person to perform measurements. Does that invalidate the measurements?

D. The measurements were not taken to satisfy our needs today, but rather to simply satisfy the needs of the man taking them, at that point in history. Does that invalidate our use of them today?

If you answer Yes to these questions, you essentially argue to invalidate most historical measurements, including those of the Pharos Lighthouse of Alexandria. If you reasonably argue not to invalidate historical measurements, then we reasonably do not need to invalidate the Bluff Creek Site measurements either.

We must acknowledge that if the filming of the PG Film occurred today and an investigative team of certified professionals were employed to do a site survey tomorrow, the entire measurement process would be vastly different, and the measurement would likely be reliable to decimal fractions of an inch. But this measuring did not occur today. It occurred over 38 years ago, in a simpler time, with men likely using simple tape measures and making their own determination as to whether their measurements needed to be accurate rounded to the foot or more precise, **for their purpose**, not ours today. They did not document the points of measurement for us, but for themselves, by a method of their preference.

We cannot judge the historical measurements of others by our current standards, except to say, by our standards today, all historical measurements will surely fail to compete in accuracy and degree of documentation. And all historical measurers (except for the occasional trained surveyor) will likely be dismissed as "uncertified" by today's standards. Yet we do not throw out all the historical measurements. And neither should we throw out the measurements of John Green or Rene Dahinden. Rather, we grade them with consideration as to their potential for accuracy and consistency with each other and any data we can develop independently.

We may think of this grading as a plus/minus evaluation, although the very process of grading is itself subjective and can be contested. So the ideal process would be for one to do a grading evaluation, and allow critics to offer alternate or opposing grading criteria, and ideally, impartial people to make the judgment or determination as to which argument is the more compelling or credible. In that regard, I will offer my appraisal of the grading of evidence quality.

So let us examine the Measurements in this context.

1. Three of Rene Dahinden's measurements, for the trees I designated as T-C1, T-C2, and T-C4, form a triangle. The digital model of those three objects can form a triangle as well. The triangles are substantially correct in comparative form. Given the uniqueness of triangles (for any three numbers or objects, there is essentially one resulting triangle), this similarity allows a reasonable conclusion that the three measurements of Mr. Dahinden are proportionately correct (in proportion to each other) and so if they are dimensionally incorrect, they must be incorrect by a common proportional factor, which in a highly uncommon type of measurement error. A reasonable conclusion is that Dahinden's measurements are a fair representation of the tree distances, any error being rounding to a whole number in feet.

2. Two of Mr. Dahinden's measurements converge on a point where he has estimated Roger's camera to be, and that point is correct in perspective for the site view. It is off in depth from the tree objects (relative to Roger's true camera position), but depth perception is the more common error in any estimations of position. It is also within about a foot (as scaled in the site model) of the Byrne Photo camera location, suggesting a corroboration of measurements and optical alignment.

3. John Green's measurements converge on his camera location where he filmed his re-enactment of the PG Film with Jim MacLarin shortly after the PG Film was taken. His measurements converge at a location within a foot of his camera location determined by optical analysis, which means that his measurements, all longer than 100', may have a margin of error of 1% (to be off by a foot).

4. John Green measured a position of his to tree T-C1 as 105', and to tree T-C4 as 162' Using John Green's measure from his position to tree T-C1 (105') and then using Rene Dahinden's following measure of tree T-1 to tree T-C4 (58') totals 163'. The line from Green to T-C1 to T-C4 is not quite a true straight line, which would triangulate into a slightly longer distance than the direct Green position to T-C4, but the worst case scenario is an error of 1' over a distance of 162' or 163' (either way, well under 1%), when you combine the measurements of both men. Could one be drastically in error without the other also in error? Or could both be in error, but in opposite amounts, to null out the others error? Or is it more reasonable to say the men's measurements, when combined, as reasonably consistent, within a margin of error under 1%?

Within the above estimated 1% margin of error, I see four plusses and no minuses.

Plus - the measurement triangulations match the digital model triangulations well.

Plus - The measurements of Dahinden position his reference camera position proximate to Roger's actual camera, verified by the Byrne Photo camera position.

Plus - Green's measurements to his camera proximate his actual filming position for his on site filming test, verified by optical analysis of his film.

