CHAPTER 7

Early Optical Technology

In this chapter we shall examine evidence in the area of ancient optical technology. This evidence indicates that fairly sophisticated optical technology was being used soon after the Flood ended. Although the evidence has been available in museums and other places for many years, up until recently it has been largely ignored because of the mindset that ancient people were primitive. However, what we are now learning through continued research is that ancient technology was not at all primitive. It was already mature when it first appeared. As already discussed in Chapter 5, soon after the Flood people navigated widely over the globe.

Successful navigation requires that one be able to accurately determine one's location on the globe. It is known, for example, that the Vikings navigated to America. What was the secret technology that allowed them to do that? They needed the sun for maritime navigation to determine their geographic position. However, clouds very often cover the route from Scandinavia to America. It has been discovered that they used a "sun-stone" to determine the position of the sun even through the clouds. A bipolar (or dichroic) "lens" was used to polarize the diffused light coming through the clouds to determine the sun's location. By using such a "sun-stone", they could determine their geographic position. Such a lens could have been formed from water sapphire, a

rock found in Scandinavia. Use of a polarizing lens would effectively abolish the clouds as an obstacle to maritime navigation. It is a very clever, yet effective approach.[1]

Optical Lenses

A more commonly known use for lenses is the refraction of light. Thus, a transparent substance of proper shape can bend or refract light rays so that they focus into an image. This is the principle behind magnifying lenses. Combinations of lenses can be used to make optical instruments such as microscopes and telescopes. Modern utilization of optical technology and the science of optics is relatively new. Because we moderns have only begun to apply optical technology to any great extent in the last several hundred years, and because of the assumption that ancients were primitive, we assume that they didn't use optics. The mindset that the ancients were primitive has greatly hindered our investigations in archaeology. It has been noted that "nothing is harder to dislodge than a 'conventional notion' held by experts."[2] In spite of that, however, there are some tireless investigators who have continued to carry out their research on early use of optics. The problem has not been a lack of evidence for ancient lenses. Rather it is that the evidence has either been ignored or misinterpreted or both. For example, one researcher relates his experience as follows. He had seen references to British lenses and he began a search for them.

> When I finally found the British lenses, in two unexpected

1 Robert Temple, *The Crystal Sun: Rediscovering a Lost Technology of the Ancient World*, Arrow Books: London, 2000, pp. 55-56

2 Temple, p. 4

> museums which have no connection whatever with archaeology, I discovered that they were ground and polished to a high degree of perfection. It is likely that Britain was the centre of a superb crystal lens industry, though no workshop has apparently ever been found, and it is possible that the lenses may all have been imported. Archaeologists are very familiar with numerous crystal balls which have been excavated in Britain, but they never think of them in optical terms, generally regarding them as 'magical apparatus'.[3]

Another example of misinterpreted or ignored evidence is the eyes on statues from the Old Kingdom in Egypt. While some of the eyes have been removed, perhaps by grave robbers, a tomb from a slightly later date was recovered intact. The eyes on the statues show high quality optical technology.

> The point is that they are perfectly ground and polished convex crystal lenses. …The existence of many of these crystal eyes, of such perfect workmanship, demonstrates in conclusive fashion that the technology for advanced optics existed at that time — and I do not believe it is possible for us to deny that it was used for other purposes besides eyes of statues.[4]

The author's comment above is correct. High quality optical lenses were used in other applications besides eyes for statues, as we shall see a bit further in this chapter. The mental framework one uses to interpret evidence is extremely important. It has a very strong influence on how that evidence is interpreted and explained. The question can be asked, "Well, if early post-Flood peoples used lenses, why do we not find those lenses?" The answer is, "Many lenses have in fact been found, indeed several hundreds of them. However, scholars,

3 Temple, p. 246

4 Temple, p. 464

both past and even up to the present, tend to dismiss the implication that these archaeological objects were lenses."

It is not that these artifacts were not discovered or known. They were in fact even noted in various writings. However, scholars tended to disbelieve what the older texts were reporting.

> The scholars who 'edit the texts' of Greek and Latin have taken out many optical words and have said these must be scribal errors. Then, having substituted new words of their own invention, they have said that there is no ancient textual evidence of optics. Yet they are the ones who destroyed it! … That's because the story of ancient optical technology is so large that one's immediate reaction is to believe that it is impossible! Otherwise, surely, *everybody would know about it.*[5]

One's mind-set strongly influences how evidence is interpreted. A natural or even obvious conclusion regarding evidence can be completely missed. This appears to be the case with ancient optical lenses.

