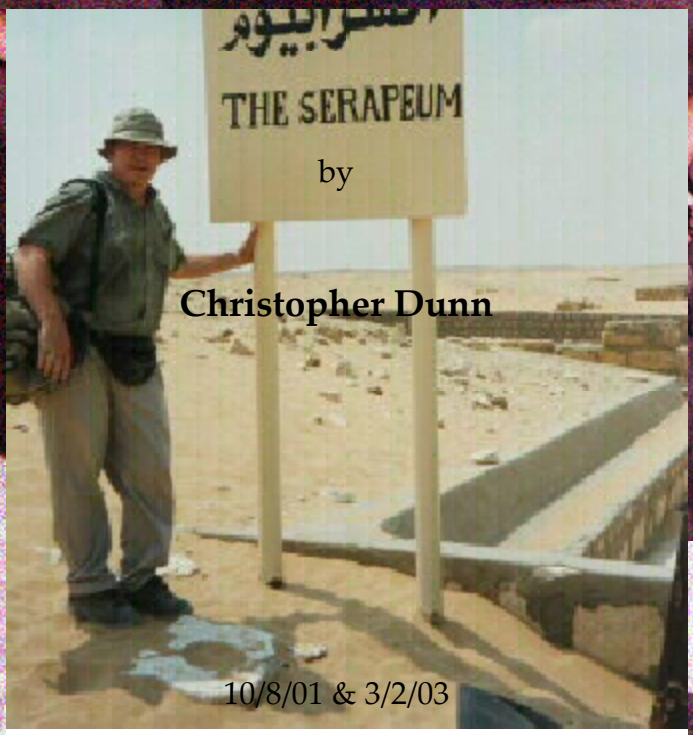
The Precision of the Ancient Egyptians



by

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In this article, I will explain in detail why I believe artifacts that I have studied in Egypt were the products of an advanced culture, or a culture with a significantly different level of technology for which we have given them credit. I will focus on one particular aspect of these artifacts: their precision. I could get into a long drawn out discussion of what was necessary to produce this amazing precision, but I will leave that for another article. For the purposes of this article, what we need to understand is what manufacturing precision is and why we create it.

What is precision?

The word comes from "precise" which Webster's defines as "sharply or exactly limited or defined as to meaning; exact; definite, not loose, vague or equivocal; exact in conduct; strict; formal; nice; punctilious." Preciseness is "exactness; rigid nicety; excessive regard to forms or rules; rigid formality." Precision is "The state of being precise as to meaning; preciseness; exactness; accuracy."

To many people, the application of precision in their lives is related to their words and actions. We have precise speech, precise time keeping and the precision of a military drill. We may have the good fortune to be invited to a dinner party by a "precisian" and find the tableware in exact order, with nary a spoon or goblet out of position.

The application of precision, as noted above, is part and parcel of being civilized. It is the discipline and order that is necessary for civilization to function successfully.

Beginning in the late 1800s, a different application of precision was gaining increased importance and seen to be necessary to ensure the successful outcome of human endeavors. The machines that were invented and used as labor-saving devices depended on precision components to function properly. In the 1800s, the cotton industry and steam power spawned the Industrial Revolution in the north of England. The demand for more efficient spinning mills and looms gave rise to a greater emphasis on producing components that functioned precisely. To make products that were consistent, variables in the manufacturing process had to be reduced or eliminated. To accomplish this, dimensional variables that were inherent in the manufacture of critical components needed to be reduced to acceptable levels. However, because of the inaccuracies of the machine tools of that day, skilled fitters were needed to scrape, chisel and file components to close dimensions in order for them to fit properly.

Wars have accelerated the evolution of standardized measurements and the elimination of variables in the manufacturing process. Put yourself in the place of a soldier during the Civil War.

Their rifles were precision crafted, but when replacing a component in the field, they had to hand file the pieces to fit. Obviously, this was time consuming, and in war, timing could make you a winner or a loser. Standards were necessarily instituted and suppliers had to meet these standards or lose business.

Anyone who has brought home a bicycle or piece of "Ready to assemble" furniture can appreciate the precision that is required for these objects to go together easily. Have you ever found yourself trying to align a bolt in a pre-drilled hole that is off by an eighth of an inch? This is an excellent example of the need for precision, and how the effort to produce precision products can be an expensive, difficult endeavor.