Plus - Both Dahinden's and Green's measurements tend to concur or compliment each other, when integrated into the digital model.

Any minuses that I see go back to methodology, and I have already explained why I feel we cannot fault men 38 or more years ago for not doing it the modern way we consider professional today. And we cannot fault them for not doing it to suit our needs today because they could not possibly back then have anticipated our need or intended use of their measurements. They did it at the time with their available tools and measure devices, for their purpose, with notation appropriate for their intended use. We cannot judge them wrong for that.

Now, taking the opposite approach, are the measurements "wrong", beyond the stated error margin? Is there any proof that the Bluff Creek site itself, and the trees and other objects in the Bluff Creek site should be scaled differently? Is there any proof from another investigator that the trees are in different positions, that the cameras are in different positions, and the triangulations formed are different triangles?

Given the way the measurements and digital site model tend to generally coincide, is there any proof that this model is dimensionally or proportionately wrong?

To all the above questions, I am not aware of any reason to say they are "wrong".

In anticipation of the critical or skeptical response, I believe there are two approaches arguing to discredit my findings.

1. One is to say things are not determined correctly and thus are not "reliable", and we don't know what the truth is. Any person can actually take that position with no justification other than to say "I'm not convinced".

2. The other is to actually prove I am wrong.

But "I'm not convinced " is not the same as "you are wrong". To say I am wrong requires some credible explanation of what is more right, not in the theoretical sense of describing procedures that should have been done to make it right (as that is still just "I'm not convinced"). Proof I am wrong requires some pro-active proof of what is more right than what I have offered.

A. Show more reliably taken measurements that disagree with the ones I used.

B. Show a digital model with different object positions that do not correspond to Green's or Dahinden's measurements, and if that digital model still corresponds to what we see in the film, that would prove the measurements wrong (or my digital model wrong).

C. Show that there are errors in my digital model as represented by the data sheet, compared to the results I displayed.

Any of these would show me wrong.

I will close this discussion with one final comment. As I have noted above, the Bluff Creek site measurements known to exist are like historical measurements, taken at a time of less sophistication in measuring and surveying that today, and I believe they are better judged in that context. If anyone wishes to argue for them being so unreliable that we should not even consider them, I would ask why they fail to be regarded as comparable to other historical measurements and graded accordingly.

As long as the digital model matches the film, and the measurements match the digital model, we have no cause to say the measurements are wrong. We simply need to establish a reasonable margin of error, to grade the degree of accuracy, for any measurements we might subsequently take from the digital model.

Conclusion

I have created a Digital Bluff Creek Site Model which consistently matches images from both the PG Film, and other known site photographs. So it is my contention that this model is an accurate representation of the site, and can be applied to further research on the film. Further, it is my conclusion that the lens Roger Patterson had on his camera that day was a 15mm lens, not the generally presumed 25mm lens. I conclude this because seven different views of the site model seen through the 15mm lens specification, plus two comparisons with other Bluff Creek site photos subsequently taken, match the site objects and proportions exceptionally well. Finally, I conclude that the identified camera positions in the site model are sufficiently accurate in terms of replicating Roger's camera positions during the filming as to allow researchers to use those camera positions as part of the subject height calculation formula (which requires the camera position as one component of the formula).

Good science requires that for any claim, the data and resources should be made available to other researchers so they may test the data and replicate the experiments or analysis. I have provided all the data necessary for other researchers to do this through the Report Website, and the data forms on following pages herein. And I welcome the efforts of others to review this data and contribute to this study.

But good science requires that we consider all the points of view and remain open to alternate conclusions. Is it possible for a different lens focal length and different site object positions to yield as good a result as I have presented herein? Every test on the 25mm lens specification I conducted for two months failed to solve even remotely as well as this model solved with the 15mm lens specification. But if there are any researchers who feel that the 25mm lens is still an option or the correct answer, I invite said researchers to use these resources (on the website) to build a model and fill out the data sheet I have included here with their data as to object locations, camera locations, and camera horizontal angle of view. I will be pleased to test any alternatives and publish any model submitted as a rebuttal to my model.

