Did We Go to the Moon?

by

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FOREWORD

by Don Davis

The reality of historical events is an interesting thing to try to prove. It seems obvious to us that Napoleon lived and that Rome once dominated Western Civilization, and yet how many people could tell you anything in detail about these events if they were asked? A profound difference in awareness of history seems to occur with events which are still within living memory. Many people still hear stories from World War II veterans, but all but a few World War I veterans have died and direct living memory of that event is fading fast. When I was a child there were still veterans of the Civil War alive. We are now as far removed from Apollo as Apollo was from the Great Depression, placing us about a third of the duration of time from the lunar landings until the time when Apollo will also pass from living memory. After we who remember are gone, the very idea that we were once able to leave Low Earth Orbit might seem fantastic. There will come a time when the things we remember will seem as the stuff of legends. I suspect part of the skepticism concerning Apollo comes from the culture-driven belief that progress is inevitable, that our reach will always be further than it was in the past. People have a hard time believing we once did things which we are no longer capable of doing. While forty years ago space exploration was striving toward unlimited frontiers, today we are seemingly eternally confined to Low Earth Orbit, looking at our past like an aged Russian Gymnast looking at fading photographs of her moment of glory when she was fourteen years old. This is what I see as the terrible truth lurking behind the expressions of doubt in our past accomplishments. Perhaps it hurts so much to know we have lost our ability to visit other worlds, that the frontiers we were enticed with as kids have been canceled, that it is better to claim it was all a fraud.

1. The Genesis of a Hoax

It might have been yet one more among the countless self-published crank books that are churned out every year by conspiracy buffs, would-be super-scientists and religious zealots, but when Bill Kaysing, a disgruntled ex-employee of Rocketdyne, a manufacturer of rocket engines for NASA, published his I doubt if even he expected it to evolve into a major phenomenon, inspiring books, websites, magazine articles, videos and even a network television documentary. His book made the astonishing claimd that the United States never landed men on the moon, that the entire Apollo program was little more than an elaborate hoax.

A quarter of a century after its initial publication, Kaysing's We Never Went to the Moon is still inspiring controversy. And it is a controversy that has been escalating at a disturbing rate. While the people who question the reality of the Apollo landings is nowhere near the thirty percent claimed by hoax enthusiasts, an increasing number of young people—disillusioned by their government, wary of the military-industrial complex and a generation removed from the actual events themselves—are asking themeselves: did NASA fake the whole Apollo program? This is perhaps one of the most insidious aspects of the moon hoax theory.

Who is Bill Kaysing and why did he write his book? Kaysing himself has never been particularly forthcoming about his background. Even his own book never makes it entirely clear what his function was at Rocketdyne, describing his position only as "head of the Technical Presentations Unit". Reading between the lines, one is left with the general impression that he was an engineer with a high-level security clearance, privy to a great deal of inside information regarding the Apollo program. In fact, Kaysing has no background in either engineering or science (and he is certainly not an "ex-NASA employee" as some of his supporters claim). He received his Bachelor of Arts in English in 1949 from the University of Southern California and worked for the Southern California facility of Rocketdyne as a librarian and technical writer from 1956 to 1963, when he left "for personal reasons". (David Cosnette, an Apollo Hoax advocate, states that Kaysing "was head of technical publications and advanced research" at Rocketdyne—an interesting, if unlikely, juxtaposition of duties!) Furthermore, Rocketdyne manufactured only the main engines for the spacecraft, not the electronics, computers or structures and Kaysing left Rocketdyne in 1963, before they started work on the Apollo project. Although he certainly had a security clearance, this would have been made necessary

by the very nature of his job, which required access to sensitive materials. The period during which he was employed at Rocketdyne was the height of the Cold War and information regarding rocket engine technology was a closely guarded secret. There is nothing to indicate, however, that he ever understood what he read (and every reason to think he misunderstood it)—nor was there any particular reason for him to do so: his job mainly entailed cataloging the data, not comprehending it.

Quitting the aerospace industry six years before the first Apollo landing, he turned to writing and publishing books on topics such as —. Since 1974 he has primarily supported himself by lecturing on the Apollo Hoax and issuing a series of videotape "documentaries".

Much of We Never Went to the Moon has little to do with NASA faking the Apollo program, but is instead devoted to apparently unrelated subjects, some of them obscure, others dealing more with the grudge Kaysing evidently held against Rocketdyne and the aerospace industry in general. And he often rambles irrelevantly into some his other favorite topics, such as his conspiracy theories regarding the Food and Drug Administration, the CIA and gas prices. Nevertheless, for all of the book's literary faults, it presented just enough intriguing questions to inspire others to pursue the subject in infinitely greater detail . . . an effort which has in recent years snowballed into one of the most popular—and lucrative—conspiracy industries since the Kennedy assassination.

Kaysing's non-science, non-engineering backgound has served as a model for most of the later proponents of the Apollo Hoax. Ralph René, author of the provocatively titled NASA Mooned America is a self-described "lay physicist" and self-educated engineer. David Percy is a professional photographer who, with co-author Mary Bennett, published Dark Moon—Apollo and the Whistle Blowers and William L. Bryan II, an Oregonian who has degrees in nuclear engineering but works as a policy and procedures analyst for a utility company, came out with Moongate: Suppressed Findings of the U.S. Space Program—The NASA-Military Coverup." All but one of these books—Dark Moon—have been, perhaps not surprisingly, self-published. René maintains a website from which he peddles his moon hoax book along with booklets explaining how to square the circle and science fiction novels based on the author's anti-relativity theories. If the breathlessly illiterate style of the website is any indication, the books must be heavy going.

None of the Apollo Hoax books were authored by people possessing formal training in any discipline directly relating to the subject they are criticising, nor do any of them have any experience in the

aerospace industry.Of all of the pro-hoax writers, René at least readily admits that he does not have “proper academic credentials”.

2. The Anatomy of a Hoax

All the elements of the Apollo Hoax can be found in Kaysing's seminal work. Even though most of his points have been profoundly elaborated upon by later writers, and many new "proofs" have been added to his catalog, the essential claims remain the same. Like Kaysing, all of the hoax proponents depend primarily on the evidence of the photographs, video and motion pictures taken by the Apollo astronauts. Every frame appears to have been scrutinized with an almost religious fervor, if not any clear understanding of photography, lighting or perspective.

In addition to the photographic evidence, the conspiracists point to the dangers of space travel, which they claim preclude any long-term human space flight, and supposed anomalies in the technology—essentially that NASA did not actually have the capability of sending a manned rocket to the moon.

Theories on how the hoax was accomplished have also changed little since Kaysing's book. Most agree that the entire thing was filmed on a sound stage somewhere in the American west. Kaysing specifically asserts that the late Stanley Kubrick—director of 2001: A Space Odyssey—which was released the year before the first lunar landing—was hired to direct the coverup film.

For the most part, they also all agree on why NASA would want to stage such an elaborate—and costly—hoax. Kaysing, in fact, offers two reasons: national prestige—the United States was engaged in a space race with the Soviet Union and was showing up as a poor second to Russia's long list of achievements—and as a means to distract the American public from Viet Nam. The second chapter of We Never Went to the Moon is specifically devoted to addressing the question of motive. " . . . [W]hen competition is in science," Kaysing wrote in his distinctive style, "specifically space flight became a factor in the battle for men's minds, no limits were imposed. In other words, the U.S. became like a frantic gambler who sees ever-increasing losses threatening total disaster. Finally, he mortgages his house and children [sic] to make one last colossal bet. He MUST win or all is gone." Kaysing also claims that much of the aerospace industry encouraged the hoax. "They—both NASA and Rocketdyne—wanted the money to keep pouring in. I've worked in aerospace long enough to know that's their goal." (Of course we must not forget that the long experience in the industry that Kaysing seems to be implying he has consists of about half a dozen years working essentially as a librarian.) "NASA couldn't make it to the moon," he continues, "and they knew it. In the late fifties, when I was at Rocketdyne, they did a feasibility study on astronauts landing on the moon.

They found that the chance of success was something like .0017 percent. In other words, it was hopeless."

What, exactly, do Kaysing and his acolytes believe really happened in 1969? It's a story of such devious complexity as to make the Watergate scandal look like an episode of Happy Days. This is his version of history—

At the end of the 1950s NASA had already realized that it would not be possible to send human beings to the moon. Studies had shown that the radiation in space would have been fatal, and the bodies of the astronauts would have been "pierced . . . with thousands of micrometeorites." There are even doubts about whether unmanned probes such as Pioneer or Surveyor were even actually sent to the moon. "I'm not absolutely certain about that," Kaysing reluctantly admits. "I will concede that certain unmanned vehicles might have made it to the moon. The Russians are supposed to have sent some unmanned vehicles to the moon. And possibly Surveyor did land on the moon. But units with people in them, never." It is entirely possible that not only did the Apollo astronauts never make it to the moon, but that all of the early space missions were faked. "I don't think that [Yuri Gagarin, the first human to fly into space] was up there. See, there was a fellow by the name of Lloyd Mallan in the early seventies who wrote a very detailed book saying that all—well, nearly all—possibly all of the Soviet space exploits were faked, and he proved it with photographs and technical data and so forth. I still have a copy of that book."

The giant Saturn rockets were constructed, with NASA fully aware that they were incapable of making the trip to the moon. The Apollo astronauts got on board, in full view of every television-watcher in the world, who also saw the rockets take off. But what they didn't see was that once the rockets were out of sight, they were "jettisoned into the South Atlantic, where all of the six that were launched now reside. There were no astronauts, of course, on board." Instead, they were spirited away to a secret base on the Tauramoto Archipelago. Their return to earth was simulated by having the command capsule, with the astronauts on board, dumped out of a C5A transport plane. "It was easy to do all of this . . ." Kaysing can prove that this is exactly what happened. Once while he was being interviewed on a radio program, a listener called in who claimed to be an airline pilot. "Bill," he said, "I agree with you one hundred percent. I was flying from San Francisco to Tokyo and I saw, along with several passengers, a command capsule dropped out of a C5A and the red-and-white candy-striped parachutes opened and it descended to the surfacce of the ocean." It's unfortunate that Kaysing neglected to ask for the pilot's name, the name of his

airline or even the date on which this sighting allegedly occured. Be that as it may, once the "astronauts" were picked up at sea they were hurriedly "put into biological suits so they wouldn't afflict anybody with moon germs, but my theory on that is they [the astronauts] couldn't tell these big bald-faced lies this early. So they were actually kept from the press for approximately a month until they could sort of reconcile themselves with telling a lot of big lies." Kaysing knew this would be tough on the honest-to-the-core astronauts and blames much of Buzz Aldrin's later emotional problems on his difficulty handling the guilt of having lied to the American public.

Since the big Saturn rockets didn't actually have to carry anything to the moon, let alone even into earth orbit, they could be stripped down to the barest essentials required to effectively simulate a take off. The faked Saturns therefore were only one-twentieth the weight of the fully-laden models.

Communications to and from a lunar-bound spacecraft also had to be convincingly faked. Fortunately, according to Kaysing, Russia was the only other nation capable of tracking Apollo. With an eye toward future economic and commercial gains from the United States, the Soviet Union agreed to turn a blind eye toward the hoax. Besides, Kaysing points out, rather ingenuously, "their space program had always been ahead of ours and this fact was well-established worldwide." Kaysing is a little hazy regarding the contradictions inherent in having the Soviets cooperate in the fabrication of an American triumph in space, but we'll let that pass for the moment.

"Secret, leased and well-secured" telephone lines were connected to the antennas of all space communication centers and tracking stations. Signals purportedly from the Apollo spacecraft were actually sent via these phone lines. To foil amateur radio operators, identical signals were broadcast from special satellites. "So perfect were all of these simulations," Kaysing writes admiringly, "that the momentary black-out when the module was supposed to be behind the moon was faithfully reproduced."

Since the astronauts were expected to bring lunar rocks and soil samples back to earth, these, too, had to be convincingly faked. What were passed off as "moon rocks" were ordinary earth rocks treated in one of NASA's "well-developed ceramics laboratory with high-temperature ovens . . . since no one has any moon rocks to compare them with, it's very simple to make up a moon rock and say, hey, this came from the moon." Kaysing claimed that a geologist—unnamed, of course—once told him that "there's no question, Bill, that these rocks were made in a laboratory on earth."

While the big show was going on at the Kennedy Space Center, a secret motion picture studio somewhere in the American West—perhaps at the infamous Area 51 or Norton Air Force Base, though Kaysing suggests a specially-constructed site near Las Vegas—was busy creating all of the still and video footage required to support the faked journey to the moon. Scenes of weightlessness in space and low gravity on the moon were accomplished using wire rigs "just like they did [in] the Broadway play Peter Pan. In other words, [they] used wires and suspended the astronauts from an overhead crane and had them leap gaily across what actually was a moon set. No, it's not difficult to show astronauts taking big leaps, nor is it difficult, for example, to put them in a simulated command capsule and have them go through an anti-gravity curve [sic] ."

In order to simulate the look of a genuine television broadcast from the surface of the moon, the set had to be "photographed through filter and electronic 'noise' had to be added to avoid a too-perfect picture."