Rock Crystal Lenses

More and more lenses are being discovered all the time.[6] Curators of museums where these objects exist are either misinformed or reluctant to admit that they could be lenses. In one instance, a specialist at a museum when shown a lens, denied that it was a genuine lens. Instead, the specialist insisted that it was a recent glass fake rather than an ancient artifact. The speculation that it was a glass fake instead of a ancient genuine rock crystal lens can be checked by making

5 Temple, p. 6

6 Temple, p. 54

scientific tests. The tests in the form of x-ray analysis showed that it was not just an unusual blob of glass.[7] It was in fact a quality lens made from rock crystal.

Rock crystal is highly transparent. It is very nearly pure quartz and is a very hard material. Thus, it has excellent optical properties. Because of its physical properties, considerable technological finesse is required to grind and polish it into a lens. Yet, the early Egyptians did exactly that. They carved and polished rock crystal!

As mentioned earlier, there are at least two types of lenses: those which are convex, that is, have an outward bulge, and those which are concave, or have an inward bulge. Perhaps most of the ancient lenses which have been discovered are convex, but recently (1997) concave ones have also been discovered.[8]

Thus far most of the concave lenses have been found in Turkey. Concave lenses are thinner in the center and are therefore quite fragile. It is possible that many of them have been broken. That is perhaps the reason why fewer concave lenses have been found compared to the many ancient convex lenses which have already been located.

Other than lenses, there are additional objects which have been discovered with complex shapes. These objects are also made from rock crystal.

> We have conclusive archaeological proof that they had mastered the art of making complicated vessels from rock crystal as early as the First Dynasty. I came across this clear evidence in the Egyptian Museum at Cairo (formerly called the Cairo Museum) in 1998. In that Museum, in Room 43, Case 13, Object Number 37 is a beautifully worked small

7 Temple, p. 185

8 Temple, p. 99

> goblet of rock crystal excavated from the tomb of Hemaka at Saqqara. …but the indisputable fact is that this object, dating from the very beginning of the dynastic period of Egypt — approximately 3000 BC — shows an absolute technical mastery of the most complex grinding and polishing techniques for rock crystal as well as the ability to hollow out pieces successfully, leaving the interiors as polished as the exteriors.[9]

While it is a task requiring more than just simple primitive skills to cut, to grind, and to polish a hard material like rock crystal on the exterior of an object, it is much more difficult to work *the inside* of the object. Yet, the early Egyptians did exactly that. It would be difficult to find a modern crystal grinder who could do as well.

Microscopic Writing and Carving

Another fascinating discovery is a knife handle carved from ivory. On the knife handle were microscopic carvings which could only be observed using a magnifying glass. There are also numerous other artifacts which have been discovered and which must have required the aid of high magnification, either for fabrication or viewing, or both. In fact to view the miniscule, ancient carved scenes and microscopic writing, a modern person would need a microscope. Yet, the practice of microscopic writing and drawing seems to have been quite widespread and many such artifacts have been discovered. Also, we have learned that lenses certainly existed at that time to allow it to be done.[10]

There is also an additional interesting artifact associated

9 Temple, p. 92

10 Temple, p. 77

with the famous Nazca line drawings in the Nazca desert in Peru. There are many drawings on the desert floor there. Some are drawings of animals. Others are in the form of geometrical shapes: straight lines, triangles, etc. One of the more interesting drawings is known as the Nazca spider. This drawing accurately depicts a known spider from the genus *Recinului*. It is one of the rarest spiders in the world and has only been found in remote inaccessible parts of the Amazon rain forest. The feature of interest to us here is an organ at the end of its extended leg and used as its method of copulation. See the photograph of this spider and his leg, figure 14b and 14c in Chapter 14. The organ at the end is so small that it has to be viewed with the aid of a microscope.[11] As Noorbergen observes, "How the Nazca artists were able to find and then observe their tiny model we cannot say, unless we ascribe to them a knowledge of science equaling our own."[12] As we shall see, there are also other items which seem to reflect on optical technology.