There is another issue which I must address, in anticipation of the response from others researching this film. That issue is the question of integrating other data from the film analysis to see how it may integrate with, or conflict with, this site model and the lens determination. The various studies of the subject trackway are one such issue I have already discussed at length with another researcher.

So I must state that data from other aspects of research, not used in any way to determine this model or the lens focal length, do not prove this model wrong, if they simply conflict with this data. Any proof this model is wrong, or that the lens focal length is wrong, should derive from this model data or general optical sciences and photogrammetry principles, and said proof must show an alternative model and lens specification which works as well, or produces a superior match in all view, to negate the conclusive results herein.

Simply put, if anyone should offer the criticism that this site model or the lens determination is wrong, please show me a site model and lens specification which is more right, as your rebuttal to my conclusion.

You may simply submit a filled in data sheet with your specified coordinates for all objects and cameras (a blank version of the datasheet is included on this website for your convenience), as a rebuttal and it will be tested. Data sheets are illustrated in this document immediately following this conclusion.

Furthermore, I will welcome other researchers who have a capability of building and testing 3D models, and who will not only be willing to test my model herein, but test any proposed alternate models as well, so any evaluation of competing model specifications can be evaluated by several people, not just myself alone.

I will also welcome any "fine tuning" of my model specifications, if any other researchers find it to be substantially correct but not "perfect" and they can advise me on adjustments of coordinates to make it more perfect. Ultimately, the goal is to accomplish a digital model that all researchers can use and rely upon for their analysis of other film issues and studies. That one digital model, with coordinates for objects and camera positions, will be a major step toward resolving the many contentious issues of this film.

So, if this model of mine stands the test of peer review and independent analysis by others, then issues of how this model integrates with (or conflicts with) other film research material, can be studied.

Looking Ahead

As noted from the Introduction, this Report is not complete yet. Release One has focused on the Digital Model of the Bluff Creek Site and the camera lens specification. The work still in progress is noted as follows, with an appraisal of its status and an estimation of the work to be done.

1. Height Analysis - The preliminary height estimate I have is about 7' 4" (as posed in F352) for a subject about 98-99 feet from camera (based on the site model dimensions as shown and a preliminary trackway position of mine locating the subject in F352, not shown here). But additional analysis and refinement are still in progress, as well as consideration of how best to calculate the margin of error factor.

I expect to re-evaluate the height of the subject on film, currently estimated at 15%, based on some new scan data being collected, so that number may change, in a range of 1 or 2%. When finalized, the documentation for determination and margin of error will be noted. Most likely, this will be a part of Release Two of this Report. The lens focal length is fixed for now, but suffice to say, if other researchers do test the site model, camera position coordinate data and find other options for focal length which also replicate the film object arrangements and size in all camera positions, then this lens determination must be re-evaluated to resolve the issue. The distance estimate is based on a preliminary trackway estimate of shape and position, and is undergoing further analysis. This may alter the distance estimate of the height calculation formula, but in all likely-hood, any change will increase the distance (and height) moreso than likely to decrease it, given the current estimate already places the subject very close to the trees it walks behind.

So the Height Analysis is the next major aspect to finalize, along with the trackway position and shape (as noted below).

2. Trackway Position Analysis - First, let me distinguish between the trackway path which the film itself can determine, and the trackway data as developed after the fact by Bob Titmus, nine or so days after the filming. I will be relying only upon the film itself for developing a trackway path estimate, not Titmus' diagrams. This trackway path analysis requires several steps as follows:

A. A study of the changing size of the subject body, as a near/far distance proportion, graphed against a left/right change of position as the subject walks among the trees. So graphing change of distance (based on change of size) with horizontal position shift will yield a path graph shape. This is merely a shape, radiating out from the camera position, with multiple prospective "ripples" of the path, each larger and further than the previous one. At this point, none has preference.

B. Aligning this group of outward rippling paths with the Digital Model is done by using the trees the subject walks among as the locators for where in the digital model this rippling outward set of path graphs must orient to.

C. Eliminating all paths which fall in front of any tree or object the subject walks behind, and eliminating any paths that fall behind any tree or object the subject walks in front of, is next. This reduces the path options to a narrow corridor.