Occasionally the "actors" would slip up in delivering their lines, such as when Houston told Armstrong that the lunar landing was "a good show", to which Aldrin replied, "Fantastic". "I'll second that," added Armstrong. Kaysing finds this sort of dialog very convincing.

The filming was done in the strictest secrecy, of course. "No one has seen [the sets] and come out alive," Kaysing asserts. "They don't intend for anybody to see it and come out alive. You've got to remember that NASA is kind of a lethal organization. Jim Irwin—Apollo 15—was put up to blowing the whistle on the whole project and he called me up, ostensibly to give me the facts. Few days later he died of a heart attack. Now what does that tell you?" NASA didn't stop with just one astronaut, of course. The Apollo 1 astronauts were deliberately incinerated in their capsule to keep them quiet—most especially the vocally critical Gus Grissom. Thomas R. Baron, a critic of the Apollo program, was killed when his car was struck by a locomotive, and even Christa McAuliffe was assassinated by blowing up the Challenger Space Shuttle for fear she would tell the world that you really <u>can</u> see stars in space. (Why NASA didn't avoid this possibility by opting for the much simpler solution of just dropping her from the program is left unexplained.) Kaysing is a little reluctant to have to admit that the Space Shuttle might actually have gotten into orbit, but "after all, it's low altitude. I haven't done a great deal of research on the Shuttle, but several people have told me that the Shuttle is faked, too." Kaysing himself has been threatened with death many times, though

one wonders how an organization capable of using locomotives as murder weapons and blowing up entire Space Shuttles could not manage to bump off an eighty-year-old man.

Given all of this, Kaysing is a little hazy on why Hollywood was allowed to show NASA faking space flights in films such as Capricorn 1 (which he claims was based on his book) and Diamonds Are Forever, in which there is a brief scene where James Bond stumbles into a secret set during the filming of a faked lunar landing. Kaysing suggests that this scene might have been filmed at the actual secret NASA studio! On the other hand, NASA heartily endorses pro-spaceflight films such as Apollo 13, which are created under its direction in order to show that it really was possible to send men to the moon.

In any event, the filming was accomplished under a cloak of secrecy the likes of which had not been seen since the Manhattan Project. In Kaysing's scenario, this is the chronology of the biggest and most expensive motion picture production in history:

In 1961, NASA and the Defense Intelligence Agency create the Apollo Simulation Project (ASP). A base of operations was established in the desert 32 miles east of Mecury, Nevada, not far from Los Vegas. This enabled ASP to work in collaboration with "the hidden rulers of Las Vegas, the crime organization chieftains", who gladly provided Cosa Nostra hit men in exchange for huge amounts of government cash. High salaries also bought the silence of the technicians working on the project. As proof of this, Kaysing notes that during this period "income for many Las Vegas casinos hit new highs."

The astronaut-actors were easy to come by. "[T]he men approached had lifetime histories of obedience. All were or had been in the armed forces and were accustomed to accepting assignments regardless of risk or rather, in spite of risk . . . Most pilots are extroverted, game-playing individuals. Thus it was a relatively simple matter to train the astronauts to play their respective roles in the high drama of ASP."

A complete set depicting the surface of the moon is built in an underground cavern at the ASP base, with every location required being recreated in exacting detail. The sound stage is dubbed "Copernicus", though it is soon nicknamed "Cuss" because of problems with lighting and sound. Scale models of the earth, moon, sun "and other bodies" are built and mounted on "a planetarium-like device" so they can be positioned and photographed with accuracy. All shots of the earth and moon in space are only photosgraphs of these cleverly-painted models. The entire complex project was coordinated by a master IBM 370-C computer. "Since all releases were by well-edited tape, there was no chance of a blooper."

Not wishing to take any chances, NASA recruits Stanley Kubrick to direct the shooting of the fake Apollo footage. Kubrick had already been working as a NASA dupe, of course: his great science fiction film, 2001: A Space Odyssey, released in 1968, had been made with the close cooperation of the U.S. Government (and "NASA indoctrinated advisors (Frederick Ordway for example)") in order to sell the American public on the concept of space travel—warming them up, so to speak, for the planned Apollo landings of the following year. "Americans were conditioned by 2001 to expect to see a certain quality in space films." 2001 was also a dress rehearsal for the special filming techniques to be used in the Apollo recreation.

Does Kaysing have even one scrap of evidence to support this excrutiatingly detailed scenario? "[N]o information has been revealed to this day," he says with unintentional candor, without explaining where, then, it all came from.

Chapter 3. Who Are the Hoaxsters?

We've already been introduced to Bill Kaysing, the founding father of the Apollo Moon Hoax. There's not much more to be said about his slim, rambling book which only touches upon a handful of "proofs" . . . nothing at all like the veritable catalogs of "anomalies" that were to eventually appear.

Following in Kaysing's pioneering footsteps came Ralph René, the self-styled "engineer", David S. Percy, the "award-winning" photographer, William L. Brian II, whose book is now an expensive collector's item, and David Cosnette, who produced the first Apollo Hoax video. There are dozens of websites devoted to proving that NASA faked the entire space program, but virtually all of them—which are also typically anonymous—merely reproduce the arguments of the Big Five and add little or nothing original of their own.

Percy, in collaboration with Mary Bennett (who edited Percy's science fiction novel, Two-Thirds and "has developed the PSI abilities that have been with her since childhood, among which is the natural gift of remote viewing"), produced by the far the most encyclopedic of all the pro-Hoax works: the mammoth 568-age Dark Moon. It's a handsomely-produced book—the only pro-hoax book not published by a vanity press (the publisher, Adventures Unlimited Press, is a small publisher specializing in fringe topics such as antigravity, Atlantis and Nazi UFOs)— printed on good paper and featuring hundreds of illustrations.

There seems to be not a single fringe idea that Percy felt was not somehow involved in the Apollo Hoax, ringing in everything from crop circles, fractal designs, antigravity and UFOs to the Face on Mars, Roswell, Stonehenge and Egyptology. He also apparently believes that everyone associated with the development of rocketry and spaceflight since the 1920s was either directly or indirectly involved in creating the fake moon landings. This includes filmmakers Fritz Lang (who directed the great silent space film, Frau im Mond, in 1929) and George Pal, the Hungarian-American producer who created the classic Destination Moon in 1950 ("The twin-like similarity of certain images in Destination Moon," Percy declares, "with some of the early NASA photographs is inescapable." They have certainly escaped me and I've seen the film dozens of times. It's too bad Percy chose to not produce any examples). "In those days few people knew of Pal's close contact with what we now call NASA." What was this connection? Percy doesn't enlighten us. (In one photo caption, Percy appears to imply that the Russians based their Lunokhod lander on the design of the time machine in Pal's film adaptation of the H.G. Wells novel!) Needless to say, Percy focusses

on all of the pre-war German rocket pioneers, from Wernher von Braun to science popularizer Willy Ley (whose name Percy misspells as "Willie" throughout the book—an indication of the high level of research that went into writing it). The frustrating thing about dealing with this book is not so much the wealth of misinformation—with an error of fact on nearly every page it would take a volume in its own right to correct them all—as its dependancy on suggestion and innuendo. All too often Percy asks the reader loaded questions—such as this one, which with its italicized word also manages to include a scarcely veiled innuendo: "Why did WvB [Wernher von Braun] resign from a program in 1972 that apparently was achieving his lifelong goal?" Percy doesn't bother to answer the hundreds of other similar leading questions such as this, leaving the reader to draw their own conclusions . . . in much the same way they might think the card they just picked from the magician's deck was chosen at random.

Stripped of all its irrelevancies, the core of Dark Moon, naturally enough, deals with supposed anomalies in the Apollo photographs—not surprisingly, since Percy bills himself as "an award winning film and television producer". Which is an interesting distinction, since a cinematographer and photographer is an entirely different thing than a producer, who never needs actually touch a camera, let alone operate one. While we're on the subject, let's examine the rest of Percy's credentials. He's a member of the British Interplanetary Society—this is nice, but membership is as open to everyone as the National Geographic Society is. He's an Associate of the Royal Photographic Society. This is good, but since it can be awarded on the basis of any number of criteria it may or may not have any bearing on Percy's actual qualifications as a photographer. As we will see, if his Associate membership in the RPS does indeed reflect real technical expertise on Percy's part, then it does not bode well for his honesty. Finally, he "was nominate Film Cameraman of the Year by the British Industrial and Scientific Film Association." Needless to say, it's obvious he didn't get the award, but if even being nominated is an indication of genuine cinematographic skill, then again it does not bode well for his honesty.

The problem is this: Percy makes such fundamental blunders in talking about lighting, perspective, shadows and camera angles that he either does not have the qualifications he claims, or he is deliberately hoaxing his readers. His book is subtitled "Apollo and the Whistle-Blowers", leading one to think, naturally, that two or more NASA scientists, engineers or other employees—or perhaps Stanley Kubrick's special effects team—have come forth with affidavits, documents and other hard evidence that there was indeed a

hoax perpetrated by NASA. If that is your natural expectation, then you need to set your sights considerably lower. What Percy means by "whistle-blower" is something a little more idiosyncratic. In answer to his own question, "Who are the Whistle-Blowers?", Percy explains that they are the anonymous individuals whom he believes "carefully encoded the information that would be needed for us to come to [the] conclusion" that the Apollo program was faked. "The evidence for this encoding," he continues, "is found in the photography, in the processing and in the final compositing of the images—moreover, this activity occurred under the very nose of NASA." In order to do this, Percy would have us believe that these mysterious "whistle-blowers" "had representatives in all the production departments, ranging from those scripting the action, conceptual design, photography and lighting, to set dressing, continuity, photo image retouching and optical compositing." And why do this? Percy has an answer for this, too: "Unhappy with what they were expected to do, and unable to speak out, some of these people opted to 'booby-trap' the images by encoding clues into the respective areas of their work."

How these unknown disgruntled employees managed to successfully coordinate such a herculean effort in absolute secrecy is not explained, nor is it really explained why—in the three decades that have passed since the Apollo 1—not one of these unhappy people have come forward to testify. Logic, however, is scarcely David Percy's specialty.

Every one of Percy's critiques regarding the supposed "anomalies" in the Apollo photographs is erroneous—most of them having such rudimentary explanations that it seems utterly impossible that anyone of Percy's supposed experience could have overlooked them. For the most part they are based on his belief that the lighting, shadows and perspective are all impossible in the conditions found on the moon and could only have been the result of the photos having been created under studio conditions. His main arguments are refuted in the next chapter, so I'll not repeat them here. In short, however, his critique of the shadows cast by the astronauts and their hardware is based on the naïve assumption that the surface of the moon is perfectly flat, that cast shadows must always appear to be parallel and that shadows on the moon are black. Additionally, he cannot understand why no stars appear in the sky or why the heat of the sun didn't melt the astronaut's film. Since many of these same "anomalies" had also puzzled Kaysing twenty years earlier and had long since been widely explained by photographers and artists it seems inconceivable that Percy could possibly have been unaware of the facts before writing his book, again leading one to conclude that Percy is

deliberately hoaxing his readers. Since he is trying to sell a $25 book, to say nothing of his videos and lecture series, "scam" might be a better word than "hoax".

The only other remotely influential pro-hoax publications are two video productions. The first was the late James H. Collier's Was It Only a Paper Moon? As Collier told the story, he was asked by Victoria House Press, a small publisher in New York, to review a manuscript they'd just received, A Funny Thing Happened On the Way to the Moon, which had been submitted by the "brilliant lay physicist" Ralph René. "Since I had just written Votescam: The Stealing of America, (Victoria House Press)," Collier explained, "they asked me to investigate
René and his manuscript to determine the credibility of both." Why Victoria House sent the book to a journalist instead of a scientist is not explained. In any event, René explained the genesis of his interest in exposing the hoax Apollo had pulled on the world. "I read Kaysing's book We Never Went to the Moon," he told Collier, "and although it was compelling, it lacked technical details, a grounding in physics that would convince scientists, beyond a doubt, that America never went to the moon."

Collier reviewed the manuscript and "although I understood basic physics, I couldn't immediately assure the publisher that René's assertions were scientifically accurate. Least of all, I couldn't assure them that we didn't go to the moon. I needed time." His researches took him to the New York Public Library, the Library of Congress and the "United States Archives" [sic] where "months" of research revealed that "precious little had been written about the Apollo missions except standard 'puff' pieces in the New York Times and the Washington Post." Leaving one to wonder just where he spent his time in these institutions—the men's room? A simple catalog search reveals some 800 titles devoted to the Apollo missions. From that laborious effort, he went on to Grumman Aircraft, which had built the Lunar Excursion Module (LM). He asked penetrating questions: "Did it run by computer? If so, who built the computer? What made Grumman engineers think it could fly?" Collier was astonished to discover that Grumman had destroyed the bulk of the documents relating to their work on Apollo. "I was stunned. The LM historical paperwork was destroyed!? Why!? They had no answers."

By now Victoria House Press must have had every reason to think they were getting their money's worth. By the end of his "researches"—most of which are covered elsewhere in this book—Collier became convinced that René might be onto something. René himself, meanwhile, "became impatient [no doubt!] and

decided to self-publish his book. He changed the title to NASA Mooned America. I, however, had become hooked. But now there wasn't a book to research. I was left hanging, questions plaguing my mind." Collier took the results of his investigations to Victoria House and proposed his own book on the Apollo Hoax, to be called Was It Only a Paper Moon? Ultimately, he decided that his "evidence" would be better presented on videotape rather than print and Was It Only a Paper Moon? duly arrived as a 90-minute "unbroken chain of circumstantial evidence that, if not refuted by NASA, proves we could not have gone to the moon. I feel this evidence demands Congressional hearings."

