Engineering in Ancient Empires

Professor Sullivan

The Antikythera Mechanism:

Timepiece of the Ancient World

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An Exploration of One of the World's Finest Artifacts

Table of Contents:

Introduction to a Marvel

The Antikythera mechanism is one of the most complex and fascinating artifacts recovered to date from the ancient world. It is simultaneously one of the most continuously studied and the most enigmatic devices ever to be constructed. The Antikythera proves that the Greeks were capable of a technological prowess not witnessed again until the end of the Medieval Ages, nearly one and a half millennia after its invention (Lobell 45). Discovered in 1900, but not initially recognized as a separate artifact, the Antikythera mechanism was supposedly capable of tracking the solar, lunar, eclipse, constellation, and planetary orbital calendars, in addition to having dials which marked the cycle of the major athletic games in Greece (such as the Olympics). Slightly larger than a dictionary, the device contained more than thirty gears that controlled all of these functions (Freeth and Jones 2.4.2).

The first modern, in depth analysis of the mechanism was conducted by Derek de Solla Price, a Professor of the History of Science at Yale University, and was published in the form of a seventy page article in November of 1974. Subsequent articles focus on aspects of the complex gear system, and the functions of its many pieces, as more dials and gears have been discovered since Price's publication. Most have been published in the mid-late 2000's, and cite Price's work as being incredibly important, crediting him for laying the groundwork for what is known today about the Antikythera. The new articles often involve the discovery of new mechanisms on the device, or clarify the purpose of a previously enigmatic part of the timepiece. The modern work has been conducted by multiple scholars, historians, mathematicians, and programmers, but there are some particularly notable contributors to what has become an international research project (called the Antikythera Mechanism Research Project (AMRP)) (Lobell 42). Michael Wright has published several papers examining the nature of the complex gear system and its methods of operation, and was the first to construct a three dimensional replica of the Antikythera, using it to examine the plausibility of certain gear configurations (51-52). Tony Freeth, a mathematician and filmmaker, has also published several papers on the mechanisms underlying the operations of the Antikythera mechanism, most notably ones that use a three dimensional reconstruction of the mechanism to determine its inner workings (80-83). It was discovered that the gears were part of a differential gear system, meaning that the cog wheels rotated around at different rates due to the varying number of teeth in the cogs (Pinostis 217). Another view is that there is an epicyclic gearing system that operates multiple cog wheels within the Antikythera, giving it the ability to rotate its components at different speeds, accounting for the differences in the solar and lunar systems (Wright 51). Upon closer examination of the artifact, there have also been extra markings noted because of modern X-ray and Computed Tomography (CT) imaging technology, which revealed many finer details of the mechanism which were previously hidden beneath the calcified and deteriorated bronze metal (Freeth, Jones, Steele, and Bitsakis 614). These details included the glyphs that mark the dials controlling what is now understood to be the cycle of the Pan-Hellenic Games and the eclipse predictions (Freeth, Jones, Steele, and Bitsakis 614). As one will see, despite many advances in archeological dating and imaging technology, there is clearly more to be discovered about the Antikythera Mechanism, including who created it, for what purpose it was primarily intended, and the underlying reasons as to why no other mechanism like it has been discovered since.

An Ancient Shipwreck

Around the time of 70 BC, a Roman ship laden with treasures and artifacts was traveling through Greek waters, presumably on its way back to Rome. Sailing north of the Island of Crete, the ship sought to bring the Greek treasures to Italy. It never reached its destination. Having made it through most of the Sea of Crete, the Roman ship was wrecked, most likely due to a storm, off the coast of the Island of Antikythera, which is a small Greek island northwest of Crete and south of the Island of Kithera (Price 5). All of its treasures sunk to the ocean floor, the place where they would rest for two long millennia. Fate would have it that in November of the year 1900, the Roman shipwreck would be ultimately discovered, but even then, it was by accident (Pinotsis 211). When a group of sponge divers from the Greek Island of Syme, which is near the Island of Rhodes, were traveling back home from their normal gathering grounds in North Tunisian waters, a storm arose and blew them off course. They were forced to seek refuge from the whipping winds, and they found shelter in an inlet on the uninhabited Island of Antikythera (Price 5). It was here that one of them, Elias Stadiatis, deciding to try his luck in the foreign waters, dove down to see if he what he could find; but instead of sponges, he found treasures enough to fill an entire wing of a museum. As the world had changed immensely around it, the shipwreck had stayed mostly the same, accumulated only more mineral deposits, crustaceans, and microorganisms which slowly chipped away at the artifacts lying amongst the wreckage. Stadiatis returned to his ship, the *Euterpe*, bringing with him the arm of a bronze statue as proof of his discovery (Pinotsis 213). The captain of the group of Symiote sponge divers, Demetrio E. Kondos, confirmed the fantastic discovery for himself, and then made measurements of the location of the shipwreck, intending to return at a later date (Price 5).