D. Using the sunlight and shadow of the two trees the subject walks behind, a final triangulation of the path location can be fixed, because only one path option will allow the tree shadows to fall on the subject as we see in the film. Note that alignment of the sunlight angle is based on shadows the trees actually cast, and which are evident in the film, and thus form a reliable reference for the sunlight angle alignment.

This is the current intended methodology and a preliminary analysis through this 4 step process has been done. A new scan of the film with greater clarity is anticipated to allow for a more precise analysis. Documentation of the method also needs to be thorough. This will take time.

Then there will be a study to determine if the Titmus trackway data can be integrated with this film-derived trackway path analysis. Some discrepancies have already been pointed out by another researcher collaborating with me on this aspect of the analysis, and we continue to challenge all assumptions and re-check all data to see if the film-derived trackway and the Titmus reported trackway can be reconciled into one analysis.

3. Comparative Anatomy - I have already completed one Comparative Anatomy study which yielded a conclusion that the PG Film Subject has a conspicuously short lower leg (as compared to the upper leg). It can be reviewed on the BFF thread below, as it was posted there last August, 2008.

http://www.bigfootforums.com/index.php?s=b2b6488da52207580b77efe9c292beca&showtopic=21614&st=165&start=165

In the "Creature Suit Analysis" group of threads in the Bigfoot Forums, under the Patterson/Gimlin Film category, look for Thread #6 - Comparative Anatomy, and go to page 6, second post (should be number 167) if this link doesn't work or you cannot copy it out of this pdf document. Or you can go to the website and the Looking Ahead page to find an active link.

A review of this study will be done, using the camera position and angle to path direction data developed in this study, to fine tune the analysis set-up of the Poser figure against the PG Film image backdrop. And I anticipate additional still image frames will be used because the larger the number of figure poses one uses to compare the anatomy, the greater the likely-hood the result is reliable in comparison.

This Comparative Anatomy Analysis, when revised, will also include a more specific body width analysis.

Impact of This Analysis:

The Release One material greatly diminishes the prospect the film was hoaxed with a human in a fur costume, because the height issue greatly diminishes the number of humans of sufficient height to be capable of wearing said costume. It further undermines any contention that the alleged costume is some hand-me-down suit left over from another project, because there may not be any prior project with a fur costume of the size determined here. And the complexities and design fitting requirements of such a large costume all but eliminate any consideration that such could have been done in a casual, amateurish, or unprofessional environment. And this height determination effectively negates any prospect that Bob Heironimous could have worn a suit to appear in the PG Film, because he is more than a foot too short in height, to have performed in this film.

Finally, the height determination effectively negates most, if not all Hollywood rumors of who made the claimed suit, or who put hair on it, or such, because you cannot make a suit without knowing all too well its size or bulk, and apparently none of these people making these recollections were aware of the fact the figure was by far larger than any ape suit of the time. Such an oversight of that very significant material fact means these stories, however fanciful they sound to hear, have dubious basis in fact, and are likely just Hollywood fantasy. The people describing the alleged "suit" are not remotely describing the truth of what's in the film, if they neglected to mention its unique immense size.

Trackway Issues

Studies of the trackway as noted by Timus.

Patterson is reported to have filmed the trackway and cast some prints the same day as the sighting and filming. But Patterson is not reported to have actually documented the trackway and it does not appear in the main PG film, A small portion of it appears in footage generally attributed to be "second reel" footage. I have scanned 202 frames of this footage personally.

The primary trackway data source is a map by Bob Timus made a reported nine days after the filming reported on Oct. 20, 1967. A heavy rain was reported on Oct. 21, 1967 and possibly days after as well. Consideration of how the trackway information may integrate with my site model requires first that we consider the options for how this trackway came to exist and be documented.

The options for the trackway include all the following:

1. The trackways were made by the subject seen walking in the PG Film, on the filming day, and were sufficiently preserved even after the rain to be studied and cast by Bob Timus nine days later. If so, this data has relevance to the site model and some effort should be made to integrate that data into the model analysis.