Astronomical Knowledge

An additional feature relating to ancient optical technology is the fact that the ancients appear to have had a surprising amount of accurate astronomical knowledge. This knowledge would appear surprising if we make the assumption that the ancients were primitive. However, if they did actually possess optical capability, they certainly could

11 Hancock, p. 39

12 Rene Noorbergen, *Secrets of the Lost Races: New Discoveries of Advanced Technology in Ancient Civilizations*, Barnes and Noble Books: New York, 1977, p. 199

have used that technology to gather accurate astronomical information. The planet Saturn, for example, was represented as having rings. The rings of Saturn, however, cannot be seen with the naked eye.[13]

Investigators have also been puzzled by another bit of ancient astronomical knowledge. It concerns what has come to be known as the Sirius mystery. Sirius is a binary star with Sirius B orbiting around Sirius A. Sirius B is a very much smaller star. Part of the puzzle is that without optical help, Sirius could not be resolved into a binary star. However, ancient observations of Sirius were so detailed and accurate that they gave the correct figure for the period of orbit of Sirius B around Sirius A as 50 years. Thus, with optical capability, which they certainly could have applied if they had had lenses, such observations were possible.

Indications are that the ancient people spent much time observing the stars from which they accumulated a fund of specialized and advanced knowledge. A case in point is the Sothic cycle based on the helical rising of Sirius. The helical rising Sothic cycle is related to the first appearance of Sirius after a seasonal absence. The ancients observed that the interval between one rising of Sirius and the next was exactly 365.25 days. The figure 365.25 days is the correct mathematical figure for observations in reference to the background stars when considering all of the math associated with astronomical movements. This fact was known 4,000 years or so before our time but was forgotten and not rediscovered until modern times.[14]

13 Temple, p. 562

14 Hancock, pp. 375-376

Earth Shape and Size

Another feature that seems strange to modern minds is the knowledge possessed by the ancients on the accurate size and shape of the earth.[15] The existence of such "anomalous" knowledge has been documented thoroughly and is beyond serious dispute. In commenting on these points, Hancock quotes Stecchini:

> The basic idea of the Great Pyramid was that it should be a representation of the northern hemisphere of the earth, a hemisphere projected on the flat-surfaces as is done in map-making… The Great pyramid was a projection on four triangular surfaces. The apex represented the pole and the perimeter represented the equator. This is the reason why the perimeter is in relation 2pi to the height. The Great Pyramid represents the northern hemisphere in a scale of 1:43,200.[16]

Our best modern estimates for the size and shape of the Earth are based on satellite observations. We naturally ask the question of how close is the Pyramid/Earth ratio of 1:43,200 to values obtained from satellite measurements? It turns out that the error is a fraction of one percent! Of course one might attribute the agreement to coincidence, but this seems highly unlikely.[17]

Considering the number and accuracy of the observations the ancients made to have the Great Pyramid an accurate model of the northern hemisphere, it is only reasonable to conclude that they in fact did possess optical capabilities. It has been pointed out that the Greek and Roman worlds did not have anything comparable to the

15 Dunn, pp. 134-135

16 Hancock, p. 180

17 Hancock, pp. 434-436

precision of the measurements achieved by the Egyptians. The conclusion then is that the scientific knowledge of the Egyptians was considerably above that possessed by the Greeks and Romans.[18]

A Surveying Puzzle

One area where ancient technology has been studied in great detail is that associated with the Egyptian pyramids. For example, the pyramids at Giza in Egypt are not only very, very large; they were also accurately constructed. One observation in support of that is the fact that the pyramids have survived for more than 4,000 years. Shoddy and inaccurate construction would not have contributed to such an enduring monument. In addition to that, a good foundation is absolutely essential for such a large and high-quality building project. In the case of the Great Pyramid, for example, a level and very flat base was required. The pyramid builders prepared one. Such a task required high-quality surveying skills.

> The first thing you have to do if you want to survey anything is establish a level. If you can't do that, you can't go any further. Measurements which are not taken from a level base are useless. Could the Egyptians establish a level? Well, the immediate answer is of course they could, since the northern pavement adjoining the Great Pyramid for instance was perfectly level.[19]

Careful modern surveys of the pavement and the pyramid base show that they were indeed flat, but how flat is flat? A scholar who has been conducting an ongoing research

18 Temple, p. 563

19 Temple, p. 579

program has made the following observation concerning the flatness of the base of the great pyramid.

