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The Great Pyramid at Giza

Abstract: *The complexity, precision and size of the Great Pyramid are contrasted to the simplicity of pharaohs� tombs. It is proposed that it is a plutonium mill. Its perfection of construction and choice of materials are compared against all other pyramids. The current history of plutonium production is related. The internal geometry of the pyramid is given correspondence to the process steps of breeding plutonium, separating plutonium from other material, disposing of radioactive waste, using water and producing hydroelectric power. The practical value of plutonium and the economic justification of the pyramid are discussed. Later attempts by the Egyptians to recreate the power and value of the pyramid are analyzed. Scientific methods for testing whether or not nuclear fission occurred within the pyramid are defined.*

Introduction

The Great Pyramid at Giza has remained a complete mystery in modern times. When was it built? Who built it? Above all else, what is it? Conventional Egyptology declares that all pyramids were tombs for the pharaohs.

The sophistication, required technology and cost of the Great Pyramid conflict with the thought that it is simply a tomb. This level of effort for a burial place stretches common sense to the breaking point.

To quote Alan Alford (**The Phoenix Solution**) �Is it so crazy to suggest that the unique design of the Great Pyramid was a legacy from an earlier, more advanced culture? In my view, it is certainly much less crazy than continuing to believe that the Pyramid was constructed as a tomb for a dead king, and that he built this totally over-engineered and revolutionary wonder of the world with absolute perfection at the first attempt.�

His statement was the genesis of this paper.

It is proposed here that the Great Pyramid was a nuclear fission production mill, and it was a technical and financial success. It did not create energy but packaged energy within artificially created isotopes of plutonium. This hypothesis is not fantastic in the sense that it would be a physical impossibility but is fantastic only in the fact that it upsets the conventional history of man. The case for this claim is developed in the remainder of this paper. The approach is to drop preconceptions about religion and culture, and look upon the Great Pyramid as a business investment.

The Development of Nuclear Energy

The awareness and confirmation of the release of a vast amount of energy from nuclear fission was realized in the late 1930s. The Second World War was initiated at the same time. The entire realm of nuclear fission quickly became hostage to the war and was placed under military control. It was developed not in terms of a new source of energy for civilization but as a weapon of destruction: the fission bomb.

There were two routes to making bomb material. The first avenue involved the extraction of the fissionable isotope U-235 from uranium ore, which is almost entirely non-fissionable U-238. The natural U-235 concentration of 0.72% weight fraction had to be purified to 80% weight fraction. This concentration can be made to go supercritical, or in other words, a bomb detonation. This type of purification is extremely difficult and involves hundreds of stages of separation because the only difference between the two uranium isotopes is their very slight weight difference. This separation was considered so difficult, that an alternate route for making bomb material was also pursued during the war.

If a sufficient amount of uranium ore is placed in the correct geometry with a �moderator�, such as graphite or water, the neutrons released by U-235 can be used to create Plutonium 239 from U-238. Pu-239 is bomb material and is chemically distinct from uranium. It can be chemically separated from reacted uranium ore by solvent extraction. This procedure is immensely easier and simpler than U-235 purification. Furthermore, a great deal of Pu-239 can be produced from the minute fraction of U-235 in uranium ore. This route was pursued at Hanford, Washington.

The natural fission of U-235 releases two to three neutrons which have high velocity. If these neutrons are allowed to pass through graphite or water, collisions with the nuclei lower the speed of the neutrons and reflect them back into the uranium ore where they can cause more fission of U-235 and can be absorbed by U-238 nuclei. This absorption creates Pu-239. The Pu-239 can also undergo fission from returning neutrons, which releases two to three neutrons. These neutrons can be reflected back into the uranium ore to create even more plutonium. The capacity for a rapid geometric growth in plutonium is �unlimited� and there can be a runaway reaction if the system is not carefully controlled. Control rods, which absorb neutrons, can be inserted into the reactor core to rapidly reduce the population of neutrons. This control material not only can prevent a runaway reaction but it can be used to bring the entire fissioning process to a halt. Alternatively, if the graphite or water is suddenly removed from close proximity to the uranium ore, the fissioning process will also come to a halt.

If a nuclear core is run improperly and undergoes a runaway reaction, the energy release will physically blow the reactor apart and the runaway reaction will stop. Such an event does not measure up to a fission bomb detonation by several orders of magnitude. It does constitute a conventional size thermal explosion and creates a radioactive mess. This happened at Chernobyl, which used graphite.

If a nuclear core that was set up to create bomb grade plutonium is run too long, other isotopes of plutonium will be created. If their concentration reaches 7% or more of all plutonium, then the plutonium **cannot** be used for a fission bomb. The other plutonium isotopes interfere with the growth in neutron population being created by Pu-239 and the material cannot go supercritical. **However, this mix of plutonium isotopes can be used to produce energy for civilized use.**

This fact is the technical and economic basis for breeder reactors. Such a reactor produces an amount of useful energy and also creates more nuclear fuel than it consumes. Through the breeding process, the amount of useful nuclear fuel within U-238 ore can be increased almost one hundred times. This process constitutes a highly profitable venture, if properly designed.