Having returned home, both Stadiatis and Kondos traveled to Athens to report their wonderful findings, taking with them the bronze arm to prove their discovery (Price 8). The fishermen met A. Oikonomu, a fellow native Symiote, and a professor of archeology at the University of Athens, who directed them to the office of Spyridon Stais, a prominent archeologist, and the minister of education in Athens at the time (Price 8). What ensued was a full-scale recovery mission, marking one of the first major underwater excavations in history (Freeth 76). The Greek authorities promised compensation to the sponge divers for relocating the shipwreck, recovering as many of the artifacts as possible, and returning them to the Greek officials. Professor Oikonomu, himself a friend of the fishermen, would assist with the project, and the Greek navy would be standing by to lift any particularly large artifacts from the ocean floor to the surface. All of it was quite exciting for the archeologists, and for the fisherman, who had originally discovered the wreck.

The sponge divers set out to recover the artifacts in November of 1900, but were significantly delayed by bad weather and difficult diving conditions. In addition to these delays, the ship sent to assist the recovery effort was too large to travel close to shore, where the wreck was located, and so a smaller ship had to be sent out (Price 8). In spite of these conditions, the divers nonetheless worked tirelessly, bringing back dozens of amphorae (clay pottery typical of Ancient Greek civilization), fragments of bronze statues, glass artifacts, marble carvings, and more, which they uncovered from the shipwreck over a grueling period of nine months. At around fifty-nine meters below the sea surface, it took nearly two minutes to descend to the shipwreck, where the divers had a maximum of five minutes to sort through the artifacts, and then ascend in close to anther two minutes (Pinotsis 213 and Price 8). Because of the difficulty of the dive, and the long time without oxygen, only a handful of divers were attempting this recovery mission. Two divers died in the efforts, and two more were permanently disabled (Price 8 and Pinostis 14). After the difficult nine month process of bringing back artifacts by hand, it was advised that the recovery efforts either be transferred to a professional recovery vessel with more sophisticated equipment, or that the project be cancelled altogether. The only ship that was small enough for the job and available to carry out the excavation at the time was operated by an Italian company, who asked for half the findings as compensation for the recovery efforts. It seemed even two thousand years later, the Italians were still trying to get the artifacts to Rome. Greek law prohibited this exchange of artifacts from occurring, and in addition, protests from the archeologists meant that a deal was never signed.

As such, the recovery efforts were cut short, and the majority of the shipwreck was left on the ocean floor. Subsequent recovery efforts in later decades revealed that there was still a significant amount of artifacts left amidst the wreckage. Indeed, in 1953, a series of dives was made under the supervision of the rather famous diver Frédéric Dumas, who reported that only the top of the wreck had been uncovered, and that there was much more buried beneath the sand (Price 9). Despite this apparent shortcoming, what the divers had recovered was a marvel in and of itself, and as such, many artifacts are still preserved by the Greek Archeological Museum (Price 8). Among the findings is a bronze statue of a young god or hero known as the Antikythera Youth, named after the island near which it was found (Price 8). A bronze head of a "philosopher" and two fine bronze statues also accompanied the recovered pieces. It took several years to catalog everything that had been returned to the surface, but as one will see, the best discovery was yet to come.

The Discovery of the Dial Fragments

Upon examining the bronze fragments returned to the surface, Spyridon Stais, the same minister of education and archeologist who had helped to set up the original dives, noticed that there were etchings and markings upon a few of the bronze pieces that stood out from the rest of what had been recovered (Price 9). Apparently, they were not part of the remnants which comprised several bronze statues, as was originally thought. They were something else entirely. Further examination would reveal that these fragments were in fact the dial systems of an ancient time-keeping mechanism which tracked multiple astronomical events during the year. It was what would be later called the Antikythera Mechanism. Named after the island near the shipwreck, just as the statue was, the Antikythera Mechanism holds its place in history due both to the incredible nature of its construction, and the unique location and circumstances of its discovery. It has become so famous that it is now sometimes referred to as *The Antikythera*.