In manufacturing today, components are made throughout the world and come together in assembly plants. The exacting standards and precision of the product shipped from thousands of miles away ensure that when they go to the assembly line, the components fit together without additional work being performed.

Most people will never actually create objects to a high precision. It is understandable, therefore, that most people overlook this important aspect of a civilization's infrastructure. To laypersons, precision is an abstract concept. This is not a criticism. If you have not had precision manufacturing experience, either professionally or as a hobby, an understanding of the concept of precision is academic.

We are end users of powerful precision technologies that fuel our civilization and make our lives easier. Without manufacturing precision, cars would not run, planes would not fly and CDs would not play. The precision we create is born out of necessity. We do not create it without good reason, because the costs of producing artifacts today go up exponentially if the demand for accuracy is greater.

An example of close accuracy and precision is the 12-inch straightedge that I have taken to Egypt in 1999 and 2001. The edge was finished on a precision grinder. Its deviation from a perfect

straight line was .0001 inch. For the reader who cannot relate to what that means in real terms, take a hair out of your head, and split it equally along its length into 20 parts. One part is approximately equal to .0001 inch. (the average hair is .0025 inch). Or, to compare it to our "Some Assembly Required" example above, this straight-edge is 1,250 times MORE precise than the pre-drilled hole which was off by an eighth of an inch.

If we were to miraculously uncover an unidentified artifact in the Sahara desert that had been buried for thousands of years, how would we determine its purpose? If the speculation arises that it may have had some technological purpose, the challenge would be to prove it, which would require us to reverse engineer its design to determine its function. Reverse engineering has been a part of industrial competitiveness for years. Engineers would buy a competitor's product and by studying its design and components would understand the science and engineering behind its function. This is why the recovery of a potential or real enemy's weapons of war is important.

If, after a cursory examination of this unidentified prehistoric artifact, we determine that it may have been a machine that functioned as a tool to create artifacts, how would we know that it was a precision machine tool? In order to prove the case for our prehistoric precision machine tool, it would need to be measure for accuracy. Certain components associated with precision machine tools are manufactured to a high accuracy. Flat surfaces necessary for the machine to function properly would be finished to within .0002 inch. This kind of accuracy separates primitive tools and those that are the result of need and development. The discovery of this precision would elevate the artifact to a higher purpose. If these components were not precise, the arguments against it being the product of an advanced society would be strengthened.

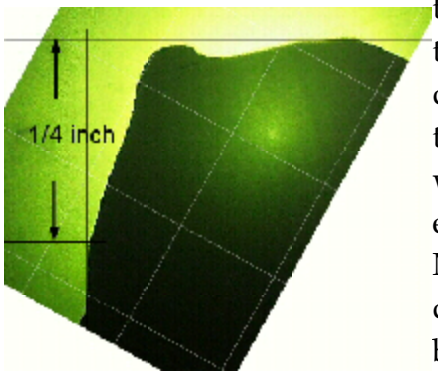
The critical evidence, therefore, is the accuracy of the surfaces being measured. Artisans do not create surfaces with such accuracy unless the artifact they are creating needs to function to exact specifications. This kind of precision is only conceived of and created out of need. Unless there is a need, it isn't even a consideration.

When looking for prehistoric machines, though, we tend to look for artifacts that are made of iron or steel, not granite. Primarily because we use iron and steel to construct our machines. We see things as we are not how they are. Nevertheless, the critical proof that would be demanded to support the conclusion that a steel artifact was a precision machine is its precision, and the product of the machine. This precision can be found in Egypt—crafted into many artifacts made of stable igneous rock that would survive tens of thousands of years and still retain their precision. On the one hand we may not have the iron and steel used to create the artifact, but we have the products in abundance. Many of these artifacts, I believe may have been mis-identified and assigned to a time period that does not support the hypothesis that the tools used to create them may have eroded over a much longer time than established dates would allow. There is support for such a speculation if we look at artifacts from purely an engineering perspective. Though it has been said that to understand the ancient Egyptian culture, you have to think like an Egyptian, it would be impossible to reach back in time and know what what was on the pyramid builders minds at any given time. Except, perhaps, for a particular train of thought. If there is anything we can say with absolute confidence, the ancient Egyptians spent much of their time devoted to the development of technical skills that were intended to accomplish some of the greatest engineering feats in the history of this planet. So, it would seem reasonable to assume that in order to understand their technological accomplishments, however, you have to think like an engineer.