Because plutonium was used in two of the first three fission bombs, which were used in war, the public perception of plutonium is limited to its use in fission bombs. It is not perceived as an energy source and is considered to be evil. In actuality, plutonium is inanimate; does not possess the capacity of morality, and cannot make decisions. Its behavior is completely predictable. Commercial nuclear reactors are officially powered by uranium. In reality, one third of the energy production comes from plutonium, because it is made and consumed in the reactor core.

At Hanford, Washington, nine nuclear breeder reactors were built in succession for the sole purpose of making bomb grade plutonium. About 15 monstrous process plants were also built to process the spent reactor cores, and extract and purify plutonium, and segregate radioactive waste. The production of energy was a secondary issue. The operating lifespan of these units was short; none being longer than 21 years. Although graphite was used at Hanford, water can also be used as a moderator. In addition, a flow through of water around the reactor can take away the released energy in the form of hot water or steam. This limits the temperature of the reactor and prevents a �meltdown�.

Official Egyptian History of The Great Pyramid

The history of the ancient Egyptian civilization was recorded in hieroglyphics cut into stone. Even when �paint� was used on the stone, the symbolization was first cut into the stone. None of these stone records attribute the Great Pyramid to a pharaoh or anyone else. There is no record of when it was built, why was it built or what its purpose was. There are no symbols cut into the stone of the Great Pyramid. The only symbolism found was �discovered� by Howard Vyse in 1837 in a recess above the Kings Chamber which was not accessible until Vyse blew open a path to it with black powder. It consisted of only pigment and is considered highly suspect. The symbols were completely out of character with how and where ancient hieroglyphics were done. Therefore, Vyse�s claim that Khufu built the Great Pyramid is in extreme doubt.

There is no artistic expression to the pyramid. To quote Alan Alford �the builders of the Great Pyramid seem to have been concerned only with accuracy and stark functionality.� Nothing was found inside the pyramid, which related it to any pharaoh by attribution or by possessions. The sarcophagus bears no resemblance to any coffin for a pharaoh.

Technical Construction of The Great Pyramid

The accuracy and the precision of the Great Pyramid both at the level of individual blocks, and as a whole, are without precedent. Modern day engineers are at a loss as to how it was done. The tools described as necessary for the cutting of stone and the positioning of stone have never been found nor are they referred to in ancient records. The precise cutting of granite, including precise interior surfaces, requires complex, powered machinery with industrial diamond bits. The raising and exact positioning of granite blocks as heavy as 80 tons to heights as much as 300 feet above grade would require huge, powerful cranes � according to current industrial practice. It is simply beyond the capacity of wooden structures and human laborers. The entire positioning of the whole structure is so accurate that modern, surveying, optical equipment would seem to be an absolute necessity.

The interior fit of stones in the Kings Chamber and Great Gallery appears to be almost watertight. A mortar was used which had a higher hardness than the stones it was used on. The mortar was analyzed for elemental content but it has not been duplicated.

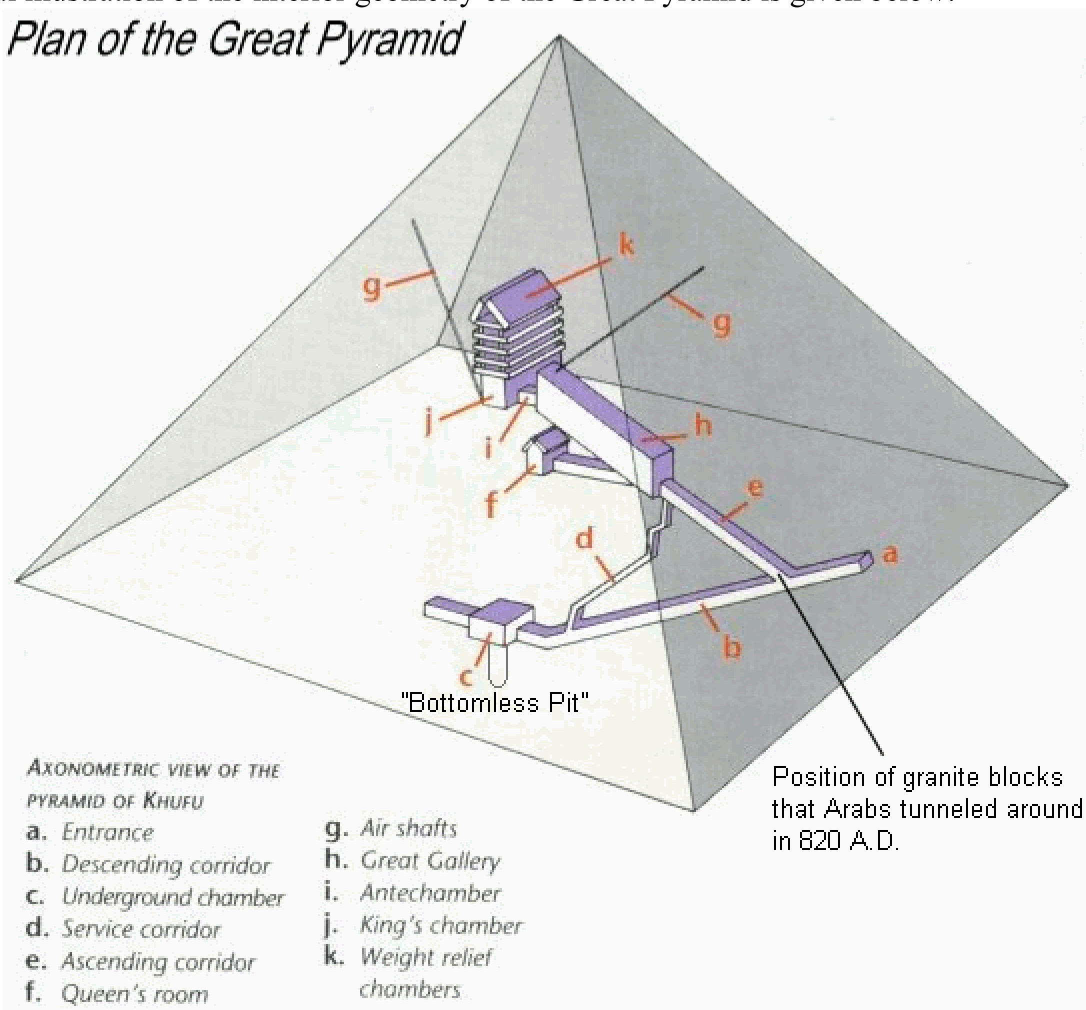
The construction has a hard industrial signature rather than an artistic one.