This "evidence" is hardly unique, consisting of the same catalog of questions and "anomalies" presented in one form or another by every other Apollo conspiracist: questions about lighting and shadows, radiation, etc., most of which are repeated and answered in the next chapter.

The second video, and perhaps the most notorious since it was the basis for an infamous Fox television "special", is Bart Sibrel's A Funny Thing Happened on the Way to the Moon (evidently no direct relation to René's original book other than in title and subject). Although Sibrel implies that he is a "former NBC journalist", it appears that Sibrel in fact was nothing more than a weekend cameraman working for a local NBC affiliate. Like Kaysing before him, Sibrel left his job under what have been called "unfortunate circumstances". Also like Kaysing and his fellow co-conspiracists, Sibrel rehashes most of the same old, endlessly debunked "proofs", though he does manage to invent a few new, highly original ones of his own.

Most of Sibrel's argument is based on a collection of recordings of live broadcasts made from the Apollo 11 spacecraft while it was on its way to the moon. What Sibrel has a problem with are the views of the earth seen through the windows of the spacecraft. As might be expected, the earth appears smaller and smaller as the spacecraft recedes from the planet. Not so, claims Sibrel, who doesn't believe that the Apollo astronauts ever left low earth orbit. Instead, we are only shown the illusion of a receding earth. To accomplish this, the astronauts merely placed cardboard templates over the window. Each template had a round hole cut in it. As smaller holes were progressively used, the impression of an ever-receding earth was created.

It is difficult to respond to a "theory" of such profound naïveté. "This is quite a fantasy," comments Jim Dade, "and it could only be concocted by someone who possesses very little knowledge of real spaceflight." Or even rudimentary knowledge of perspective, for that matter.

"It does not require deep thought," continues Dade, ". . . to see the fallacy in Sibrel's 'cutout' accusation. A spacecraft in low earth orbit is traveling at inertial velocity—about 17,000 or 18,000 miles per hour, depending upon the exact altitude of the spacecraft. At such speeds, the cloud and ground formations passing by the spacecraft window are moving by at a fairly quick pace as an astronaut looks down at the earth through the window. Watch the earth views from from the space shuttle on NASA-TV and you will observe this motion along the ground-track . . . The videotape of the Apollo 11 earth video shown in Sibrel's documentary shows zero apparent movement along the ground track. The cloud patterns and landforms shown in the video do not change at all over the several minute duration of the sequences used by Sibrel. This is obviously because the spacecraft is indeed far enough away from earth to view the planet as a globe."

Dade also points out the glaring difficulties with perspective induced by Sibrel's cut-out theory. The apparent curvature of the earth—especially noticeable where cloud patterns "wrap" over the horizon—changes the further a spacecraft gets from the planet. The differences between a nearby earth as seen through a circular hole and a view of the entire globe as viewed from a great distance are obvious when the two images are placed side by side. It is also patently obvious that as a cutout hole gets smaller, one sees less of the earth rather than more of it, as is apparent in the actual Apollo photos.

Sibrel, perhaps more stridently than any of the other conspiracists, declares in no uncertain terms that "Neil Armstrong is a liar!" Dade, among others, is justifiably outraged by such accusations, especially when they are based on such ignorant "theories" as Sibrel's. "Neil Armstrong," he protests, "is a modest man who served in combat for his country during the Korean Conflict. Neil has never accepted a dollar to use his status as a great explorer to sell Buicks, shampoo or exercise equipment. He is one of the most moral men I have ever met. Sibrel's accusation that Neil Armstrong is the kind of man who would betray his country and the entire world enrages me more than any of the other outrageous charges that he has leveled."

Sibrel has published his "Top Ten Reasons Why No Man Has Ever Set Foot on the Moon", a series of arguments that Dade, among others, has had no difficulty in refuting. The ten proofs and their answers are worth summing up here (many of them are discussed in more detail in the next chapter)—

10. "Tricky Dick" Richard Nixon was president at the time. He was the king of cover-up, secret tapes and scandal. Think about all of his potential antics that were not discovered.

Nixon was sworn in January of 1969 and Apollo 11 was launched on July 16. Hardly adequate time to stage such a massive conspiracy. The Apollo program expenditures and the moon landing mission sequence was determined well before Nixon even won the election in November of 1968. Apollo 11 was also paid for long before Nixon was elected. This claim constitutes type of illogical conclusion drawing that is frequently indicative of a dearth of critical thinking skills. Nixon cold not even pull off a simple burglary or a simple cover-up of a burglary. How could he fake a moon landing?

9. A successful manned mission to the moon offered a wonderful pride-boosting distraction for the near revolt of the citizens of America over 50,000 deaths in the Vietnam War.

It is hard to imagine the Apollo program distracting the American public from Viet Nam, especially considering the news coverage offered the first "television war". The United States' withdrawal was slow and painful, but the country. was never "on the verge of revolution". The vast majority of draft-notice recipients dutifully reported for processing and Nixon had already announced the initial phase of U.S. withdrawal from Vietnam one month before Apollo 11 when he called 25,000 troops home. A successful moon landing was unlikely to stir anti-war activists either. The anti-war crowd at the Newport jazz festival booed the moon landing announcement on July

20th.

8. The Soviets had a five-to-one superiority to the U.S. in manned hours in space. They were first in achieving the following seven important milestones:

1. First manmade satellite in earth orbit...
2. First man in space...
3. First man to orbit the earth...
4. First woman in space...
5. The first crew of three astronauts onboard one spacecraft...
6. The first space walk...
7. The first of two orbiting spacecraft rendezvousing...

This put America at a perceived military disadvantage in missile technology during the very height of the Cold War.

Most of Sibrel's "facts" only serve to illustrate his fundamentally shoddy research. Any fears that the Soviets had put the United States at a disadvantage in missile technology had been abandoned long before the Apollo program begun. Much of what the Soviets gained in their oneupsmanship of the Americans was acheived by performing what were little more than ill-planned stunts. The "three man" spacecraft in #5 was merely a standard two-person spacecraft with a makeshift seat crammed in. The famed Soviet spacewalk was even riskier. Alexi Leonov nearly died when he was unable to safely return to the spacecraft because of problems with the inflatable airlock. Primitive Soviet technology made an airlock necessary for spacewalking since the spacecraft's vacuum tube electronics could not operate in the harsh vacuum of space.
All that U.S. astronauts had to do was de-pressurize the crew compartment of their sophisticated Gemini spacecraft and open the hatch. At the close of the pre-Apollo Gemini Program, the U.S. had gained a better than two-two-one advantage in total human spaceflight hours. The U.S. was not in a "space panic" mode at the time of Apollo.

The Soviet rendezvous in space was also a fraud because those spacecraft did not and could not change their orbits. It was only the result of carefully-timing their launches that the respective orbits of the two spacecraft brought them so close together. The crews or onboard systems did not rendezvous actively. U.S. leaders knew of these Soviet limitations at that time.

7. Passengers of a spacecraft that went further than Earth orbit would likely have been subjected to lethal radiation. The Apollo missions were the only times ever that an astronaut, Soviet or American, left the safety of earth orbit and ventured into the deadly hazards of space radiation.

This is a favorite of the Apollo Hoax proponents and is answered more fully in the next chapter. In short, the Apollo spacecraft passed through the Van Allen Radiation Belts too fast for any harm to have come to the astronauts. An astronaut would have to spend a total of two days continuously within the Van Allen belts in order to be dosed lethally. The Apollo spacecraft passed through the belts in only a few minutes. The radiation exposure levels encountered by Apollo 8 as it journeyed through the Van Allen Belts were no greater than that experienced during high altitude aircraft flight.

6. Neil Armstrong, the first man to supposedly walk on the moon, refuses to give interviews to anyone on

the subject. “Ask me no questions, and I’ll tell you no lies.” Collins also refuses to be interviewed. Aldrin, who granted an interview, threatened to sue us if we showed it to anyone.

This claim is both absurd and wholly inaccurate. All three astronauts have been interviewed extensively. There are hours upon hours of Neil Armstrong interviews in the public and private record. Aldren especially loves the camera and microphone and has been a highly visible and outspoken supporter of manned spaceflight. In response to the broadcast of Sibrel’s Fox television “special”, Neil Armstrong’s office released a statement on April 9, 2001 stating that while he “accepts that individuals may believe whatever they wish”, he was “substantially offended by the program’s implication that his fellow Apollo crewmen were possible accomplices in the murder of his very good friends Grissom, White and Chaffee. He has
indicated his displeasure to Fox.” The statement also expressed the hope that “NASA responds to this matter in a more forceful manner than they did in the Fox broadcast” where Sibrel made his allegations. Meanwhile, during a C-SPAN interview, Buzz Aldrin categorically dismissed Sibrel and his fellow conspiracy proponents as profit-seekers who are merely taking advantage of the
opportunity to exploit gullible people.

5. Newly retouched photographs correct errors from previously released versions. Why would they be updating thirty-year-old pictures if they really went to the moon?

“Maybe,” suggests Dade, “because we have superior imaging and image scanning technology these days and people like me want to see cleaner prints of these old Apollo
images.” In fact, none of the Apollo negatives have ever been “retouched”. What Sibrel and some of the other hoaxers have been looking at are the inferior prints of the original Apollo negatives that appear in NASA Public Affairs releases and in publications created by private publishers. The general press was usually satisfied with the quality of the old scans and prints that NASA public affairs churned out since newspaper and magazine printing technology in the 1960s and 1970s was far from the high quality we see today. Broadcast television video was also of poor resolution until the advent of digital tuners, electronic filters and larger, brighter screens. The grainy, 16-millimeter NASA documentary films supplied to the TV networks back during the Apollo years look quite primitive by today’s video standards. Hence, new images from NASA are actually of much higher quality than those of even ten years ago.

4. Rediscovered lost footage shows the American flag blowing in the wind. The wind was probably caused by intense air-conditioning used to cool the astronauts in their lightened, uncalculated, space suits. The cooling systems in the backpacks would have been removed to lighten the load not designed for earth's six times heavier gravity, otherwise they might have fallen over.

There is no such thing as "lost footage" from Apollo. The movement of the flag is discussed in detail in the next chapter but in short, NASA did not want the flag to hang limply so a wire stiffener was added to give the appearance of an unfurled flag in a breeze. An examination of the video never shows the flag flapping in any manner other than that inflicted during the mechanical action of planting it in the highly resistant lunar surface. Besides, if the "intense air-conditioning" was powerful enough to disturb the flag then why didn't it also disturb the finely powdered surface?

3. Enlarged photographs underneath the lunar lander's 10,000 lb. thrust engine showing the soil completely undisturbed. During ground tests there was grave concern for the vehicle falling into the hole the engine created as it descended. An oversight that they would have to keep for all subsequent moon missions. They attributed it to the affect of no atmosphere (except for the flag blowing in the wind!)

This is another of the standard "proofs" trotted out by most of the conspiracists, and is answered in full in the next chapter. The 10,000 pound thrust figure used by Sibrel and others is deceptive. The Lunar Module descent stage engine actually had a thrust ranging between 1050 to 9870 pounds. The thrust was throttled down as the extremely lightweight LM made its final approach and the astronauts cut the thrust completely about six feet above the lunar surface. The actual thrust required for the landing phase was much less than that provided by many civilian helicopters and aircraft. Moreover there is no evidence that NASA ever feared that the LM would drop into an enormous crater excavated by the descent engine.

2. Rare, uncirculated photographs, allegedly from the moon's surface, show scenes supposedly lit solely by sunlight. Yet they contain shadows that do not run parallel with each other, indicating supplemental artificial light. Sunlight would cast shadows that would never intersect.

There is no such thing as "uncirculated" Apollo photographs, rare or otherwise. The film logs and images are available to anyone who requests them. So far as the question of the shadows is concerned, this is the oldest and hoariest of the conspiracist's "proofs" and is covered in considerable detail in the next chapter.

1. Recently uncovered mislabeled, unedited, behind-the-scenes video footage, dated by NASA three days after they left for the moon, shows the crew of Apollo 11 staging part of their photography. Is this the arm of God moving across the earth, or an outtake of an astronaut's arm in front of a mockup of the earth as it might appear from a distance if they were actually able to leave earth orbit? See our streaming video: "God's arm or astronaut's?" Either way, it's one-of-a-kind footage and is only available in "A Funny Thing Happened On The Way To The Moon!"

Certainly there is film and video footage of Apollo astronauts working on an obviously artificial lunar set. It was part of their training and no one could possibly confuse those shots with images taken on the moon—unless one assumes either a monumental ignorance or a deliberate intention to deceive on the part of the conspiracist. "Sibrel," Dade explains, "does not have a strong grasp of the Apollo spacecraft configuration or what is actually going on during these telecast sequences. These are profound charges made by an accuser without the profound expertise or basic knowledge required to back them up." He recalls visiting the impressive looking lunar surface astronaut facilities and simulators at various NASA facilities as a teenager during the Apollo program. "Some people," he suggests, "may see images made during these training sessions and confuse them with actual Apollo lunar surface photos. That is an understandable mistake for someone who is not expert in space history. Perhaps it is a lack of expertise in this particular are that makes some people susceptible to conspiracy theories of this type."