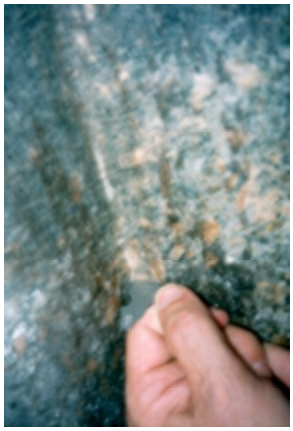
The Serapeum

The granite box inside Khafre's pyramid has the same characteristics as the boxes inside the Serapeum. Yet the boxes in the Serapeum were ascribed to the 18th dynasty, over 1100 years later

when stoneworking was supposedly in decline. Considering that this dating was based on pottery items that were found and not the boxes themselves, it would be reasonable to speculate that the boxes have not been dated accurately. Their characteristics show that their creators used the same tools and were blessed with the same skill and knowledge as those who created Khafre's pyramid. Moreover, the boxes in both locations are evidence of a much higher purpose than mere burial sarcophagii. They are finished to a high accuracy, their corners are remarkably square, and their inside corners worked down to a dimension that is sharper than what one would expect to find in an artifact from prehistory. All of these features are extremely difficult to accomplish and none of them necessary for a mere burial box.



This photograph is of a wax impression taken of the inside southwest vertical corner of Khafre's box. The wax impression was fixtured on a 40X J&L comparitor. The existence of such a sharp corner raises the question of purpose because of the inordinate amount of extra time needed to work the granite down to such a small dimension.



Inspecting the corner radius

The following photograph is of the corner radius in one of the boxes inside the Serapeum. I was the only person inside this dark box when this photograph was taken, so I had to put down my flashlight to use my camera. Hence, the photograph, is somewhat out of focus. I can testify, though, that when I was going through my set of radius gages in order to select the closest fit, the 5/32 inch radius gage that you see in this photograph fit snugly in the corner.

Granite box inside the Serapeum

In 1995 I inspected the inside and outside surfaces of two boxes in the Serapeum with a 6-inch precision straight edge that was accurate to .0002 inch. My report on what I discovered has been published in magazine articles, in my book The Giza Power Plant, and on my web site, as Advanced Machining in Ancient Egypt.

The artifacts I have measure in Egypt have the marks of careful and remarkable manufacturing methods. They are unmistakable and irrefutable in their precision but origin or intent will always be open to speculation. The following series of photographs were taken inside the Serapeum on August 27, 2001. Within these rock tunnels carved out of the native bedrock, are over 20 of these boxes. The majority are made of granite, which was quarried over 500 miles away at the Aswan quarries, and one of them is made of basalt. Distinguishing the rock these boxes are made of and the rock tunnels within which they are housed, is the level of difficulty necessary to cut the material. Granite and basalt are glass-like igneous rocks. The pink granite, found in Egypt contains about 55 percent silicon quartz crystal that has a Mohs hardness of 7. By comparison, the limestone bedrock where these boxes are found has a hardness of Mohs 3. Though not impossible to work, granite requires an abrasive that is as hard or harder to cut it. There are differences of opinion on the level of technology used to create these artifacts. Some claim that hand work with quartz sand and copper is sufficient to explain the evidence, but there are several

artifacts, besides the boxes in the Serapeum, that argue against such a simple primitive notion. There are drill cores that indicate that holes were drilled into the granite at a feed rate of .100 inch per revolution of the drill. To date, no one has produced evidence that shows that a simple hand powered bow drill attached to a copper tube can accomplish this feat.

In the following two photographs I am inspecting the squareness between a 27 ton lid and the inside surface of the granite box on which it sits. The precision square I used was calibrated to .00005 inch (that is 5/100,000 of an inch) using a Jones & Lamson comparitor.

The underside of the lid and the inside wall of the box I found to be square, and finding that the squareness was achieved not just on one side of the box but both, raises the level of difficulty in accomplishing this feat.