Material Contrasts With Other Pyramids

All other pyramids show a pronounced degradation in quality of materials, in the cutting of materials and in their assembly. Hard granite was used very little in contrast to the Great Pyramid and not used in the same manner � with mild exceptions in the Second Pyramid and the Red Pyramid. In the Second Pyramid, the sarcophagus was also cut from hard granite. It has been observed that this sarcophagus was apparently better cut than the sarcophagus in the Great Pyramid. The answer to this curious exception is very revealing and will be explained further on.

Functional Nature of The Great Pyramid

A useful illustration of the interior geometry of the Great Pyramid is given below:



A fundamental axiom of engineering is that form follows function. An engineered system must be fabricated and assembled in accordance to the functions it must perform. Variance from this axiom, for the sake of economy, as an example, will result in failure of function. A subsequent corollary is that a system, which is operated, will wear out. A stronger design will give a longer life. The claim that a process plant has been over engineered will make a startup engineer�s blood boil. Any engineer assigned to operating a process plant will immediately embrace the philosophy of �build it once, build it right�.

The Great Pyramid was built to last as a process plant for a very long time.

The heart of the pyramid is the Kings Chamber and the heart of that is the sarcophagus. This was also the heart of the process. The uranium oxide would have been fitted into the sarcophagus. It may have been put in as bricks or pellets or even in granular form. Depending on the oxide used, the density of uranium oxide is 9 to 11 times that of water. It has no buoyancy at all.

At this point, a review of the types of radiation is in order. Alpha radiation is emitted by uranium and plutonium isotopes. This is the natural decay process for these isotopes and is low energy. It consists of a helium nucleus; it has large mass and low velocity. This helium nucleus very quickly collides with any nucleus around. Six inches of air or a very thin layer of paper will absorb alpha radiation. Beta radiation is an electron with significantly higher energy than alpha. It takes several inches of solid, non-metallic material, or a thin layer of metal, to absorb this radiation. Gamma radiation is very high energy and has no association with any particular particle. It is quite penetrating and is absorbed by very dense material such as lead or gold, or about 15 feet of stone. Under the act of fission, in which a nucleus splits apart into two lighter nuclei, a few neutrons are also released. These neutrons possess high velocity and very high energy. They will pass through metal or stone very well. The materials, which interact with them best, are substances containing a lot of hydrogen, such as water or oil. The protection for workers in a plutonium extraction plant, who are working with fissioning material, consists of alternating layers of leaded glass and clear oil. The leaded glass absorbs gamma radiation and the oil slows down and reflects neutrons.

The sarcophagus was fabricated from a very hard granite, even harder and denser than the rest of the granite used to build the Kings Chamber. This fact is a very significant signature of its function. The interior dimensions of the sarcophagus are very precise. This is consistent with maintaining a very exact amount and geometry of the uranium oxide. The outside of the sarcophagus was rough cut. This reflects the fact that the outside surface of the granite is quite unimportant to the fissioning process. The granite must be able to withstand the high temperature and radiation emitted by the fissioning uranium oxide. It has to survive the damage from radiation for a very long time. It must allow passage of most of the neutrons, which it does. Color photographs show that this granite sarcophagus has undergone radiation and heat damage in a very gradual manner over a very long time. Its appearance is very reminiscent of metals and minerals, which experienced long term radiation in the canyons of the plutonium mills at Hanford. The damage, or �wear�, indicates an operating time of many years.

The Kings Chamber is made of very large blocks of granite. The inner surface of the granite bears a striking resemblance to interior walls of a plutonium mill. Once again, there is the appearance of long-term exposure to radiation and heat. The floor and walls of the chamber appear to be very well sealed. This is consistent with the Kings Chamber being flooded with water.