4. Evidence for a Hoax

We have seen the claim that the Apollo landings were an elaborate hoax, faked in a secret desert studio, in order to preserve American prestige, distract the public from the Viet Nam war and to keep the cash flowing into the military-industrial complex. Well, it is one thing to assert that the entire lunar landing program was faked—but is there any proof that there was a hoax? What evidence, if any, do the conspiracists have to offer? Plenty, they say.

Most of the alleged "evidence" lies in the presumed anomalies found in the thousands of photos and hours of videotape and motion picture footage taken by the Apollo astronauts. Some of the questions involve seemingly strange lighting and shadows, the absence of stars in the sky or the sheer perfection of the photos themselves (how is it, they ask, that the Apollo astronauts could have taken every picture as perfectly exposed and composed as they did under such adverse conditions?). Other questions involve problems surrounding the lunar excursion module (or LM) or other technology, or the conditions in space and on the moon. Rather than respond to the questions raised by each individual conspiracist, I've decided that—since all of them raise more or less the same issues—it would be simpler to combine them all into a single catalog . . .

Problems With the Photographs

Since the Apollo program generated many thousands of photographs and hours of video and film footage, this is the material that has been most avidly seized upon by the conspiracists. While it is easy to see how some of the more esoteric illusions of perspective and lighting might confuse or mislead anyone not very familiar with either art or photography, it is absolutely incomprehensible how someone who is ostensibly not only a professional photographer and cinematographer but a highly regarded one as well could possibly misinterpret what they see in the images. But that is exactly what David Percy has done. Percy claims to be not only a professional photographer but an Associate of the Royal Photographic Society and a nominee as as Cameraman of the Year 1986 by the British Industrial & Scientific Film Association. How he can have achieved any sort of career as a cinematographer and yet have no experience with such industry-old techniques as bounced fill lighting is a complete mystery. In fact, most of the photographic "anomalies" he has discovered among the Apollo images would seem to belie any comprehensive knowledge of photog-

raphy whatsoever. Perhaps some clue might lie in the implied nature of his credentials. Note that he is not a member of the RPS, but only an "associate". Most societies of this type require election to full membership, while anyone—even interested layman—can usually obtain an associate or corresponding membership. And while Percy may have been nominated as Cameraman of the Year fifteen years ago, one might be petty enough to ask: and how many others were also nominated? It might be even more petty to point out that Percy didn't get the award.

1. Why are there no stars in any of the photographs?

This is the first question asked by virtually every pro-hoaxer. With no illuminated atmosphere to mask them, as happens in the daytime sky of earth, the stars should stand out brilliantly in the black sky of outer space. Yet in all of the photos taken in orbit and on the surface of the moon the sky appears to be a flat black, without a single star appearing. In fact, the sky looks exactly like a big black velvet backdrop. Could that be what it actually was?

The answer is simple if not immediately obvious. The stars are there, they are just too dim to be photographed. Even on a dark, moonless night on earth it is impossible to photograph the stars using the same exposure time and aperture setting (lens opening) for a daytime shot. To have the stars appear in the final photograph you would need a time exposure. Using an ordinary 35mm camera with a 50mm lens, an aperture set at f2.8 and the same film the astronauts used (which had a relatively "slow" ASA 64 rating), an exposure of about 45 seconds would be needed to record an image of the stars. By comparison, an exposure of only 1/2000 second would be needed to photograph the full moon.

Film needs light in order to create an image. The more light there is, the less time the film needs to be exposed, if there is not much light than the film needs to be exposed for a longer time. If you happen to be in a situation where you have one object illuminated brightly and one in shadow, you have a problem. If you expose your film long enough to record the shaded object, the brightly lit object will be badly overexposed; if you take a very short exposure to allow for the illumination on the brightly lit object, the object in the shadow will be underexposed and come out too dark. Even your own eyes have this problem, since they are cameras that adjust to changing light conditions by changing the aperture or lens opening. Your pupils will grow larger in the shade, allowing more light to strike the retina in the back of the eye (the equiva-

lent of the film in a camera), and smaller in the sunlight, allowing less light to reach the retina. Anyone coming out of a movie theater on a summer afternoon has been dazzled by the brilliant light until their eyes have had a chance to adjust (conversely, coming into a darkened room from outdoors, you will have to pause a moment until your eyes adapt to the dimmer light).

If you will compare the number of stars you can see near a full moon with those that are visible on a moonless night, you will begin to get a grasp on the problem the Apollo astronauts faced. Your pupils, adjusting for the bright light of the moon, make it more difficult for you to see many of the stars, which are much dimmer than the moon. (The difference in brightness between a full moon and the dimmest stars perceivable by the average person—about magnitude 6.0—is about 30 million!) When the Apollo astronauts were on the moon, they were attempting to take photographs of a landscape illuminated by the intensely bright light of the sun. In doing so, the exposures they needed to use were entirely inadequate to record the stars at the same time.

But . . . the astronauts did photograph some stars. Some photos, if enhanced sufficiently, reveal the presence of the brighter stars, and the Apollo astronauts intentionally recorded images of stars from the surface of the moon using ultraviolet-sensitive film. Other astronauts also photographed stars, such as when Stafford and Cernan obtained an image of the zodiacal light in 1966, which included Venus and a half dozen stars.

Perversely, one pro-hoax website uses the apparent presence of stars in a few video images as proof that the photos were faked. The argument is that since NASA claims that "because of the very bright conditions on the moon, stars would not be visible from its surface", the presence of stars in some of the pictures reveals that they have been faked in some way. But the conditions that prevented the stars from appearing in most of the photos does not preclude some of them from ever appearing if conditions are suitable. It appears that to the die-hard conspiracist, NASA loses if there are no stars in the photos and loses if there are stars.

But we are left with one question for the pro-hoaxers: why would NASA leave the stars out of every photo ever taken in space (it is not just from the Apollo photos they are missing, but from photos taken in space by virtually every other manned space mission)? After all, it doesn't appear to be too hard for Hollywood's science fiction filmmakers to include stars in their movies. One suggestion is that NASA

found it too hard to "fake the complicated arrangement of the stars", which must be laughed at by every planetarium director in the country.

2. Why is there illumination in the shadows?

This is the second big argument for the Apollo photographs having been staged. In many of the photographs taken on the lunar surface, surfaces facing away from the sun appear to be brighly illuminated by at least one secondary source of light. This is particularly noticeable on the Lunar Module, where the American flag is always perfectly visible on the shadow side of the vehicle, and on the astronaut's own spacesuits. If there is only one source of light on the moon, the sun, where is this backlighting coming from? Surely, the conspiracists ask, this must be evidence that there were other sources of light? After all, they point out, there is no atmosphere on the moon to diffuse light. Shadows should be as black as ink.

The answer may sound startling at first: Yes, there were other sources of light. One of these was, of course, the earth itself. Seen from the moon during the Apollo 11 and 17 missions, our planet was nearly full. Since our planet is four times larger than the moon, it appears four times larger in the moon's sky than the moon does in the earth's sky (four times the diameter, that is, it covers nearly fifteen times the area). The earth is also five to eight times more reflective than the moon, making it a much brighter object—at least forty times brighter than a full moon back on earth. Since a full moon provides enough light to easily read by, it's not too difficult to imagine how much light an object forty times brighter would provide, even if it were only half full, as it was during the Apollo 11 mission.

But the earth was neither the only nor hardly the best source for the fill light in the Apollo photos. That light came from the moon itself. The objects in the photos—the Lunar Module, rocks, equipment and the astronauts themselves—were all surrounded by hundreds of square miles of brilliantly illuminated lunar landscape. This was the primary source for the light filling in the shadows. It's not remotely an uncommon phenomenon—it can be observed on any sunny day anywhere on earth and is an effect known to all photographers and cinematographers (which makes one seriously question either the experience, expertise or motives of David Percy, a professional photographer possessing some imposing credentials. The "anomalous" fill light in the Apollo photos is only one of many simple light and shadow effects that seem to mystify him—he either has not the experience he claims or is deliberately misleading his readers). In fact, it is an

effect that is deliberately employed by professional photographers shooting outdoors. In order to fill shadows with light they will raise large reflectors of white cloth or silvered material to bounce sunlight into them. Exactly the same thing is happening on the moon.

If the light illuminating the shaded sides of the astronauts and Lunar Module was actually coming from floodlights, this same light would also be filling in the cast shadows on the ground. But these shadows are black, exactly as one would expect them to be if in fact it is the ground surrounding the shadows that is producing the fill on the vertical surfaces.

3. Isn't that the reflection of a floodlight I can see in the astronaut's faceplates?

No, it's a reflection of the sun. The small sharp shape of the reflection is a result of the convex shape of the visor . . . like the reflection of the sun seen in a silvered garden viewing ball. As proof, a line drawn through the reflection from the shadow of the helmet will always point directly toward the sun.

4. Why do some shadows seem to be going in different directions? Shouldn't they all be parallel?

Conspiracists point to the many Apollo photos that appear to show shadows of two different objects going in two different directions. David Percy (who by all rights ought to know better) claims that "light travels in straight, parallel lines at any given moment. Shadow directions are constant because the light comes from the sun over 90 million miles away." Therefore, he says, there must be something wrong in those Apollo photos where shadows diverge or converge toward one another. He is right and wrong. He is right in that rays of light from the sun reach the earth in virtually parallel lines (they actually travel radially away from the sun, but the huge distances involved combined with the small size of the earth and moon mean that we can treat the rays as being parallel for all practical purposes). He is also right in saying that shadows created by these parallel rays would also be parallel. But . . . what we are discussing here is not what is actually happening but with what is perceived to be happening. That is, Percy is leaving out one exceedingly important factor: perspective.

Everyone has at one time or another run across the classic demonstration of foreshortening: the effect of railroad tracks appearing to meet at the horizon. We know they are actually parallel, but in photographs and to the naked eye they appear to converge, coming closer together as they recede into the

distance. Seen from directly above, however, the tracks would be seen to be the parallel lines they actually are. Shadows are as subject to the effects of perspective as anything else. The shadows of two objects on the surface of the moon, seen from above, would be as parallel to one another as the railroad tracks were. But seen from the surface, they will not appear to be parallel. If the sun is behind the viewer and the shadows are stretching away toward the horizon, they will appear to converge toward one another. If the sun is in front of the viewer, parallel shadows will appear to get further apart as they approach, just as the railroad tracks appear to be wider nearest the viewer and closer further away. It is the easiest thing in the world to take photos of non-parallel shadows, which anyone can do in their own back yard. In fact, it is much more difficult to take photos of shadows that appear to be exactly parallel than shadows that are not. The effect of perspective is exacerbated by using wide angle lenses, or by combining two or more photos into a panoramic view, which can extend the angle of view to 120 degrees or more. A visual angle of 180 degrees can have shadows on either side of the photo coming directly toward one another!

David Percy fills the opening chapters of Dark Moon with diagrams and photos in an attempt to demonstrate that the shadows in the Apollo images are all going the wrong way. To prove his thesis he actually cheats—subtly but unmistakably. For instance, he superimposes white lines over Apollo photos and photos he has taken himself in order to compare graphically the "anomalous" shadows in the NASA images with the "correct" shadows in his own photos. But he cheats. In virtually none of the photos does he superimpose a line directly over the shadow itself. Instead, the line is drawn some distance away. This prevents the reader from making any direct connection with the object casting the shadow and the length and direction of the shadow itself. And all too often, Percy's lines appear to be only approximate—tending to emphasize the point he wishes to make rather than the actual direction. This is more than a little obvious in one image he uses to demonstrate that shadows cast by the sun are "always parallel". This is a photograph of a group of trees. Near the shadow of each, Percy has drawn a white line and it is clear that these are parallel. But . . . Two things are also clear. The most obvious is that the lines are only approximate and that by not superimposing them directly on the shadows, it is difficult for the reader to determine whether the shadows are actually parallel or not. The less obvious fact is that the photo itself appears to be either cropped from a larger image or was taken with a telephoto lens (or both). By taking only a small segment of a larger scene, Percy guarantees that the shadows will appear to be more parallel than they would in a photo that had a

more conventional field of view.

Percy's critique of supposedly misaligned shadows would be simple enough if the moon were as flat as a table, but normal foreshortening caused by perspective is complicated by the fact that the moon has a highly irregular surface. Much of this, on the small scale of the terrain surrounding the Apollo landing sites, is smoothly rolling, so that the irregularities are not immediately apparent to the naked eye, especially when the sun is relatively high in the sky. Dark shadows, however, running across the surface, follow the shape of the topography, even if that shape is not otherwise apparent. A combination of perspective foreshortening and uneven terrain easily results in peculiar-looking shadows.