2. The trackway Bob Timus found and cast prints from may have been made by the same subject as seen in the film, but made days later after the rain, but before Timus arrived. Note that the subject in the film is walking away from the camera, apparently intent on getting away from Patterson and Gimlin. If the intent is to get away, to hide, why didn't the subject go to its left during the first segment, into the woods immediately to its left, the shortest route to go into the forest and hide effectively? One possible explanation is that something fleeing or choosing to evade will choose a path the subject is confident about, a familiar path. Can the trackway path be a 'familiar path", and so the subject went that way confident it would take the subject to a safe place to hide?

If so, then the subject may reasonably be expected to have walked that path enough times to be familiar with it, before the filming day. If so, walking that same path after the filming day is an option to consider, as a repeat of an established behavior (the hypothetical in the first sentence)..

3. The trackway was made by actual walking, but by an entity other than the filming subject, after the rains, before Timus arrived, perhaps related to the film subject and thus also familiar with the path.

4. The trackway may have been manufactured (some method other than the actual footprints of real feet walking), but by whom and for what intent we can only speculate, and such speculation does not negate the prospect the filming event is real even if the trackway Timus reported was manufactured. There are many hypotheticals here, limited only by one's imagination.

All of these are theoretical options to consider. Until all these options are evaluated to the extent that the Option #1 above can be conclusively determined as the certifiable fact, issues of trackway discrepancy with the digital site model and lens study cannot negate the site model or lens conclusion.

Site Model Data Forms

There are five forms following. The actual Site Model Data Sheet which follows contains all the coordinate information on all site model objects (dimension, position, and rotation) as well as the coordinates (position and rotation) for all seven camera positions, so you may test this model in a 3D visualization software application. This document (next page) will be considered my proof that the model and the camera positions and lens specification (a 15mm lens) are correct. This is the actual data from the 3D software application I used. It is labeled: Site Model Data Forms (Bryce Coordinates)

Form #2 - Please Note that there are two versions of this chart, because my 3D application has used objects called symmetrical lattices as the five center trees, while many other 3D applications will use simple image planes for those trees. Bryce loads the symmetrical lattice into the workspace laying flat (one mesh up, its mirror mesh down). So when it is used to make a tree, I must rotate the object -90 degrees to turn it upright. If you use an image plane created already in an X & Y orientation, upright, then that -90 degree rotation is not necessary. So in the second form (Noted "For X, Y Image Plane Trees") the rotation on C1 to C5 are 90 degrees different than my Bryce coordinates. This form, the second one, specifically has the notation of "Image Plane Trees" in the title. The reddish panels are the data which is different from the above first form.

Form #3 The Blank Form - I invite other researchers to test or check my data independently. If you feel that another solution of object arrangements and/or camera positions and/or lens angles will produce a result as well, or better, and thus re-butt my contention that this is the correct solution, please use the following blank form to note your data for object and camera coordinates and either post in a forum or e-mail to me, and I will be pleased to test the data you provide, and publish the results to compare with my results herein. Blank data sheet can also be downloaded from the Report Website.

Form #4 has the camera coordinates for the two other site photos, so the camera position for each can also be replicated.

Form #5 has the coordinates for the measure bars seen in the diagram about scaling the site.

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Site Model and Camera Data Form Bryce Coordinates - Results by Bill Munns