The water in the chamber has multiple roles. It is the medium, which slows down neutrons and reflects them back into the uranium oxide pile. It is also the mechanism for removing heat from the chamber. The south �air shaft� from the outside to the chamber would have been a pipe for continuously adding water to the system. This shaft is 8 inches by 12 inches by 175 feet in length. After a short horizontal run from the Kings Chamber, it rises at a 45 degree angle to the outside of the pyramid. Hydraulic calculations for water indicate that the flow would vary from 5,900 to 8,400 gallons per minute, depending on the back pressure of the water and steam in the Kings Chamber. The water would have flowed out through the entrance to the Kings Chamber down into the Great Gallery (This entrance was highly constricted by three granite blocks.) The exiting water would have carried away radioactive, soluble isotopes such as Cesium-137 and Strontium-90. A second �air shaft� connecting the chamber and Great Gallery to the outside would have been a vent, which released steam and noncondensible gases. This shaft is 5 inches by 7 inches by 235 feet in length. After about 10 feet of horizontal run, it rises at a 31 degree angle. Calculations for compressible flow give the shaft a steam flow rate of from 3 to 8 pounds per second, depending on the Kings Chamber pressure.

The final role of water is very interesting and quite ingenious. The reflection of neutrons by the water back into the uranium pile must have a careful, narrow control to it. The mean free path of a neutron in water is about one foot. A neutron must undergo about 6 to 7 collisions in the water to finally reach the appropriate speed and be reflected back towards the nuclear bed. If not enough neutrons are reflected, the fission reaction will die down. If too many neutrons are reflected back, the reaction will begin to grow rapidly, producing too much energy. However, when the energy production goes up, the water heats up and begins to form steam. Steam occupies about 1,000 times as much volume as water and it would progressively occupy more of the volume of the Kings Chamber as more energy was released. For all practical purposes, steam does not reflect neutrons back to the uranium bed because the nuclei of steam molecules are very far apart. This fact stops a runaway reaction because more and more of the geometry around the reactor core becomes steam instead of water. This design is a passive and very stable system for controlling the rate of fissioning in the sarcophagus. When operating, the Kings Chamber would have always had some volume of steam in the upper portion. This volume would have grown and shrunk in response to the fissioning rate, keeping it in control.

Based on the limits of flow for water and steam, and based on maximizing the removal of heat via water and steam, about 570 million British Thermal Units per hour could be removed from the Kings Chamber. It is beyond the ability of the authors to relate this energy removal to the breeding rate of plutonium. Hopefully, nuclear engineers can bring definition to this hypothesized purpose of the Great Pyramid.

We now come to an example of the real purpose of geometry. An overall view of the interior structure of the pyramid shows that the entrance, the descending passage, the ascending passage and the Great Gallery are not at the east-west center of the pyramid but about 24 feet east of center. The Kings Chamber is not in north-south alignment with the descending passage, the ascending passage and the Great Gallery. It is offset to the west. Furthermore, the sarcophagus is located in the western end of this chamber. From the viewpoint of aesthetics, it is �ugly� and out of balance. Form follows function. The sarcophagus, which is the source of highest temperature and pressure, is in the very center of the pyramid. The processing of a uranium core in the sarcophagus is halted by stopping the flow of water down the �air shaft� to the Kings Chamber. The water within the chamber heats rapidly; some of it becomes steam; and most of the water is blown out through the Antechamber into the Great Gallery. Because the energy being dealt with is enormous, it is very important that the water is quickly removed from the chamber to a location that is geometrically remote from the sarcophagus. This rapidly stops the reflection of neutrons into the uranium oxide. Also, the water that is moving rapidly and forcefully through the exit, is as far from the sarcophagus as practical. This internal geometry is a requirement of physics; it is not symbolism or a �message�.

The complex structure above the Kings Chamber is a sort of �shock absorber�. The monstrous blocks of granite, with air pockets between them, absorb most of the effect of the explosive steam at the end of a batch run of uranium oxide. In fact, the granite beams could crack all the way through and still remain in place. The much smaller and much weaker blocks of limestone could not be used for the ceiling of the Kings Chamber.

Within the Antechamber, which is between the Kings Chamber and the Great Gallery, three blocks of granite restricted the flow of water from the chamber to the gallery and maintained a water level in the Kings Chamber.

The Great Gallery serves multiple functions. First, it is a large volume that allows separation of water and steam. The upper end of the gallery has an air shaft leading to the outside. This enables the escape of noncondensible gases and steam. The lower end of the gallery spills to the upper end of the Service Shaft, which drops all the way down to the Underground Chamber. The floor of the gallery has a sunken trench running down the middle. The outflow of water would pass through in this trench during normal operations. The trench is surrounded on both sides with higher �walkways� which have slots cut into them at regular intervals. These slots probably were occupied by �stays�, which allowed the progressive lowering and raising of new and spent uranium ore along the Great Gallery. There are two grooves in the walls, which extend the entire distance of the gallery. These grooves would very likely be the �runways� for an overhead hoist. The hoist could maneuver loads of spent reactor core from the exit of the Kings Chamber to the open surface outside the tunnel to the Queens Chamber. With the vent at its upper end and with its connection to the Ascending Corridor and the Entrance, the Great Gallery would have drawn air up through it, which would be countercurrent to the flow of radioactive, hot water. This would sweep radioactive gases up through the vent and the air would have been breathable. It has been noted that the perfect fit of stone in the Great Gallery makes it almost airtight. The stone from the Antechamber to the trench in the Great Gallery shows considerable wear. If not from water, then from what?