Most conspiracists believe that the "anomalous" shadows are evidence of the use of multiple light sources, such as are used on sound stages during the making of a motion picture. The theory is that each different shadow is produced by a different light. Unfortunately, lighting doesn't work this way. Each light source will, of course, produce its own shadow, and if the lights are at different distances and heights, they will cast shadows of different lengths to different distances. The catch is that an object will cast a shadow for every different light shining on it. If an object is illuminated by two light sources, it will cast two shadows, if illuminated by three it will cast three shadows, and so on. If there were multiple lights used on an Apollo sound stage, every object in the photos would be casting multiple shadows. You can see this effect in every Hollywood movie ever made where an outdoor scene is duplicated on an indoor set: the actors cast shadows in every direction—one for each spotlight aimed at the set. The fact that each and every object in the Apollo photos only casts one shadow is proof that there was only one light source.

5. Why are shadows from identical objects different lengths?

Once again, it is a matter of where the shadow is falling. In every case where one shadow appears to be short and the other long, the terrain, if examined closely, will be seen to be uneven. Percy, in all of his arguments, assumes that the lunar shadows are falling on a perfectly plane surface. This is just not so. Even Tranquility Base, which appears at first glance to be as flat as a pool table, is extremely irregular; the Apollo 11 Lunar Module sat tipped at 4.5 degree angle. A shadow falling on a barely perceptible rise may be appear to be significantly shorter than a shadow cast on a more level surface only a few yards away.

6. Why do some of the astronauts appear to be illuminated by a spotlight?

In many of the Apollo photos, an astronaut will appear to be standing in a pool of light while the rest of the landscape is much darker. To many conspiracists, this looks very much as though there had been a spotlight aimed at the figure. This is, in fact, an effect produced by a combination of the angle of the sunlight and the nature of the lunar soil itself and is not at all particularly unusual. It is not dissimilar to the "glory" that can be observed surrounding one's one shadow cast on wet grass. This brightening can also be observed on sandy beaches, snow and other similarly-textured surfaces. What is happening, essentially, is that sunlight is being reflected directly back to its source. Since your head lies directly on the sun-ground line, you see the ground more brightly illuminated around the shadow of your head then it is further away. The brightest area will always be exactly opposite the sun. It is similar to the effect exploited on traffic signs that reflect light directly back to its source, thus appearing very bright to oncoming cars but dim when seen from the sides. In fact, the analogy is an almost exact one since the traffic sign achieves its effect by means of tiny glass beads—and much of the lunar soil is composed of beads of glass. These were created when asteroid and meteor impacts threw up vast clouds of vaporized rock. This material cooled into tiny glass spheres (in much the same way that water vapor will condense into raindrops) which then settled onto the lunar surface. Over hundreds of millions of years, the moon has become literally buried under this material.

7. Why is the distant landscape darker in some photos than the foreground?

The fact that the landscape appears to darken toward the horizon puzzles some hoax proponents, who believe that it is evidence that stage lighting was used to illuminate a motion picture set. After all, they ask, wouldn't a real sunlit landscape be illuminated evenly from foreground to horizon?

Well, actually, the landscape is illuminated evenly—as of course it would be. The effect of the landscape darkening toward the horizon is, like the "spotlight" on the astronauts, caused by a combination of lighting angle and the texture of the lunar soil. It is similar to the reason the horizon at sea is usually darker than the foreground. The surface of the moon is not smooth, like a pool table—it is made up of myriads of tiny grains. When they are backlit, we see their shaded sides and this tends to make the surface appear dark. When they are frontlit, we see their illuminated sides and the surface tends to look brighter. Armstrong mentioned this in his debriefing, commenting that the effect was striking. Apollo astronauts also commented

on the distinct differences in the color of the lunar soil, depending on the angle of the light striking it.

Imagine a line of small rocks stretching from the foreground to the background. As in the Apollo photos, the sunlight is coming from either ahead of us or from the right or left. The side of the rocks facing us will be in shadow, while their tops and opposite sides will be in sunlight. We can see the tops of the nearer rocks since we will be looking more down upon them. As the rocks recede into the distance, however, we see less of their lit sides. Perspective also causes the rocks to overlap more the further they are from us. The combination of these effects means that as we see less of the lit areas of the rocks we see more of their shadowed sides. The increased overlapping also causes us to see less of the illuminated ground between the rocks, contributing to the overall darkening effect.

Something else that is easy to forget when looking at photographs taken on the surface of the moon: the moon is not the earth. Qualities of the terrestrial landscape that we see every day and take for granted simply don't exist on the moon. We are used to the effects of atmospheric perspective. The earth's atmosphere causes distant object to look lighter and bluer than they really are. The further away something is, the more pronounced is this effect. It is one of our main visual clues to the distance of an object. On a body with no atmosphere, there is no atmospheric perspective. Distant objects are as distinct as nearby ones and their color and brightness are unchanged.

8. Why does the earth look so small in the photos taken from the moon?

If the earth is supposed to be fifteen times larger than the moon, why does it look so tiny in the photos taken from the lunar surface? Well, that "fifteen times" is very misleading, for one thing. A number of people have taken it to mean that the earth itself is fifteen times larger than the moon, whereas in reality it is only about four times the moon's diameter. Seen in the lunar sky, the earth is about four times the width of a full moon seen from earth. The area it covers, however, is about fifteen times the area the moon covers (the area of a circle is calculated by using the formula r^2). This is not as much sky as it might sound. The apparent size of the moon is about that of a dime held at arm's length. The earth would be disk only four times wider. To the naked eye this would appear fairly large, but taking a photograph is an entirely different matter. Try taking a snapshot of the moon with an ordinary camera (say one with a typical focal length of about 45mm). All you will see is a tiny white spot in the sky, looking disappointingly—and surprisingly—

small. This is the result of using a lens designed for taking pictures of landscapes, not small celestial objects that require longer, more telephoto-like lenses. The cameras the Apollo astronauts used on the moon were designed for a similar purpose: to take photographs of the lunar landscape, not sightseeing pictures of the earth. The relatively wide angles result in the earth looking much smaller than one would expect.

Some hoax proponents claim just the opposite: that there were no photographs taken of the earth from the moon. This is just plain wrong: the astronauts took many photos of the earth. Mike Bara points out that all of the images of the earth taken on 70mm film must have been taken by the astronauts themselves since all of the non-handheld photography was done on other formats.

9. Why do some of those little black crosshairs seem to go behind objects in the photos?

NASA had Hasselblad, the manufacturer of the cameras used on the Apollo missions, build in tiny, black crosshairs—called reseau marks—that would be automatically superimposed on every photo.

To do this, the cameras were fitted with a device called a reseau plate on which were etched these small black crosshairs. The plate was pressed against the film so that any image exposed on the film would contain a grid of these marks. A reseau grid is used in the science of photogrammetry for establishing a geometrical basis for measuring objects in photographs. It can be used to correct for misalignment of the film or distortions in the image after development or electronic scanning. Since the location of the marks on the reseau plate is precisely, correcting for distortion is a simple matter of manipulating the image until the marks are in the correct positions.

Reseau marks are not used, as some hoax proponents have suggested, primarily to aid in determining the distance of objects (for this multiple photos of an object are needed, taken from different positions, something the astronauts seldom did), but rather as a standard by which things such as camera orientation and distortions could be determined. So long as a print showed the marks perfectly square and evenly aligned, scientists knew that the photo was accurately reproduced. This was hardly a new technique: it had been in use in scientific and military photography for decades. The problem, as some conspiracists see it, is that in a handful of images the crosshairs appear to lie partially behind objects in the photo. How could this be if the reseau marks are built into the camera itself?

It's not exactly clear what the hoax proponents suggest this is supposed to mean. Are they implying

that somehow NASA painted all of the marks in on a huge backdrop? It certainly would have been a lot easier to have just used the built-in marks in the cameras. Fortunately, the answer once again lies in the conspiracists' profound ignorance of photography and optics. The disappearing marks are the result of an effect called irradiation. This is where a bright light source will seem to bleed into the area of a dark object in front of it. The setting sun, for instance, will sometimes seem to cause an indentation in the line of the horizon. If you hold a thin black thread in front of a bright light, you will notice how the line seems to "pinch off" as it passes in front of the bulb. This is exactly what is happening in the case of the vanishing reseau marks, which are actually extremely thin, only about 0.004 inch thick (0.1 mm; the marks look much thicker when they are reproduced in print or online). An illuminated area would have to bleed about half that much—less than the thickness of a human hair—in order to completely obscure the crosshair so it's not surprising that the hair-thin marks are simply wiped out when the illuminated area of a bright object bleeds into the lines. Every example of a supposedly anomalous crosshair involves its juxtaposition with a brightly illuminated object. There are no examples of reseau marks seeming to lie behind dark or dimly lit objects.

If irradiation is really the explanation behind the disappearing marks, then one would expect there to be occasions when the brightly lit background wasn't quite bright enough to entirely wipe out the lines. And this proved to be the case—there are several images in which a reseau mark appears to be neither in front of nor behind the bright object.

9a. In some photos, the crosshairs are not square with the edges of the photo, are misaligned with the horizon or are off center. This must mean they were added later.

No—what it means is that the photos were cropped later, with an eye more toward composition than keeping the crosshairs in the right positions or aligned with the edges of the image. Also, since the Apollo astronauts were taking hand-held (or chest-held) photographs without viewfinders and while standing on an uneven surface it would be more surprising to see the reseau marks perfectly aligned with the horizon every time than otherwise.

10. Why are the photos so perfect?

Many hoax believers think that the quality of the Apollo photos are simply too good to be true. After

all, with the cameras mounted on their chests they had to way to use a viewfinder and with the large, clumsy gloves they wore it should have been very difficult for them to manage to get shots in focus and perfectly composed.

It's true: the Apollo astronauts took many technically perfect photographs . . . but they also took thousands of dreadful ones as well. The Apollo 11 astronauts alone accounted for some 1400 frames—a great deal more than the average tourist would have taken in the same amount of time. A great many of these are good enough, but of subjects that would scarcely excite a lay person—rock and other geological details, spacecraft and equipment, etc.—so they are seldom reproduced in popular magazines and books. But a great many are also just terrible: out of focus, motion-blurred, over- and underexposed, accidental shots . . . in fact, all the same sorts of goofs that any nonprofessional photographer might take on their vacation. That the astronauts got as many excellent photos as they did is due to the many hours of training and practice they underwent on earth.

It only seems as though the astronauts managed to take perfect pictures everytime because NASA and the newsmedia have very little reason to want to publish rotten photos. Is it so unimaginable that they would only want to show the very best shots to the public? Do you put all of your photos—good, bad and indifferent—into your family album, or just the very best ones?

11. <u>How in the world did NASA get video footage of Neil Armstrong stepping onto the surface of the moon if no one had been there yet?</u>

A number of people are under the impression that Buzz Aldrin must have been the first man on the moon since he must have had to go out first and set up the video camera that captured Armstrong's first steps. It's been suggested that having to pretend that Armstrong was the first man on the moon instead of himself led to his breakdown. The answer is nowhere near as dramatic as that.

A video camera had been mounted on the side of the Lunar Module just for the purpose of shooting the first steps onto the moon. As Armstrong descended the ladder, he deployed the camera, which swung out from its storage position. If you view the videotape you can see that the left side of the image is obscured by the side of the Lunar Module and the arm that lowered the camera. This fact along with immobility of the picture is evidence that the camera was fixed solidly to the Lunar Module and was not in the hands

of a studio videographer. Once Armstrong was on the surface of the moon, he dismounted the camera and attached it to a remote support in order that the remainder of his and Aldrin's activities could be broadcast.

12. Why is that you can see through the figures of Armstrong and Aldrin as they move around on the moon? This certainly looks as though they have been superimposed onto a background.

This "ghosting" is a result of the state of the art of videography in the late 1960s. When video cameras were pointed at a bright object for any length of time an image would be "burnt" into the electronic image receiver (the component which converts the image into an electrical signal, similar to the retina in the back of your eye), similar to the way in which you see an afterimage of a photographer's flash "burnt" onto your retina. Anyone watching reruns of video shot in the 50s and 60s will have noticed many instances of moving bright lights leaving comet-like trails behind them as they burnt their image into a camera's image orthicon tube. Since the background of the lunar landscape and Lunar Module weren't moving, their image was burned into the camera and appeared to be superimposed on the moving astronauts, who seldom remained still long enough for their images to become fixed (but if you watch the entire tape, you will see many instances where just that very thing did happen, with the astronauts leaving momentary ghost-like images of themselves every time they stood still).

The Apollo 14 video camera was burnt out when it was accidently pointed at the sun.

13. The cameras were attached to the chest packs of the astronaut's spacesuits. How is it that some of the photos are obviously taken with a camera at head height?

The favorite example for this is the famous photo of Buzz Aldrin taken by Armstrong. Part of the top of Aldrin's helmet is visible as is part of the top of his backpack. How could that be possible with a camera mounted as low as Armstrong's was supposed to have been, especially when the ground between the two men was level?

The explanation is simple. First, the ground between the astronauts was not level. According to Apollo 11—The NASA Mission Reports Volume 1, the Lunar Module sat on ground that sloped at a 4.5 degree angle. Dr. David Groves calculated that this would make a difference of 300 mm in altitude between the two astronauts. This would bring the supposed head height of the camera down to chest height.