Camera Lens: 15mm with 37.8 degree Horizontal Viewing Angle

Object	Dimensions			Position			Rotation		
	X	Y	Z	X	Y	Z	X	Y	Z
T - C1	6.02	0.9	31.67	79.6	17.85	115.75	-91.77	-15.24	0.47
T - C2	6.57	1.17	32.16	89.65	19.51	125.41	-90.25	2.25	0.30
T - C3	3.74	0.91	36.12	108.84	21.05	130.68	-91.93	-3.18	1.60
T - C4	13.88	1.23	55.52	85.09	28.91	175.15	-90.48	24.42	-0.63
T - C5	30.97	2.20	43.87	106.68	24.37	170.12	-90.94	4.21	-1.45
T - N1	6.51	49.72	6.51	19.06	42.98	243.77	0	0	-1.50
T - N2	0.62	38.03	0.62	14.80	26.24	224.35	0.07	-13.25	-0.97
T - N3	0.62	38.03	0.62	35.15	25.89	229.14	0.07	-13.25	-0.97
T - N4	1.25	40.38	1.25	75.69	44.62	269.11	0.73	-0.28	4.00
Main Log	1.40	35.00	1.40	64.85	3.07	62.46	14.47	-0.87	-86.11
Obj 1	0.3	0.3	0.3	63.19	3.65	61.71	0	7.5	0.5
Obj 2	0.3	0.3	0.3	75.77	4.24	80.17	4	1	0.07
Obj 3	2.87	5.42	2.87	77.23	3.52	223.57	1.64	83.25	-1.62
Obj 4	5.3	3.92	5.3	41.62	4.52	205.99	-21.74	-0.56	-1.47
Obj 5	2.64	3.80	2.64	24.34	4.13	195.35	-0.25	-0.25	0
Cameras	No Dimension Values			Position			Rotation		
				X	Y	Z	X	Y	Z
C3 bg F205				76.63	8.23	0.30	5.24	-18.93	3.34
C4a bg F352				74.85	8.22	21.07	0	0	0
C4b bg F462				75.29	7.44	22.31	0.51	13.83	2.32
C5 bg F634				75.13	8.77	30.51	-1.12	25.62	1.02
C6 bg F715				53.98	9.32	42.98	9.09	24.21	2.68
C7 bg F727				52.61	9.90	46.13	-2.87	30.22	0.09
C8 bg F875				48.09	11.59	56.29	0.90	40.01	-0.03

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Site Model and Camera Data Form - For X, Y Image Plane Trees

Camera Lens: 15mm with 37.8 degree Horizontal Viewing Angle

Object	Dimensions			Position			Rotation		
	X	Y	Z	X	Y	Z	X	Y	Z
T - C1	6.02	31.67		79.6	17.85	115.75	-1.77	-15.24	0.47
T - C2	6.57	32.16		89.65	19.51	125.41	-0.25	2.25	0.30
T - C3	3.74	36.12		108.84	21.05	130.68	-1.93	-3.18	1.60
T - C4	13.88	55.52		85.09	28.91	175.15	-0.48	24.42	-0.63
T - C5	30.97	43.87		106.68	24.37	170.12	-0.94	4.21	-1.45
T - N1	6.51	49.72	6.51	19.06	42.98	243.77	0	0	-1.50
T - N2	0.62	38.03	0.62	14.80	26.24	224.35	0.07	-13.25	-0.97
T - N3	0.62	38.03	0.62	35.15	25.89	229.14	0.07	-13.25	-0.97
T - N4	1.25	40.38	1.25	75.69	44.62	269.11	0.73	-0.28	4.00
Main Log	1.40	35.00	1.40	64.85	3.07	62.46	14.47	-0.87	-86.11
Obj 1	0.3	0.3	0.3	63.19	3.65	61.71	0	7.5	0.5
Obj 2	0.3	0.3	0.3	75.77	4.24	80.17	4	1	0.07
Obj 3	2.87	5.42	2.87	77.23	3.52	223.57	1.64	83.25	-1.62
Obj 4	5.3	3.92	5.3	41.62	4.52	205.99	-21.74	-0.56	-1.47
Obj 5	2.64	3.80	2.64	24.34	4.13	195.35	-0.25	-0.25	0
Cameras	No Dimension Values			Position			Rotation		
				X	Y	Z	X	Y	Z
C3 bg F205				76.63	8.23	0.30	5.24	-18.93	3.34
C4a bg F352				74.85	8.22	21.07	0	0	0
C4b bg F462				75.29	7.44	22.31	0.51	13.83	2.32
C5 bg F634				75.13	8.77	30.51	-1.12	25.62	1.02
C6 bg F715				53.98	9.32	42.98	9.09	24.21	2.68
C7 bg F727				52.61	9.90	46.13	-2.87	30.22	0.09
C8 bg F875				48.09	11.59	56.29	0.90	40.01	-0.03

The Munns Report - Site Model and Camera Data Form

Camera Lens focal length________ True Horizontal Angle of View________

Software Application used for test____________________Person Testing______________________

Object	Dimensions			Position			Rotation		
	X	Y	Z	X	Y	Z	X	Y	Z
T - C1									
T - C2									
T - C3									
T - C4									
T - C5									
T - N1									
T - N2									
T - N3									
T - N4									
Main Log									
Obj 1									
Obj 2									
Obj 3									
Obj 4									
Obj 5									
Cameras	No Dimension Values			Position			Rotation		
				X	Y	Z	X	Y	Z
C3 bg F205									
C4a bg F352									
C4b bg F462									
C5 bg F634									
C6 bg F715									
C7 bg F727									
C8 bg F875									

The Munns Report
Site Model and Camera Data Form Other Site Photos - Results by Bill Munns
Lens Viewing Angle is not known for these Cameras

Comparisons with Bluff Creek Site photographs taken after the fact, some years later, do present some challenges to match. As we do not know the film format or the camera lens, a different comparative methodology is used.