Spent reactor cores from Hanford reactors were transferred by armored train to plutonium separation mills where they were placed in a very long canyons. The spent cores would advance along a canyon over a period of weeks before being chemically processed. This gave time for short-lived isotopes to die down, which greatly reduces the gamma and beta radiation. These two types of radiation are quite penetrating and quickly harmful to human life. One can envision a �train� of these spent cores slowly progressing down the Great Gallery.

The Queens Chamber is probably the laboratory, which chemically extracts and purifies the various plutonium oxides from all other waste. It is noteworthy that this chamber is placed quite a distance from the lower end of the Great Gallery. This distance would give added protection to workers in the chamber. The two shafts, which leave the Queens Chamber, are of unknown purpose but they were definitely �pipes� which conveyed materials. Waste separated from plutonium would have been walked back to the Well Shaft and dumped down it. The wearing of gold facemasks, etc, would have been excellent protection from the radiation in the Queens Chamber.

The products of fission, such as Cesium-137 and Strontium-90, are quite soluble, whereas uranium and plutonium oxides are extremely insoluble. A constant pass through of water in the Kings Chamber would have flushed these short-lived, radioactive isotopes all the way to the Underground Chamber via the Great Gallery trench and the Service Corridor.

The Service Corridor is small and winding and mostly vertical. Human travel through it would be very difficult and pointless, since the Ascending and Descending Corridors are available. It shows extreme erosion. Why would a �pharaoh�s tomb� pyramid have extreme erosion in a shaft isolated from the outside world? Even floods would not have reached this corridor. The obvious answer is water erosion over a very long time. Part way down this shaft is the Grotto. This position is just barely below the surface of the prepared bedrock base for the pyramid. This chamber served some function.

The Underground Chamber has an interesting geometry. The eastern half is about six feet below the termination of the Descending Corridor. In the center of this eastern basin is the �bottomless pit�, so called because the earliest discoverers could not find a bottom. The western area is about 8 feet higher and it has five bench like protrusions and two depressions. A walkway is cut from the eastern basin up into the western chamber, halfway between the two largest �benches�. Overall, the ceiling is about 11 feet above the floor.

To the south is a horizontal chamber that is 30 inches wide by 30 inches tall by 53 feet long. This last excavation could not have been dug with hand tools. The material is bedrock and there is not enough room to swing a tool such as a pick, especially with the worker lying on his stomach or his back. Powered machinery seems to be the only reasonable answer.

The purpose of the Underground Chamber was twofold. The first purpose was to drill a hole down through the bedrock to a sand layer below. This depth might have been one hundred to several hundred feet. The radioactive water coming from the Kings Chamber would finally go down the hole and disperse into the sand layer. This is a routine methodology in secondary recovery oil fields, where they inject hot water or steam or gas into a sand layer. The sand layer would have accepted and retarded the migration of radioactive isotopes � long enough for them to decay to trace levels.

The second purpose was hydroelectric power. The entire floor of the Underground Chamber bears an amazing resemblance to the support structure for a water driven turbine electric generator. The water wheel would have extended out from the western chamber into the eastern chamber. The water coming down the Descending Corridor would have shot across the water wheel. The benches on the western chamber floor would have supported the rest of the machinery, including the generator. There is even a support and depression for an oil cooling system. The stairway cut into the western floor gave access under and behind the water wheel to where the shaft and couplings would reside.

Based on the projected water flow from the Kings Chamber, the dynamic head of the water dropping almost 300 feet, and a turbine efficiency of 78%, the produced electrical power would have been from about 29 kilowatts to 41 kilowatts. This is an adequate amount of power to provide lighting within the pyramid and to run modest electrical machinery in the Queens Chamber. The chemical separation of plutonium from uranium involves the use of electrical power, just as it was done at Hanford, Washington. This generation and use of electricity would have been entirely within the Great Pyramid, hidden from outsiders.

The floors and well hole are strongly eroded. The obvious eroding agent is water. And the entrance to the Descending Corridor is well above the landscape, so natural flooding could not be the cause.

The Grotto, which is just off the Service Corridor, would have been a logical position for an electrical distribution point and for changes in voltage.

Shutting Down the Great Pyramid

The wear seen in various parts of the pyramid�s internals suggests an operating life of a few hundred years. The process may have been halted because enough product had been made or the wearing down made the process unreliable and dangerous. This is hinted at by the erosion of one corner of the sarcophagus. There are significant clues that the system was purposely put out of commission and sealed. The three granite blocks in the Antechamber to the Kings Chamber were apparently removed and then used to block the low end of the Ascending Corridor. The slots and grooves in the Great Gallery had equipment removed from them. The Queens Chamber was obviously stripped of equipment. The creator of the pyramid would have told the Egyptians of the horrible death that lay inside and commanded them to not attempt entry.