Armstrong's height was about 1803mm (5'11"). Grove's calculation of a camera elevation of between 1446mm and 1527mm would put the camera at about throat level before allowance is made for the slope. Taking that into account places the camera exactly where it was supposed to be. Add to this the fact that the astronauts could not stand completely upright and still maintain their balance while wearing their backpacks. This meant that they had to learn forward slightly, contributing to the possibility of getting the top of a helmet into a photo, especially if the photographer is shooting from an elevation.

14. What about the perfect letter "C" that clearly shows up on a rock in the foreground of one of the photos?

This has been latched onto avidly by hoax enthusiasts and it certainly is difficult to claim that something so perfectly formed and symmetrical is a natural feature on the rock. Conspiracists assert that this was some sort of code that was placed on the fake rocks so that the movie prop men would know where to place them—and one of these rocks was inadvertantly placed wrong way round.

Amazing-looking as the "C" is, it is also the easiest of all the anomalies to clear up. The solution lies in the fact that the conspiracists have not been looking at the original image. When the NASA original is examined—the "C" is not there. How it got into the image the hoax fans have made such a fuss about is open to speculation—but it doesn't really matter. What does matter is that it is not in the original photograph.

However, since pro-hoaxers have made much of the fact that the "C" is visible on a photograph in NASA's own official archive, investigator Steve Troy decided to look into the matter in some considerable detail. When he examined three sets of transparencies from three different NASA photo archives, the "C" did not appear on any of them. What he and personnel at both the Lunar and Planetary Institute and Johnson Space Center noticed was that the image of the rock that had been reproduced most often in pro-hoax publications had been enhanced to appear sharper and more regular. While the "C" was visible in the archived photo, it was not as clearly defined as it is in the reproductions the conspiracists were passing around. When LPI experts looked at the "C" under high magnification, it became clear that it was an image of something—a hair perhaps—that was sitting on the surface of the print. It is of a slightly different color than the surrounding rock and there is even a slight hint of shadow beneath it. It is unquestionably not part of

the rock itself. The reason the hair left a dark impression instead of a white one (as one would expect to see from dirt on a negative) is that NASA's prints are not made from negatives but from positive Ektachrome transparencies—like ordinary slide film. This meant that a hair or fiber on the original would produce a dark image on a print. It was suggested that the hair had probably been on the paper itself and not the transparency, otherwise it would have shown up in subsequent prints. And it does appear that the archived print is the only one that had the infamous "C".

This has always been one of the major stumbling blocks for the conspiracists. Few of them bother to examine first-generation images. Instead, they use NASA press releases—which may be any number of generations removed from the original transparency or negative. Like a photocopy made of a photocopy of a photocopy, each subsequent duplicate degrades the image. Even worse, many hoax proponents use published NASA images as their evidence. When a photo—which may already be several generations removed from the original—is converted into a halftone for reproduction in a book, magazine or poster, there is a tremendous loss of detail, no matter how high-quality the printing may be. For an extreme example, compare an original photograph with its reproduction in a newspaper. Finally, and worse of all, pro-hoax theorists will use low-resolution images of questionable provenance that have been downloaded from the internet.

16. How is it that the Lunar Module was able to cast such a large shadow on the moon when it was supposedly still 95km above the surface?

Another simple explanation: the shadow is not being cast on the moon by the Lunar Module. It is one of the attitude correction rocket nozzles seen through the window of the orbiting Command Module. A similar nozzle can be seen in photos taken from the Lunar Module while it is sitting on the surface of the moon.

17. How is was it possible to get video footage of the Lunar Module taking off from the moon when there was no one left behind to take it?

Perhaps the easiest of all the objections to answer: no one had to be there. The astronauts simply left the video camera that was mounted on the lunar rover pointed toward the LM. The first attempts at

doing this (Apollos 15 and 16) were only partially successful since the remote operator back on earth was unable to follow the ascent module as it took off. But by the time of Apollo 17, NASA had perfected the timing of the technique and the camera was successful in tracking the spacecraft.

18. There are no photos of Neil Armstrong on the moon.

Not true. There are two.

19. Why do the same backgrounds show up in pictures taken in entirely different locations?

Why shouldn't they? This is mainly another case of conspiracists forgetting that they're dealing with the moon and not the earth. There is no atmospheric perspective on the moon—the effect that gives us our main visual clues as to how far away things are. Since distant mountains on the moon look much closer than they really are, one expects there to be a greater shift in parallax when one moves from one location to another. In fact, the backgrounds are not identical—close examination shows that details in the scenery have shifted and by just the amount one would expect considering the actual distances involved.

20. What about those strange blobs that show up in the sky in some of the photos? Is NASA covering up the discovery of aliens on the moon?

These "blobs" have formed the basis of an elaborate theory by Dr. Norman Bergrun, in which he claims that NASA astronauts discovered an alien presence on the moon (more about this in a later chapter). They are actually nothing more than lens flares, a commonplace photographic effect caused by light reflecting off the interior of the camera's lens. This most often happens when shooting at or close to the sun. You can take your camera outside on any sunny day and obtain photos featuring lens flares that exactly duplicate those in the Apollo photos.

Lens flares have been indentified as UFOs since the very beginning of the phenomenon, but their distinctive shape and the fact that they are invariably aligned with a bright light source always gives them away.

21. What about those Apollo photos where ceilings, lights and other structures are clearly visible?

Those are photos of the Apollo training facility and the originals are clearly labled as such. Many of them were released prior to the first lunar landing—so they were certainly no secret—and bear but only superficial resemblance to the later photographs taken on the actual lunar surface.

Problems With the Hardware

Hoax proponents claim that the spacecraft used in the Apollo missions were in one way or another inadequate for the job. Most of their objections are based on either a lack of knowledge about the space-craft themselves or a misunderstanding of basic scientific or physical principals. In short: they haven't done their homework.

1. The astronauts could not have exited the Lunar Module because the hatch was too small. There was not even enough room inside the LM to open the hatch in the first place.

This is just plain wrong. There was more than enough room to open the hatch, although it made the interior even more cramped than it already was.

The exit hatch was located between the two astronauts, who stood to either side of it, Buzz Aldrin on the right, Armstrong on the left. The door swung inward toward Aldrin, effectively pinning him between the door and the righthand wall, which meant that Armstrong had to leave the Lunar Module first. Once he had left, Aldrin closed the hatch, moved to Armstrong's position, reopened the hatch and exited himself.

So far as the impossibility of actually getting out of the hatch is concerned, the entire sequence of Aldrin's egress from the Lunar Module was filmed by Armstrong. This maneuver was rehearsed hundreds of times in simulators . . . if it was impossible to accomplish it surely would have been noticed long before the astronauts got to the moon.

Reporter James M. Collier (creator of the video, Was It Only a Paper Moon? and Ralph René's staunchest supporter), makes much of the "fact" that the hatch on the Lunar Module is too small. His "proof"? He went to the National Air & Space Museum in Washington and videotaped the Lunar Module on display there. Since the public is not allowed to clamber about on the museum's artifacts, Collier could have had no opportunity to actually measure the hatch or see how it worked. His opinion that it is too small to admit a spacesuited astronaut was based entirely on his videotape (how, exactly, he doesn't make clear).

2. How could the astronauts get from the Command Module to the Lunar Module when their spacesuits and backpacks were too large to fit through the tunnel?

The astronauts didn't have to pass back and forth between the two modules with their backpacks on. The packs were stored in the LM the entire time, and even then the packs were only put on when they were about to perform an EVA.

3. The lunar rover was too large to fit in the lunar

Yes, it would have been if had not been made to fold up like a Transformers toy. James Collier was the originator of this "anomaly". His conclusion was evidently based on taking measurements of a deployed rover on display at the Johnson Space Center, and comparing these dimensions with the available space on the Lunar Module. His "research" seems to have never gone so far as tofind out how the rover actually worked.

4. The Lunar Module had a very powerful engine. Why didn't it produce a crater beneath the lander when it touched down?

This complaint goes back to Kaysing, who argued that there had to have been a crater because all of the pre-Apollo artists' renderings showed a crater beneath the lander. The possibility apparently never occured to him that the artists were simply wrong. Most of the post-Kaysing hoax enthusiasts have forgotten about the genesis of the "anomaly" and have instead focused on the perceived power of the Lunar Module's engine, which most grossly overestimate. David Percy, however, is not one to let a good idea go to waste—whether it makes any sense or not. He makes much of the discrepancy between artists' impressions of the lunar landing and the actual thing as though this somehow proves something. A reproduction of a NASA-published rendering of the LM landing is accompanied by a caption breathlessly exclaiming, "Artists [sic] impression of LM landing and clearly producing a very obvious exhaust." Not afraid to look foolish more than once, Percy goes on to present two other illustrations, one from the National Geographic Society and another from NASA. "When the space agency," Percy asks, "were preparing their early 'artist's impressions' of future landings on the Moon, they had the artist include the red exhaust gas and a crater

underneath the LM. So why was there no crater in the real thing?" Well, for one thing (speaking as an illustrator who has produced his share of astronautical artwork), an artist—especially one working for NASA—does not work under the sort of strict constraints Percy seems to think. In fact, if one looks at any collection of NASA-generated artwork from the 60s and 70s it is apparent that scientific and technical accuracy was not a particularly high priority. This is a tradition that has by no means been abandoned. As an artist whose particular specialty is astronomy, I cringed at a recent NASA-commissioned depiction of the future Huygens lander descending onto the surface of Saturn's moon Titan: everything about the scene, except for the spacecraft itself, was wrong—and for all I know, the lander was inaccurate as well. To suggest that somehow the Apollo program is wrong because its details didn't match the preconceived visualizations of artists is the height of naïvete.

Ignorance, too. Percy makes much of the artwork used on the LM-7 mission patch, which features a craggy lunar landscape that Percy believes was inspired by the 1929 Fritz Lang film, Frau im Mond—and thereby establishing another link in his convoluted theory of a Nazi-NASA connection. Unfortunately, Percy didn't realize that the lunar background was taken directly from a Chesley Bonestell painting that was published in The Conquest of Space in 1949.

Should the LM have produced a crater upon landing. The LM descent engine could be throttled between about 1000 and 10,000 pounds of thrust (compare this to the thrust produced by a jet fighter, which is between 18,000 and 22,000 pounds). Contrary to what most conspiracists claim, it was not used at full thrust while landing. It was throttled back as the LM descended until its thrust was just enough to maintain altitude. Since the LM only weighed about 1500 pounds in lunar gravity, this did not require anything near the full 10,000 pounds of thrust hoax proponents claim was used during the landing. A thrust significantly greater than the weight of the spacecraft would have caused it to take off again. The engine was also cut off just before touchdown—the LM actually fell the last few feet onto the moon. (There were four long probes hanging below each footpad which detected first contact with the lunar surface—you can see the drag marks they made in photographs of the lander on the moon.) There is film, however, showing dust violently blowing away from the descending lander just before it settled onto the surface. This dust did not billow (or billowed very slightly within the gasses created by the engine), but settled to the ground instantaneously when the engine was shut off because there is no atmosphere on the moon to support it. But even

more to the point of the conspiracists' objections, the LM did leave a small depression, as well as radially scouring away the few inches of dust that lay on the surface. Several photos clearly show the shallow crater beneath the descent engine.

Here is something to think about: have you ever seen the Harrier jump jet leave a crater when taking off or landing on soft earth or sand?

5. If there is no air on the moon, how come the flag the astronauts planted can be seen waving?

There are a couple of reasons, but the first thing I ought to point out is that, contrary to the claims made by some hoax proponents, there is not one second of videotape or film showing the flag waving without an astronaut holding the flagpole. In other words, the flag is moving because the astronaut is making it move.

Since there is no atmosphere on the moon to support a flag, the one the astronauts erected was held up by a horizonal rod attached to its top edge. When moved, the flag would swing, pendulum-like from this rod. But as soon as the astronaut removed his hand from the pole, the flag would quickly come to a stop. There are many still photos that look very much like pictures of a flag caught in mid-movement, but that impression is nothing but an illusion. The flags never hung perfectly straight, the supporting rods were hardly ever horizontal and the flags themselves were wrinkled. All of these factors added up to making the flag look quite different when seen from different angles, contributing to the illusion of a moving flag.

The Apollo flag assembly consists of a telescoping tubular pole shoved vertically into the lunar soil. Attached to the top of this was a telescoping horizontal support attached by a hinge. The flag itself was a commercially available nylon flag. A hem was sewn into the top edge into which the horizontal crossbar could be inserted. The astronaut deployed the flag by driving the steel-tipped aluminum pole into the ground, then raising the crossbar on its hinge until it locked into the horizontal position. He would then extend the telescoping segment of the crossbar to support the entire width of the flag. The inner bottom corner was fastened to the pole. The outer bottom corner was free to move. The astronauts said it was hard to drive the pole into the lunar surface. The Apollo 11 astronauts had no means of hammering it in. In later missions the top of the pole was reinforced so that a geologist's hammer could be used to drive it. The flag pole was also twisted in the fashion of a drill bit so that it would bore into the soil. Twisting the pole would cause the

outer tip of the crossbar to describe an arc with a radius of about five feet (1.5 meters). The free corner of the flag, suspended from the tip, would swing back and forth, creating the penduluming motion that many conspiracists have confused with a flag waving in the wind.

Although the flag could have been smoothed out flat by stretching to its full width on the crossbar, this was not done since most of the astronauts felt that a wrinkled flag looked more "natural".