Think of it as a geometric reality. In order for the lid to be square with the two inside walls, the inside walls would have to be parallel to one another along the vertical axis. Moreover, the topside of the box would need to establish a plane that is square to the sides. That makes finishing the inside exponentially more difficult. The manufacturers of these boxes in the Serapeum not only created inside surfaces that were flat when measured vertically and horizontally, they also made sure that the surfaces they were creating were square and parallel to each other, with one surface, the top, having sides that are 5 feet and 10 feet apart

from each other. But without such parallism and squareness of the top surface, the squareness noted on both sides would not exist

While it may be argued that modern man cannot impose a modern perspective on artifact that are thousands of years old, an appreciation of the level of precision found in these artifacts is lacking in archaeological literature and is only revealed by an understanding what it takes to produce this kind of work. As an engineer and craftsman, who has worked in manufacturing for over 40 years and who has created precision artifacts in our modern world, in my opinion this accomplishment in prehistory deserves more recognition. Nobody does this kind of work unless there is a very high purpose for the artifact. Even the concept of this kind of precision does not occur to an artisan unless there is no other means of accomplishing what the artifact is intended to do. The only other reason that such precision would be created in an object would be that the tools that are used to create it are so precise that they are incapable of producing anything less than precision. With either scenario, we are looking at a higher civilization in prehistory than what is currently accepted. To me, the implications are staggering.

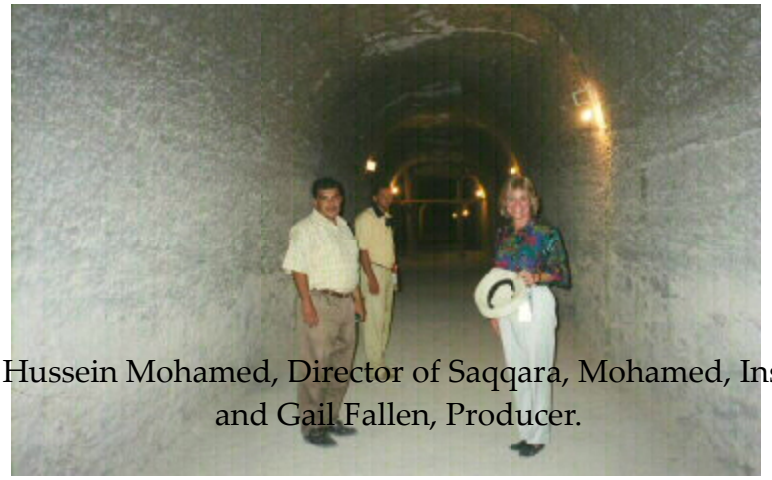
This is why I believe that these artifacts that I have measured in Egypt, are the smoking gun that proves, without a shadow of a doubt, that a higher civilization than what we have been taught existed in ancient Egypt. The evidence is cut into the stone.

The boxes that are off the beaten tourist's path in the rock tunnels of the Serapeum would be extremely difficult to produce today. Their smooth flat surfaces, orthogonal perfection and incredibly small inside corner radii that I have inspected with modern precision straight edges, squares and radius gages, leave me in awe. Even though after contacting four precision granite manufacturers I could not find one who could replicate their perfection, I would not say that it would be impossible to make one today—if we had a good reason to do so. But what would that reason be? For what purpose would we quarry an 80-ton block of granite, hollow its inside and proceed to craft it to such a high level of accuracy? Why would we find it necessary to craft the top surface of this box so

that a lid with an equally flat underside surface would sit square with the inside walls?

There may be arguments against the claims of advanced societies in prehistory. Some may argue that the lack of machinery refutes such claims, but a lack of evidence is not evidence. It is fallacious to deny or ignore what exists by arguing for what does not exist. When we ponder the purpose for creating such precision, we inexorably move beyond the simple reasons espoused by historians and are forced to consider that there was a civilization in prehistory that was far more advanced and vastly different than previously thought. We do not need to look for secret chambers or halls of records to know that this civilization existed. It is crafted into some of the hardiest materials with which they worked—igneous rock.

I am indebted to Dr. Zahi Hawass for introducing me to Mr. Adel Hussein Mohamed, the Director of Saqqara, who gave me permission to conduct further studies inside the Serapeum. Mr. Mohamed was extremely hospitable and kind. He accompanied me to the site and observed as I inspected the granite boxes and took photographs. I especially enjoyed his Egyptian hospitality and hot tea. I am deeply grateful, also, to Gail Fallen of Grizzly Adams Productions. Without her impeccable diplomacy, these events would not have transpired.



Adel Hussein Mohamed, Director of Saqqara, Mohamed, Inspector and Gail Fallen, Producer.