This method is to widen the digital rendering camera field of view to include more area then the trees seen in the photograph, and then position the camera by trial and error experimentation, to find a location that yields a close match of objects and proportions.

Then once the digital site is rendered, in Photoshop, that render is compared to the source photograph, and scaled accordingly (but always scaled to retain height/width ratio).

The coordinates listed below are for the camera position of the actual digital render shown in each comparative panel. Rotation is not as critical as position, because we may assume the camera is on a tripod at the stated position and can be tilted or panned, and not impact on the image of the trees in terms of their size, proportion, and relative position to each other. And lens field of view is not calculated because we do not know if or how the reference photos may have been cropped.

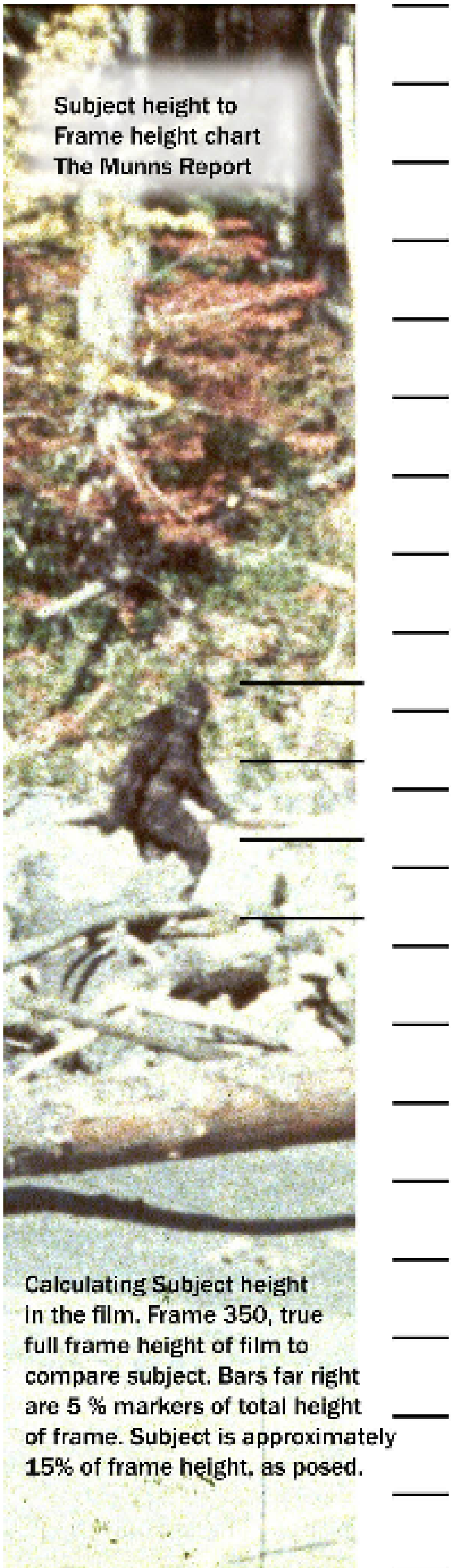
Work is continuing on these photos and others from Bluff Creek to continue to refine the model and add more trees and objects to the model.