Economic Justification of the Great Pyramid

The current, nation-wide, average price for electrical energy is 10 cents a kilowatt-hour. This makes Plutonium-239 worth one million dollars a pound on a watt for watt basis, when it is in competition with hydroelectric power, coal, oil and natural gas. Gold is worth only $4,000 a pound. A mixture of plutonium isotopes would be worth a little bit less than Pu-239 but all the isotopes will release energy. Obviously, if the Great Pyramid was a plutonium production mill, it produced a great many tons of plutonium.

There is no archeological evidence of power stations and electrical grids existing on earth in the past 10,000 years, which would have utilized the plutonium. The logical answer is obvious: the plutonium was taken off planet. Barring travel to another solar system, the rational destination could only be Mars.

It takes a great deal of energy to lift mass up from the Earth�s surface to orbit and then out of orbit. But a pound of plutonium is ten million kilowatt hours in energy. Since Mars is a very cold planet, the heating value of plutonium there would be more than it is on Earth. If it is not condensed, exhaust steam from a power turbine on Earth must be released at 212oF and 14.7 psia. On Mars the same steam could be utilized all the way down to 45oF and less than 0.15 psia. The result is that 18% more useful energy can be extracted from plutonium on Mars than can be extracted on Earth. Hydroelectric power and fossil fuels are not an option on Mars.

What were the realistic costs to the creator of the Great Pyramid? He (or they) would have brought knowledge to the ancient Egyptians, who were probably hunter-gatherers at that time. He would have brought seed to initiate a variety of crops for food. He would have brought capital tools for producing many more tools. The Egyptians would have been taught how to cut and shape stone, how to build dwellings, how to farm, how to make clothing and on and on�..

In return, the Egyptians would have provided the labor to fabricate and erect the Great Pyramid. The exchange would have been very profitable to both sides.

When viewed from space, the Giza location would have been ideal. It is near the equator, which makes orbital landings and takeoffs easier. It has a sunny climate with a large, reliable river and a vast delta for growing food. It is an excellent base for creating a large population of humans. Uranium ore from the center of Africa could probably be brought down the Nile River to Giza. In particular, Giza has a layer of bedrock with sand layers below it. The bedrock can support the pyramid and the sand layers can absorb and retain radioactive waste. The worst climatic disaster in the Giza area would be a sandstorm. Today, when we hunt for high purity uranium ore, we might very well be �gleaning the orchard�. The best ore has already been taken.

The Second Pyramid at Giza

It is rational to assume that the Second Pyramid at Giza was erected **after** the Great Pyramid shut down. A pharaoh, who was head of state, probably initiated this enterprise in the hope that he could gain the mysterious power and riches that came from the Great Pyramid. Based on a probable operating life of a few hundred years, no Egyptians who built the Great Pyramid would have still been alive. Knowledge of its internal structure would have been verbally handed down from generation to generation, and would have been perceptual.

The internal structure of the Second Pyramid is much simpler and non-functional in comparison to the Great Pyramid. There was no provision for passing water through the Kings Chamber where the sarcophagus was, so as to remove heat. Based on the horizontal layout of the internal structure and on the hydraulics of water, it is very doubtful that the Kings Chamber could have been flooded with water. The sarcophagus is actually recessed into the floor and surrounded by granite and limestone blocks. Uranium oxide placed in the sarcophagus would have remained almost entirely dormant. Achieving a criticality with uranium oxide is extremely dependent on the mass and geometry of the nuclear pile and the water. The window for success is very narrow. The Kings Chamber in the Second Pyramid was built out of limestone. If criticality had been achieved, it would have caused fairly rapid disintegration of the limestone. The sarcophagus itself shows extremely little wear in comparison to the Great Pyramid sarcophagus, which is why it looks superior!

If Egyptian �priests� were present and knew the dangers of a nuclear reactor, they would have had a strong motivation to mislead the pharaoh on the design of the Second Pyramid. If he killed them, he would lose his only source of knowledge about the Great Pyramid.

The Meidum Pyramid

This pyramid may have been a fresh start **after** the Second Pyramid failed. Its internal structure represents a moderate amount of progress over the Second Pyramid. However, the improvements seem to reflect what would be learned from a limited visual inspection of some of the Great Pyramid�s internal structure. It reflects no understanding of the use of granite for a king�s chamber, the point of its geometry, nor the �air shafts�. One can envision someone climbing up the Service Corridor to the Great Gallery and the Queens Chamber. It would have required torches and was probably quite frightening. The inspection would have been perceptual and probably would not have included measurements. It must be noted that the three granite blocks at the low end of the Ascending Corridor of the Great Pyramid are still there!

The Meidum Pyramid�s internal structure does have a descent from the outside to the Kings Chamber of about 70 feet. Therefore, the entire internal structure could have been flooded with water. However, there was no provision for passing water through the Kings Chamber so as to remove heat.

Color photographs of the Meidum Pyramid�s internal structure are very revealing. The Descending Corridor has precise geometry to begin with. After some distance, the surfaces of the corridor become increasingly irregular, rounded and **larger** than the �good� corridor. The Queens Chamber is extremely irregular in shape. In the Kings Chamber, the corbelling in the vertical ceiling is very rough and the floor is quite uneven. Standard Egyptology states that the workers gave up on doing a good job on the internal structure. But this work would have been the first five percent of the effort of making the entire pyramid. If the workers �gave up�, why was the remaining 95% completed?