6. The 1960s-vintage computer on board the Lunar Module would not have been nearly powerful enough to compute something as complex as a lunar landing.

"In 1969," according to one hoax-supporter, "computer chips had not been invented. The maximum computer memory was 256k, and this was housed in a large air-conditioned building. In 2000 a top of the range computer requires at least 64Mb of memory to run a simulated moon landing, and that does not include the memory required to take off again once landed. The alleged computer on board the Apollo 11 had 32k of memory."

The question is: just how powerful did the onboard Apollo computer have to be? Comparing the actual lunar landing to a computer game simulation is hardly pertinent. None of the Lunar Module's computer power was needed for graphics or high-resolution video displays—which is what eats up most of the memory in today's computer games. Besides, the bulk of the work was done by the big computers in Mission Control, which radioed the results to the spacecraft.

7. The air pressure inside the spacesuits would have made it impossible for the astronauts to move.

There's not too much that can be said in reply to this other than that it's not true. The people who claim that the astronaut's spacesuits would have swollen like balloons, rendering them immobile, must think that the Apollo astronauts were wearing the first spacesuits ever made. The fact of the matter is that the "spacesuit" has a history going back to the 1930s, when aviator Wiley Post developed a special pressure suit to enable him to function during record-breaking altitude flights. A major breakthrough came in the development of segmented, bellows-like joints at the knees, hips and elbows which improved use of the limbs. This striking visual aspect of the early 40s suits resulted in their being termed "tomato worm suits," after the

distinctive corrugations of the tomato hornworm's body which had originally inspired inventor Russell Colley. This innovation allowed the wearer of a full pressure suit much more mobility. The design was incorporated into the spacesuits used in the Mercury program. The problem of manuevering in a pressurized spacesuit was dramatized by Cosmonaut Alexei Leonov's historic space walk, during which his spacesuit expanded so much it took him eight agonizing minutes to reenter his spacecraft. Ed White's subsequent experience on his own space walk was not much better. The astronaut was rendered nearly immobile. By the time of the Apollo program, however, suit mobility—primarily though the use of improved constant-volume joints—allowed one engineer to perform jumping jacks, push up and toe touches while wearing the new A7-LB Apollo suit. ILC Dover, the manufacturer of the Apollo spacesuits, describes the problem they faced this way: "When pressurized, the 'soft' material portion of the suit becomes very rigid and nearly impossible to bend except where specially-designed joints are provided . . . Without these joints it would be virtually impossible for the astronaut to do useful work. These special joints are located at the knees, wrists, shoulders, elbows, ankles, thighs and waist of the SSA [Space Suit Assembly]. Normal body movements by the astronauts cause the suit joints to bend."

The astronauts had, of course, months of training and practice in using the clumsy suits, so they were in fact quite adept in working in them.

8. The spacesuits could not have handled the temperatures on the moon.

Since there is no air temperature on the moon, all temperature readings are based on how hot or cold its surface is. The soles of the astronauts' boots were made especially thick to insulate them from the soil although lunar dust and rocks do not conduct heat very well, so there was actually very little danger in walking around or handling rocks. They were also made of silicone rubber, which can withstand high temperatures. For the rest, the spacesuits were covered with a highly-reflective white fabric.

9. If the Lunar Module really did scatter so much dust during the landing, how is it that there is no dust on the lander's footpads?

Another easy question to answer: There is dust on the footpads and you can see it in several photo-graphs.

10. The Lunar Module was too unstable to have made a successful landing.

Ralph René makes much of this assertion, suggesting that even the slight movements of the astronauts piloting it would have been enough to throw it out of control. As proof of this instability he points to Neil Armstrong's near-fatal accident during training.

He is completely wrong. The LM had a computerized guidance and inertial control system—similar to that which had been stabilizing rockets for decades. It was a well-proven system. The attitude of the LM was determined automatically several times a second by matching the movement of a system of gyroscopes against a "stable member" attached to the structure of the LM. Any variations from the expected attitude would be corrected by adjusting the engine, either by moving in its gimbals or by throttling it. The system also controlled the Reaction Control Subsystem, several small rockets mounted around the LM that allowed even more fine-tuning of the spacecraft's attitude. In addition to all of this automatic control, the pilot could override the system at any time to make manual adjustments.

11. Why is no flame visible when the Lunar Module's ascent stage takes off?

As proof that there should have been a visible flame, many hoax proponents point to early NASA artists' impressions that show a flame blasting out of the engine of the ascent module. This makes no more sense than using artists' impressions of a crater beneath the lander as "proof" that there ought to have been one. Bluntly: the artists were wrong.

There are two reasons for the exhaust being invisible—the nature of the fuel being burned and the nature of the lunar atmosphere.

Problems With the Moon

1. How did the moon acquire a layer of top soil without wind or water to erode the surface rock?

This question is asked by James Collier, who subtly loads the question by using the word "top soil", which suggests the layer of organic material that covers much of the earth's surface. But whatever sense he is using the word "soil", the fact remains that there is erosion the moon. How in the world does Collier think

the lunar mountains became so rounded? This quality of the lunar surface—its topography has been compared to South Dakota—is not something made up by NASA. It is easily observable from earth. Although the popular image of the moon as being covered by craggy, jagged, precipitous peaks had persisted into the early 1960s (primarily through the influence of astronomical painter Chesley Bonestell), astronomer-artist Lucien Rudaux had pointed out back in the 1930s that the lunar terrain would in fact be smooth and rolling and showed how anyone with a telescope could see for themselves that this is true.

The erosion that smoothed the lunar terrain and created the layer of dust on the surface had at least two major causes: thermal erosion and micrometeorites. The first is the result of the extreme temperature changes that occur between night and day—a range of 500 degrees Fahrenheit. The second have effectively been sandblasting the moon for the past few billion years.

2. The astronauts could not have taken any pictures on the moon because the film would have melted in heat of the sun, which reaches 250 degrees Fahrenheit in the daytime.

True enough, 250 degrees is more than enough to melt photographic film. The answer is that the film was never exposed to any such temperatures. Once again, it is easy to forget that the moon is not the earth. Space itself, being a vacuum, has no temperature. Only objects within it, such as the moon, astronauts or spacecraft, do. Temperatures on the moon refer only to the temperature of the surface. Even on earth, the surface temperature is an entirely different thing than the air temperature. A balmy 80 degree day may not feel uncomfortable, but it would be painful to walk barefoot over an asphalt parking lot, which may be well over a hundred degrees.

There are three ways in which heat can move from one place to another. The first is convection, which requires the physical movement of some heated substance. Hot air, for instance, carries heat from a basement furnace to the rooms of a house by convection. The second is conduction, in which heat passes through substance. The heat that flows from one end of a hot poker to the other is carried by conduction. Last is radiation. You can find out for yourself the difference in efficiency between conduction and radiation, though the experiment is a potentially painful one: You can easily stick your hand into a 350 degree oven with no real discomfort, but if you take hold of the baking pan inside you'll instantly burn yourself.

A Thermos bottle (known by physicists by its proper name of Dewar flask, named for its inventor)

works by taking advantage of the qualities of all three forms of heat transfer. Between the inner and outer layers of the bottle is a vacuum. This prevents the transfer of heat by convection. The separation of the inner bottle from the outer bottle takes care of the problem of conduction: there is nothing to carry the heat except the very small area at the neck of the bottle where the inner and outer layers meet. Finally, radiation is taken care of by silvering the inner surface of the bottle. This reflects the heat and prevents it from escaping.

The moon is effectively a natural Thermos bottle. The vacuum prevents heat transfer by convection. If an object is covered with white or gold-plated material, it will reflect most of the heat that is arriving by radiation. All of the vital equipment used by the astronauts (including their spacesuits) was covered by highly-reflective white fabric. Often, the space beneath the fabric was the vacuum of space, which acted like the interior vacuum in a Thermos. The cameras were protected in this way and that is why the film never got hot enough to melt.

3. Dave Scott (of Apollo 15) performed an experiment where he dropped a hammer and a falcon feather while on the moon. They both landed on the ground simultaneously, but this doesn't prove anything.

Astronaut Dave Scott tested Galileo Galileo's famous assertion that bodies fall at the same rate regardless of their respective weights. That is, a ten-pound cannonball will fall just as fast as a twenty-pound cannonball, not half as fast as one might intuitively think. Galileo realized that light objects will often seem to fall more slowly not because the weigh less but because they are more susceptible to the resistance of the air they are passing through. The only reason a hammer will hit the ground before a feather will is because air resistance holds the feather back. (You can see this for yourself by peforming a very simple experiment. Hold a book and a feather—a dollar bill works just as well—the same height above the floor. Release them simultaneously. The book will hit the floor long before the feather finishes fluttering down. But if you eliminate air resistance from the feather's fall, it will fall as fast as the book. You can do this by simply shielding the feather from the air by placing it on the cover of a second book. Now, when you drop both books, the feather will fall along with them.) Scott's demonstration was particularly impressive because it would only have been possible in a vacuum.

James Collier and Dave Cosnette have problems with this experiment. Collier misdescribes it by saying "that the experiment wasn't done to prove the absence of atmosphere, but to prove that an eagle

[sic] feather and a hammer would both fall at the same rate of speed because the moon has gravity (1/6th as strong as Earth's) . . . on Earth . . . they would both fall at 32-feet per second-per-second." Yes, but only in the absence of an atmosphere. So while the primary purpose of Scott's experiment was to demonstrate Galileo's assertion that objects will fall at the same rate regardless of their weight, he secondarily proved that the moon has no atmosphere since his demonstration would have been impossible otherwise.

Cosnette's website attempts to refute this by showing a little video clip of a hammer and feather falling together, presumably in an atmosphere (they are being dropped by someone wearing a lab coat)—both plummet to the floor simultaneously. What makes this video a little suspect—other than the fact that Cosnette cites no source for it—is that the feather bounces when it hits the floor! What in the world was it made of? Iron?

4. With no atmosphere to diffuse it, sunlight on the moon would be blinding.

No more so than here on earth. Sunlight on the moon is not significantly brighter than it is here. The astronauts had to wear gold-plated visors on their helmets not to protect them from the brilliance of the sunlight but from the ultraviolet radiation that is normally blocked by our atmosphere.

5. When the astronauts move around in what is supposed to be low lunar gravity, it looks fake.

Conspiracists have suggested that the low gravity effects were achieved by "Peter Pan rigs"—wires suspending the astronauts—or by shooting them in slow motion. Dennis Muren, the eight-time Oscar-winning senior special effects supervisor at Industrial Light & Magic disagrees. "A moon landing simulation might have looked pretty real to 99.9 percent of the people. The thing is, though, that it wouldn't have looked the way it did. I've always been acutely aware of what's fake and what's real, and the moon landings were definitely real. Look at 2001 or Destination Moon or Capricorn One or any other space movie: everybody was wrong. That wasn't the way the moon looked at all. There was an unusual sheen to the images from the moon, in the way the light reflected in the camera, that is literally out of this world. Nobody could have faked that."

Kaysing's response to this criticism is typically conspiratorial: "Perhaps this guy was part of the cover-up. Anything is possible."

But Muren's point is difficult to dismiss: the Apollo video and film footage looks nothing like that from any science fiction film before or since. One would think that even modern CGI-driven special effects would be able to convincingly duplicate thirty-year-old Apollo images, but it cannot. How was it possible with 1960s film special effects technology?

In the matter of faking low gravity conditions, there is one effect that most conspiracists go out of their way to avoid. When dust is kicked by the astronauts or thrown by the tires of the Lunar Rover, it does not billow or hang in the air as it would if there were an atmosphere. Instead, it follows parabolic arcs, dropping immediately back to the ground . . . exactly as it should behave in a vacuum. The action of the dust is striking when watching any of the Apollo videos. (Compare this with, for example, the dust kicked up by the Aries spacecraft when it lands at Clavius Base in 2001: it billows in the atmosphere in which the model was being shot.) The only possible way to have faked this would have required a football field-sized soundstage complete evacuated of all air. The technical and engineering difficulties of doing this, to say nothing of shooting the film, would have made it easier and simpler to go to the moon to do it.

When some of the Apollo footage is projected at a faster speed, as was done in a Fox television documentary, some of the movements of the astronauts do look vaguely "normal", implying that the original film was shot in slow motion, slowing down movements of astronauts that were actually being made under normal earth gravity. But this "correction" also makes many other actions look very strange—it fails to "normalize" everything as one would have expected it to. Some actions come out looking speeded up and others just plain odd. Only in the original projection speed does everything look consistent.

6. How do we know the rock samples came from the moon?

Conspiracists suggest that the rock samples brought back by Apollo astronauts could have been easily faked on earth. "How do we know they came from the moon?" they ask. "There's nothing to compare them to." Well, yes there is. The Soviets obtained lunar samples from their unmanned Luna 16 spacecraft in 1970. They matched the Apollo samples brought back both before and after that mission. Since the Russians had no reason to support American findings (and every reason not to), it must be assumed that the Apollo samples really did come from the moon. And we know that at least some of the Apollo rocks were in fact picked up by the astronauts (as opposed to some unmanned device similar to the Russians) because

we can see the identical rocks sitting on the lunar surface in photographs with the astronauts.