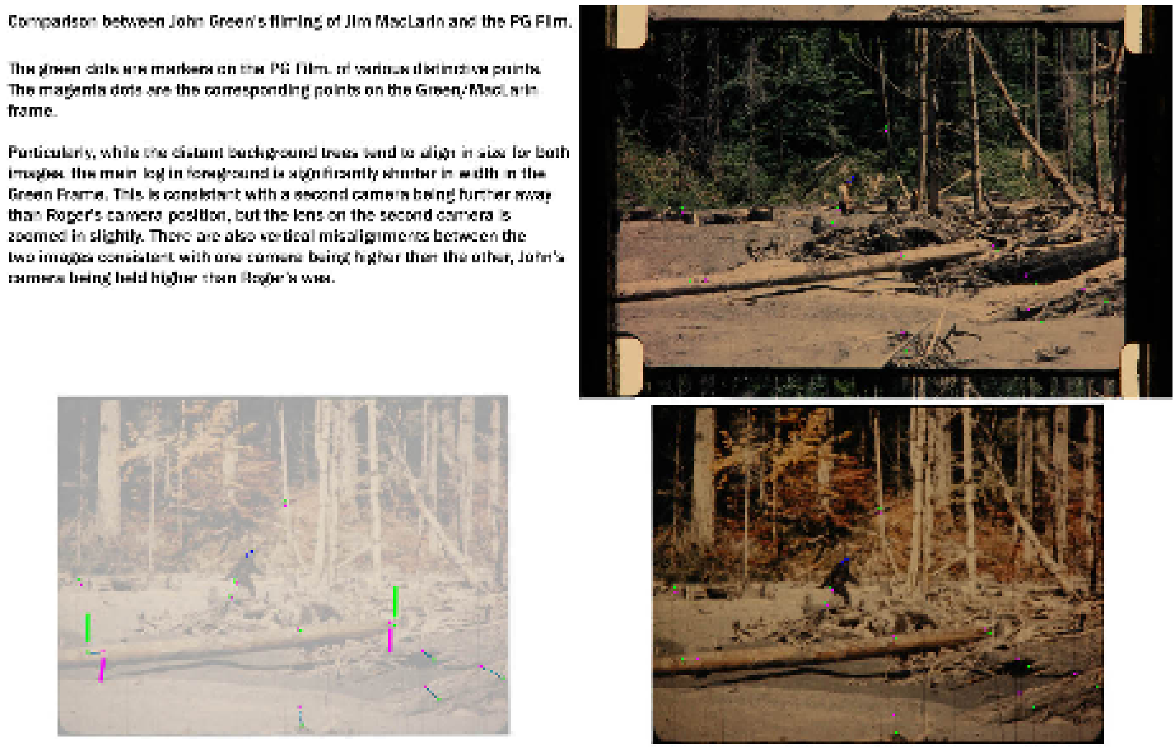
Cameras	No Dimension Values	Position			Rotation		
		X	Y	Z	X	Y	Z
Byrne Photo		72.97	11.54	27.42	0	-1.72	0
Dahinden Photo		-8.39	11.84	14.11	-2.29	25.21	0

Note, for the Dahinden position, the minus X coordinate simply means it is to the left of an arbitrary Zero coordinate center.

The Munns Report
Site Model and Camera Data Form - Results by Bill Munns
Object Measure Bars used to illustrate site measurements by Green and Dahinden

Object	Dimensions			Position			Rotation		
	X	Y	Z	X	Y	Z	X	Y	Z
Dahinden									
Bar 146'	0.3	0.3	146	95.28	1	98.87	0	15.5	0
Bar 36'	0.3	0.3	36	72.60	1	46.44	0	-10.5	0
Bar 58'	0.3	0.3	58	82.99	1	145.10	0	5.5	0
Bar 49'	0.3	0.3	49	87.40	1	149.86	0	-3.0	0
Bar 12'	0.3	0.3	12	84.58	1	120.68	0	41.50	0
Bar 49.5'	0.3	0.3	49.5	81.76	1	198.91	0	-11.0	0
Green									
Bar 105'	0.3	0.3	105	78.75	1	63.59	0	1.5	0
Bar 115'	0.3	0.3	115	83.20	1	68.35	0	6.0	0
Bar 162'	0.3	0.3	162	81.41	1	92.16	0	3.0	0


Subject height to
Frame height chart
The Munns Report
Calculating Subject height
in the film. Frame 350, true
full frame height of film to
compare subject. Bars far right
are 5 % markers of total height
of frame. Subject is approximately
15% of frame height. as posed.



A higher resolution version of this is on the website.