> With an error of only 7/8-inch over the entire thirteen-acre base, over a distance of one foot the amount of error would be only .001 inch — less than half the thickness of a human hair! To detect the 7/8-inch error in the base of the Great Pyramid, even if the base were perfectly flat originally, the ancient guardians would had to have been in possession of some remarkably advanced measuring equipment.[20]

This observation raises the question of what type of measuring equipment could have been used. Might optical methods have been used?

Optical Surveying Instruments

What type of instrumentation matches with the observed degree of accuracy for the base of the Great Pyramid? Up until the electronics era, modern surveying was done using an instrument called a theodolite. It incorporates a small telescope used for sighting. Although distances are now measured using electronics, the instrument used for sighting still incorporates a small telescope. Did the Egyptians have optical capability for telescopes? It has been discovered that they did have that capability. Robert Temple, a specialist in astronomy, optics, and ancient science, has amply documented this fact.[21] He states:

> We shall be seeing that only with optical surveying instruments was it possible to construct many of the Old

20 Christopher Dunn, *The Giza Power Plant: Technologies of Ancient Egypt* Rochester VT: Bear & Co., 1998, p. 30

21 Temple, pp. 579-588

> Kingdom Egyptian buildings. In fact, *it was physically impossible* to construct the Giza pyramids without the use of theodolites or something similar to them. Their precision *could not have been achieved in any other way*. But we know that the lenses needed for optical surveying instruments did indeed exist, and I will also show the evidence for other aspects of ancient Egyptian surveying. This does not involve any far-fetched theorizing; we are dealing with inescapable facts of construction and surveying requirements for which there must be an answer. And unless one accepts optical surveying, there is nothing left but some form of magic![22]

Surveying Procedures

In addition to using optics for sighting, there are additional requirements needed for surveying. The first thing that is necessary in surveying is to establish a level. We ask the question, "Could the Egyptians establish a level?" The answer is, "Yes." We know they could because as already mentioned the northern pavement adjoining the pyramid is totally level. The question is not whether they could establish a level; the question is, "Could they do it with the equipment that we have evidence that they used for surveying?" In modern times, we use a "spirit" level. It is a device with a small bubble floating in some type of liquid in a transparent tube. When the bubble fits between two marks (on the glass tubing holding the liquid), a level is established. As far as evidence that has been discovered so far, the Egyptians did not use spirit levels. There is, however, considerable evidence, not only from ancient Egypt, but other ancient cultures, of the use of plumb bobs, a line with a weight at the end.

22 Temple, p. 464

In addition to establishing a level, direction must also be known. Also we know that the Egyptians established the cardinal directions of the compass (north, east, south, and west) very accurately. They did not use a magnetic compass as we are accustomed to doing. A disadvantage of determining direction by means of a magnetic compass is that it must be repeatedly adjusted for drift of the magnetic pole, and other variations. The magnetic pole does not remain at one location, but it wanders geographically. Ancient Egyptians used more accurate methods and were not bothered with magnetic variations.[23] The telescope could be used for sighting, but angles also need to be determined. We use a graduated scale to measure angles. However, there are ways of establishing angles other than the methods we use. At least one alternative method has been studied in detail. The method is ingenious and one the Egyptians could well have used. Experiments using the method have shown that it is quite accurate.[24]

It may sound strange to the modern mind to consider that the ancient Egyptians from the Old Kingdom may have had the technical capability for optical surveying. The problem is not that they were intellectually inferior, because we know they weren't. Evidence indicates that they were capable in mathematics, agriculture, and other advanced tasks. What causes the problem for the modern mindset is the mental framework that considers people from the Old Kingdom to have been "primitive." That culture from so long ago must still have been in the primitive stage as that line of thinking goes. The Old Kingdom of Egypt is from the very first soon after the Flood. Even so, however, we now realize that they

23 Temple, pp. 579-588

24 Temple, pp. 579-588

did have lenses, and therefore the technological possibility of constructing telescopes. Again as Robert Temple observes:

> The fact that magnification was being used at that date [circa 3300 BC] means that optical technology can truly be said to have been an integral part of high civilization since its very beginnings; from the earliest times known in excavations, it has not been absent.[25]

Based on these and other observations discussed in this chapter, it appears that optical technology was available as far back as we have any historical records of ancient civilization.

An interesting feature of ancient optical technology is the apparent lack of any evidence showing a slow progressive development of optics. The technology was already advanced when it first appears. Is that pattern unique or are there similarities to other technologies as well? For example, what do we observe about the technology required for building the Egyptian pyramids? Let us consider that topic next.

25 Temple, p. 121