7. The pads of the Lunar Module and the footprints of the astronauts are too sharp-edged to have been made in dust. The soil must have been moist to have held its shape that way.

Not at all. Any extremely fine powder (such as ordinary flour) will take an imprint in this way. But the dust on the moon has a special character that particularly lends itself to this, which lies in the microscopic structure of the individual soil particles. On earth most soil particles rub against each other as they are acted upon by wind and water. This rubs off the rough edges—hence the rounded quality of ordinary beach sand. But lunar soil has no wind or water to erode it at the microscopic level, and so it retains the sharp edges that allow each particle to firmly adhere to its neighbor.

Moreover, there is the effect of "vacuum bonding". While silicates—of which the lunar soil is primarily composed—have a natural tendency to cling together, spaces between particles on earth are filled with oxygen, which inhibits them from bonding. On the moon, however, the lack of atmosphere means that the particles will cling together much more easily, especially when compressed by something like an astronaut's boot.

The the lunar soil would pack in this way was well-known even before the first Apollo landings. Photographs were sent to earth by the unmanned Surveyor lander of the trenches cut by its sampling scoop, and they show exactly the same "wet sand" effect.

Problems With the Space Environment

1. The radiation in space, in particular that of the Van Allen radiation belts that surround the earth, would have been fatal to the astronauts.

Like the problem of "anomalous" shadows, this is one of the most-cited arguments against the reality of the Apollo program. First, it should be explained that the Van Allen radiation belts are very real and do pose some threat to an astronaut's health. They are a pair of donut-shaped rings of high-energy particles trapped by the earth's magnetic field. One is about 3000 km above the earth and is about 5000 km thick. The outer belt is between 15,000 and 20,000 km above the earth and ranges between 6000 and 10,000 km in thickness.

Hoax proponents quote NASA physicist John Mauldin, who "once said shielding at leat two meter [six feet] thick would be needed" to protect the astronauts. The problem with this concern is that it doesn't take into consideration the amount of time the Apollo astronauts actually spent in the radiation belts. The Radiation Plan for the Apollo Lunar Mission, prepared by NASA's Space Physics Division, concluded that "Van Allen radiation doses can be kept small by use of low-altitude orbits or by rapid movement through the belts . . . The radiation plan for the Apollo lunar mission calls for low-altitude earth orbits and rapid transit to the moon to keep the Van Allen belt radiation dose below 1 rad." And in fact, the altitude above the earth of the orbiting Apollo spacecraft (and most other manned spacecraft before and since), was far below that of the belts, and the time spent within them on the way to the moon was too short to cause any harm—at a speed of 25,000 mph, the astronauts would have been within the belts for only about half an hour.

The supposed radiation hazard of the Van Allen belts is one of Ralph Renés primary concerns. According to one critic, René's problem lies in confusing particle radiation with wave radiation. While the former is certainly more dangerous to biological specimens than the latter, particle radiation, of which the Van Allen belts are comprised, is much easier to shield against. While it takes a considerable amount of heavy material, such as concrete or lead, to shield against gamma or X-rays, the most damaging particle radiation (such as alpha particles) can be stopped by a sheet of paper. The actual radiation dosage experienced by the Apollo astronauts has been calculated to be no more than twice that of the U.S. recommended limit on annual exposure for radiation-prone environments. However, it is not at that level that illness occurs. That requires much greater and more prolonged exposures. Government regulations have a considerable built-in safety factor. Even though the astronauts did in fact have to endure more radiation than might have been acceptable for the average person, René's assertion that this would have inevitably resulted in illness or death is unfounded.

Hoax enthusiasts assert there is more danger from space radiation than just that produced by the Van Allen belts. "Outer space is awash in radiation," says one, "that emanates from solar flares firing out of the sun." Indeed, the only radiation the scientists actually feared was that which would have been generated by a massive solar flare—but they counted on the rarity of such events to protect the astronauts, whose shielding would have been entirely inadequate. Hoax supporters like to point out that astronomers recorded "no less than 1485" solar flares during the Apollo flights—but this is misleading in that these flares didn't

produce the deadly bursts of radiation produced by the much rarer massive flares that did in fact worry Apollo scientists.

Weird Questions

1. When Alan Shepard playfully hit a golfball on the moon with a homemade club, Mission Control teased him about slicing the ball to the right. Since a slice caused by air passing around the ball, how could this be possible in an airless environment?

The clue is in the word "tease"—Houston was making a joke (get it?) The ball actually went straight (landing only a few hundred feet away in spite of Shepard's whimsical boast that it went "miles and miles").. 2. If the Apollo astronauts really went to the moon, why don't we just point the Hubble Space Telescope at the landing sites and look for the debris?

Various forms of this question are asked by several conspiracists. "If debris from the Apollo missions was left on the Moon," states a pro-hoax website, "then it would be visible today through a powerful telescope."

The material left on the moon by the astronauts is simply too small to be seen by any ordinary earth-based telescope. It is even too small to be seen by the Hubble Space Telescope. If the Lunar Module was as large as 10 meters on a side, it would only subtend an angle of 6 milliarcseconds as seen from the earth. The resolution of the Hubble telescope is a little less than 46 milliarcseconds. This means that in order for the Lunar Module to be resolved by the Hubble Space Telescope it would have to be fifteen times larger, and even at that it would only appear as a tiny dot.

This is not to say that the landing sites are invisible to any remote instrument—the Clementine lunar orbiter recently succeeded in photographing the Apollo 15 landing site and the Lunar Module's descent stage is just visible as a small dark dot exactly where it was expected to be. Nor is it to say that any Apollo "debris" is not detectable by earth-based instruments: a reflector erected on the surface has returned laser beams aimed at them from earth, proving that someone, at least, put them there.

3. Why didn't the Apollo astronauts set off some sort of signal or make a mark that would have been visible

from earth to prove that they were on the moon?

What for? Who ever would have thought that anyone would ever doubt it! It has been suggested by at least one conspiracist that the astronauts could have spread sheets of silvered mylar over hundreds of square yards of the surface of the moon, or spread acres of soot, creating a signal conceivably visible from the earth. Do they think the astronauts had nothing better to do?

4. Surprisingly, precious little has been written about the Apollo missions except the standard "puff" pieces in the New York Times and Washington Post. Why?

This was the assertion of James Collier, creator of Was It Only a Paper Moon?, the first video devoted to the subject of an Apollo hoax—produced when he was unable to find a publisher for a book on the subject. Even though he spent "months at the New York Public Library, the Library of Congress in Washington and the United States Archives" he somehow managed to overlook the nearly 900 books written since 1969, from the two-volume book-record set published by Time-Life only a few months after the Apollo 11 landing to Andrew Chaikin's recent A Man On the Moon and The Last Man on the Moon by Gene Cernan and Don Davis. NASA itself has published official histories of the Apollo program, including Chariots for Apollo, which was devoted to the development of the spacecraft used in the missions.

5. The moon is so reflective that anyone orbiting above its surface would be blinded by the light.

According to the anonymous author of one pro-hoax website, since the moon is bright enough to illuminate the earth from a quarter million miles away, it would blind anyone close enough to land on it. The idea, apparently, is that the moon gets brighter as one gets closer to it. In fact, the opposite is true. As you approach the moon in a spacecraft, the moon covers more area of the sky—but the amount of light being reflected from the moon at any one time remains constant. Therefore, as you approach the moon this fixed amount of light gets spread over a larger space. The result is that the moon grows dimmer the closer you get to it.

6. You can see a big earth in the window of the Command Module when it is supposed to be near the moon.

The “big earth” that appears in the window is obviously nothing more than a reflection of an internal light source.

Chapter 6—Even Loonier

Related to the proponents of the theory that the Apollo missions were faked are those that believe that the United States did indeed go to the moon, but it is the discoveries made there that are being covered up.

William L. Brian II was forced to self-publish Moongate, which is now quite difficult to find. He does not doubt that the United States sent spacecraft to the moon, it is the motives for the mission that he questions as well as the scientific "discoveries" that were officially announced. While he believes that NASA went to the moon, he disagrees on the conventional explanation of how this was managed. Instead of using giant, chemically-fuelled rockets such as the mammoth Saturn, NASA used the antigravity technology developed from crashed UFOs. Like Richard Hoagland, Brian is convinced that NASA discovered the presence of an alien intelligence on the moon and has fabricated an elaborate hoax to cover up the true facts. The basis of his contention is that NASA is lying outright when it claims that the moon's gravity is about 17 percent that of earth's—a ratio that has been accepted by astronomers for centuries. Instead, NASA discovered in the 1960s that the moon's gravity is actually 64 percent as strong as earth's. It is this discovery, Brian claims, that inspired a grand NASA coverup. If what he believes is true, Brian claims, than Newton's Law of Universal Gravitation (on which calculations of a planet's or moon's gravity is based) is wrong, and if so this puts all of conventional physics on a "shaky foundation". Moreover, if the moon's gravity is in fact this strong it may mean that the moon is capable of retaining an atmosphere. And if there is an atmosphere there may be life.

Brian accuses NASA of indulging in the same sort of theatrical shenanigans asserted by Kaysing and Percy. If the moon has a gravitational only a third less than earth's, then it's obvious that the one-sixth gravity effects visible in the Apollo films—astronauts bouncing around like kangaroos for instance—had to have been faked. In fact, he finds evidence in the films themselves that the astronauts were actually moving in a stronger gravititational field than that claimed by NASA (and every astronomer on the planet). According to his calculations, an astronaut weighing 185 pounds carrying a life support system of the same weight should have been able to leap six feet off the ground in a lunar gravity one-sixth that of earth. Yet none of the Apollo astronauts ever appeared to be able to jump more than about eighteen inches. Brian suggests that NASA used the weight of the bulky backpacks to explain away what he describes as "anemic jumping". To give the

illusion of low gravity, all of the Apollo films were taken in "semi-slow motion". (The assertion that low gravity effects were simulated by slow motion photography was repeated in a Fox television program [one hesitates to say "documentary'} about the Moon Hoax. To demonstrate this, the producers ran footage sped up to "normal" speed. Some of the astronauts' movements did indeed look more "natural", but the overall result was that overcranked effect peculiar to silent movies.) Brian wonders why the astronauts were so winded while hiking around on the moon? Surely every movement would have been easy if the gravity were actually as low as NASA claims.

Brian's mathematical "proof" of a high lunar surface gravity fills an entire appendix in his book. In short, it is based on a presumed discrepancy in the reported official position of the so-called "neutral point". This is the point in space where the gravity of the earth just balances that of the moon. The actual position depends on the relative gravitational pulls of the two worlds. If the gravity of the moon and earth were equal, the neutral point would fall exactly halfway between the two worlds. Since the moons' gravity is lesst than that of the earth, the neutral point falls closer to the moon. Until the advent of the Apollo program, the neutral point was usually given as being about 24,000 miles from the moon. In 1969, however, Wernher von Braun stated that it was actually 43,495 miles. If von Braun's figure is the true one, Brian claims, then the moon's gravitational pull must be much greater than the "official" figures. If the moon's gravity is indeed as high as Brian says it is, then NASA had to have had antigravity technology: conventional rockets simply would not have been powerful enough to land there and take off again.

The position of the neutral point, however, is not as simply calculated as Brian assumes. If the gravities of the two worlds are plotted separately, they cross at a point 24,000 miles from the moon. But if their gravities are plotted as interacting with one another, as they do, the neutral point shifts to 43,000 miles. The two different figures come from calculating the neutral point in two different ways. There is no need to suppose a higher gravity for the moon.

Like Percy, Kaysing and just about every hoax proponent, Brian is unduly impressed by the depiction of the lunar surface in early artists' impressions and science fiction films. He compares the moon's gently rounded surface with the steep, craggy, rugged peaks that were a cliché of science fiction and popular science books since the 1860s. He sees the rolling lunar landscape as proof of erosion by weather and water, without, obviously, being aware that astronomers had not only known the true appearance of the

moon's terrain since at least the 1930s, but were also perfectly comfortable with the explanation that thermal expansion and micrometeorites were entirely sufficient to explain the erosion. He claims that certain Apollo photos show signs of atmospheric diffusion—though I've never seen any sign of this—and that NASA painted out the blue lunar sky with black.

Brian believes that the moon's atmosphere might be as dense as the earth's and is probably breathable. The Apollo astronauts probably didn't even need life support systems. "It follows that [their] suits wree probably only used during filming to propagate the cover-up" But if the moon actually has a dense atmosphere, what about the motion of dust thrown up by the Rover's tires or the astronaut's boots? It acts exactly as dust would in a vacuum. And what about the famous experiment performed by Dave Scott during the Apollo 15 mission? Replicating Galileo's famous experiment (which used different-sized cannonballs), Scott dropped a hammer and a falcon feather. Both hit the ground simultaneously. How was this possible if there was an atmosphere present? The feather should have fluttered down, coming in a poor second to the hammer. The best explanation Brian has for this is that "The feather probably concealed a rather heavy object".

The thousands of craters that pit the moon are not the result of the impacts of meteors and asteroids, according to Brian, but are instead the aftermath of a "terrible war" that took place "less than 30,000 years ago". From here, Brian extrapolates an elaborate fantasy of extraterrestrial warfare that would have had a difficult time getting published in Startling Stories