The evidence and logic point to another cause for the rough interior and the collapse of much of the exterior of this pyramid. A sarcophagus would have resided in the Kings Chamber and it would have been loaded with uranium oxide. The entire interior would have been flooded with water. Because of no pass through of water and because of the very high and very narrow shape of the Kings Chamber, the nuclear pile would have reached criticality and then become a runaway reaction. Once beyond the initiation of criticality, the runaway takes only a few thousandths of a second. There would have been a rapidly growing steam explosion and the entire interior would have behaved like a gigantic shotgun blast. Interior surfaces would have been blasted out. The shockwave would have destabilized the whole pyramid and brought down the thousands of smaller exterior blocks. One can be sure that the Egyptians steered clear of this disaster.

The Meidum disaster was not from stupidity. It was from ignorance.

The Bent Pyramid

The Bent Pyramid is the �learning curve� pyramid. There are two entire interior systems. The first one was built of limestone and down into bedrock which was probably as soft as limestone. The interior layout is quite similar to that of the Meidum Pyramid. However, there are two vertical shafts adjacent to the Kings Chamber. They are not ornamental but appear functional in a technical sense. They might have been intended as relief chambers if an explosion occurred once again.

As in the Meidum Pyramid, the Descending Corridor begins with good geometry and then progressively degrades into a larger, irregular, round tunnel. The antechamber is distorted and the corbelled ceiling is very rough. The Kings Chamber also has a crude appearance. The two vertical shafts, were found full of rubble. Once again, there is the signature of a runaway reaction and consequent steam explosion. There was no capacity for passing water through the Kings Chamber and this chamber had the wrong geometry. The lower exterior of the pyramid held up well; there was no major collapse.

It is very probable that the pyramid was built only about half way up and then the uranium oxide was placed in the sarcophagus; water was loaded and the system was tested. The explosion was not as severe as it was with the Meidum Pyramid.

From on top of the **uncompleted** pyramid, a tunnel was dug down and through to the original Kings Chamber. The Egyptians probably examined the remains and damage to the sarcophagus and Kings Chamber to see what happened.

They proceeded to build a second interior and the rest of the pyramid. The new Descending Corridor had two substantial portcullises built into it to isolate the Kings Chamber. One portcullis was positioned between the new Kings Chamber and the tunnel to the old Kings Chamber. Surprisingly, this portcullis was left in an open position. The other portcullis between the inner portcullis and the new Descending Corridor was kept closed. Beyond that the new descending corridor was sealed shut. It was prepared so that another explosion would pass out through the old interior system. The second Kings Chamber shows damage to the corbelled ceiling and the floor. Undoubtedly another nuclear runaway reaction and steam explosion happened but it did exit through the old interior.

The Egyptians were making progress but still had no conceptual understanding of the nuclear reaction. They were attempting to duplicate the �mystery� of the Great Pyramid and one cannot fault them for trying.

The Red Pyramid

The design and construction of this pyramid reflects a dead serious and valiant attempt by the ancient Egyptians. They did not dig into bedrock but chose to build the interior structure with granite. They chose a distinctly lower slope for the pyramid. They built three large chambers with corbelled ceilings � each of them narrow and tall. All of this is granite! The mass of stone above this interior was more substantial than it was with the previous pyramids. There is an excellent chance that the use of granite around and above the interior structure is beyond what can be observed. There is no question that the structure was superior to the Meidum Pyramid and the Bent Pyramid. If only they had understood the concept of the nuclear reaction and the vital importance of geometry and pass through water!

Again, the Kings Chamber shows heavy damage to the floor and its exit corridor exhibits a blast out effect. Considering the weight of the pyramid and the strength of the corbelled ceiling in the Kings Chamber, the steam blast probably blew down into the floor besides exiting out the granite, descending corridor.

One must salute these ancient Egyptians. They did their best with the knowledge they had. After failures with three pyramids in succession, this type of endeavor was probably abandoned. This abandonment may have been congruent with the death of the pharaoh who led this cause. If ancient Egyptian records are correct, this pharaoh was Sneferu and his son, Khufu, then went north to Giza with a great vengeance.

Conclusion

Every process step for breeding plutonium, controlling the nuclear reactor, separating the plutonium from other radioactive material, and disposing of radioactive waste, is taken care of by the internal structure of the Great Pyramid. Even the production of internal electrical power is accounted for.

The why and what for, of this endeavor must be viewed from the perspective of sentient beings arriving at Earth, rather than from our perspective in 21st century America. We produced a great deal of plutonium for purposes of war, which in the largest sense, is non-productive. These �people� would have valued plutonium as the most precious item to extract from the Earth because of its immense, long lasting energy and its minimum mass. To them, it would have meant �life�. If you could select only one material from Earth to take back with you into space and probably to another planet, what would it be? What other kind of energy source can be used anywhere? What energy source is placed on all space vehicles that leave Earth�s orbit? What is the energy source of choice in unmanned spacecraft in Earth orbit?

The Great Pyramid could not be recognized for what it was until contemporary man had accomplished the same feat. Prior to about 1945 - no matter how wise the man - he could not have reasoned out its function. All of the authors have had exposure to this general

Who built the pyramid? When did they build it? We have no idea.

Erica Miller, chemical engineer
Sean Sloan, mechanical engineer
Gregg Wilson, chemical engineer

Methodologies For Scientific Proof of Nuclear Fission in The Great Pyramid

Short Lived Isotopes

The primary decay chains for thorium, uranium, neptunium, etc, result in the final production of several helium nuclei and lead, or something close to lead. Fission, however, produces lighter nuclei and the highest probability products are Cesium-137 and Strontium-90. The cesium will decay to Barium-137 and the strontium will decay to Zirconium-90. These end products are stable nuclei.

If the internals of the Great Pyramid were a nuclear breeder system, then there was a sizable wash through of water, which went to the Bottom Chamber. From there the water would have descended to an underground sand layer. Assuming retention of the uranium and plutonium oxides, the major, soluble, radioactive isotopes are Cesium-137 and Strontium-90. Because they have half-lives of 30 years and 28 years, respectively, they would no longer be detectable.

However, Barium-137 is very insoluble as barium carbonate, and presumably the bedrock in the Bottom Chamber is limestone or close to it. Some of the barium � as an ion � would have exchanged with the calcium in the limestone, producing insoluble barium carbonate. The discolored surface of the bedrock in the Bottom Chamber would have barium carbonate and this surface material is a prime specimen for sampling. The interior of the limestone should not have more than about one part per million of barium, because barium is quite toxic as an ion and presumably the limestone came from living matter.

Zirconium would behave in a similar manner by depositing as zirconium oxide hydroxide,

$ZrO(OH)_2$. This compound is extremely insoluble, even in mildly acidic water. A sample of discolored surface material from the bedrock in the Bottom Chamber would be ideal for analysis. The interior of the limestone should not contain more than several parts per billion of zirconium, because it is not a part of living matter and the salt, zirconium carbonate, is fairly soluble and would not have precipitated.

These samples would be digested in acid and analyzed for barium and zirconium. The presence of both or either would be a positive indicator, but not proof, of nuclear fission.

If barium were present, it would have to go through isotopic analysis to determine the spread of barium isotopes. Naturally occurring barium will be 71.66% Barium-138 and 11.32% Barium-137, with lesser portions of other barium isotopes. A scraping of the limestone would probably result in about 50% surface material and 50% interior material. If analysis of barium isotopes gave a Barium-137 percentage higher than twice the natural 11.32%, that would be very strong evidence of nuclear fission.

If zirconium were present, it would also have to go through isotopic analysis. In natural zirconium, 51.46% is Zirconium-90. Again, a scraping would probably be 50% surface material and 50% interior material. If the measured Zirconium-90 was higher than 60%, then this would also be powerful evidence of nuclear fission.

Nile river water should have not more than one part per million of barium and only a few parts per billion of zirconium.

A baseline comparison for barium and zirconium concentration and isotopic spread would also have to be done with a sample from the **interior** of the bedrock. This sample and its analysis would either support or fail to support the claim of nuclear fission.

Long Lived Light Isotopes

A nuclear core, which is brought up to criticality, establishes a high flux of neutrons. What the neutrons do is a probability distribution, much like a bell curve. A fraction of them will not return to the uranium oxide formation but will collide and be absorbed by other species. For instance, some of them will create deuterium oxide in the water; others will interact with nuclei in granite, causing some of them to become radioactive. The most probable long-lived, radioactive nuclei in granite are Aluminum-26 and Calcium-41. The aluminum isotope has a half-life of 740,000 years and the calcium isotope has a half-life of 110,000 years. A piece of the granite sarcophagus would have the highest chance of possessing these isotopes. A sample of this granite would have to be examined for the known radiation types and frequencies of these two isotopes. Natural granite would not have any Aluminum-26 and Calcium-41 because their half-lives are far too short in comparison the age of the granite.

Samples from the granite floor, walls and ceiling would be far less likely to have radioactive species than the sarcophagus because the large volume of water in the Kings Chamber would have absorbed or reflected almost every neutron.

Long Lived Heavy Isotopes

Uranium and plutonium oxides are extremely insoluble and would not have dissolved in the water. However, traces of these compounds might be found on the surface of the granite in the Kings Chamber and on the surface of the limestone in the Great Gallery and the Queens Chamber. It is a very common technique for radiological workers to wipe surfaces with a slightly damp cloth and then check the cloth for radiation with a Geiger counter. This procedure must be done very carefully, and with the optimum sensor, because alpha radiation is very weak and does not penetrate. Once again, these isotopes have known frequencies for their radiation, so they could be identified.

The presence of these isotopes would not prove nuclear fission but would certainly prove that fissionable isotopes were in the Great Pyramid.

Natural granite will have traces of Uranium-235 and Uranium-238 within it. There should not be any plutonium. If the granite from the Kings Chamber was exposed to a neutron flux, some of the U-238 would have been transformed to plutonium isotopes. The presence of any plutonium would prove nuclear fission. A depletion of U-235 compared to U-238 would also demonstrate nuclear fission.