The device, when it was originally found, was no larger than a phone book, and was actually made of both bronze and wood. Because of the nature of its discovery alongside many other pieces of bronze statues, it was not until nearly a month after being brought to the surface that it was found to differ from other pieces around it. Unfortunately, because it was not immediately recognized due the heavy calcification and deterioration of the remains, the wood on the mechanism had actually dried out and cracked after it was removed from the water, breaking the Antikythera mechanism into four main fragments and multiple smaller pieces (Price 10 and Freeth 76). This was rather unfortunate in a way, as it would have been advantageous to preserve the mechanism in a state as close as possible to the one in which it was found, but this is hardly reasonable due to its fragile nature after slumbering for two millennia under the sea. On the other hand, the fact that the Antkythera broke apart gave the discoverers an earlier look inside the machine, and it might be quite possible that because the outside was so calcified, if it not broken, the archeologists would have never discovered the still barely legible markings on the dial systems inside, somewhat protected from the harsh nature of the sea water. It is also possible that the device would have only been discovered much later, perhaps when the first catalog of items was completed in 1908, or perhaps not until it was reexamined in the subsequent decades (Price 10).

The Construction of the Antikythera Mechanism

When originally categorizing the materials, it was only after the artifacts had been brought back to the surface and had been sorted for a while that Stais noticed there were some pieces that differed from the rest; even so, it took a long time to decipher what the new findings actually were (Price 10). The first public mention of the device was in an article in the Athens Newspaper published in May of 1902, in which the object was said to have been identified as some sort of astrolabe contained within a box (Price 10). This original determination was generally correct, as the Antikythera did have dials indicating the solar, lunar, ecliptic, and constellational calendars, all features of an astrolabe device. It would later be discovered, however, that the Antikythera also had a few other tricks hidden within its complex gear system. These realizations would subsequently be described in more detail thanks to modern imaging technologies, and an examination of the historical perspective relating to the device. The purpose of these gears could then be parsed out by more closely examining the nature of the internal structures of the parts comprising them, and how they related to the size of the other mechanisms on the machine.

Upon examining the Antikythera more closely, the most striking aspect of the complicated and enigmatic device was the precision with which it was made. It is noted that there are no evident mistakes in the device, and that it is exceedingly well constructed, especially for time period in which it was built (Freeth and Jones

2.4.2). The teeth on the gears have been cut to the millimeter, which is extremely precise for a hand-made object (Freeth and Jones 2.4.2). The spacing of the gears has also been measured to the millimeter. Nowadays, highly refined metal would be used to create a device of this nature, and such precise measurements would be made by machines, the wheels laser-cut to exactly the right size, and then polished with an industrial brush. Even with such advanced equipment at their disposal, however, the people who would make this modern version would still be considered nothing short of master craftsman. To think that the Ancient Greeks had none of these advanced machines and yet still managed to build a device which was so technically advanced and precise is quite fascinating to ponder. It begs a reexamination of ancient technology.

The Dial System

It has already been noted that the Antikythera was composed of bronze and was once surrounded by a wooden frame. But in taking a closer look at the ancient timekeeping device, we can note some more precise details about the underlying mechanisms behind its operation. First of all, its functions can be divided into the front section and the back section, because each side displayed some unique features of the device and its intended operations (Edmunds and Morgan 6.10). Each side has multiple dial hands which were operated by numerous gears within the mechanism.

The large front dial displays the Solar Calendar, which marks the passing of the days and months in what is also known as the Egyptian year (Freeth 80). The ring which represented the days could be rotated such that the dates of the equinox and solstices be adjusted once every four years (in equivalence to our "leap years") (Wright 35). On the inside ring of the front dial is the passing of the constellations, which shows that the inventor had an interest in horology, or at least, in keeping track of the different constellations as they passed through the sky (Edmunds and Morgan 6.11). There are inscriptions on the face of the front cover that have been later illuminated through X-Ray and Computed Tomography (CT) imaging (Freeth, Jones, Steele, and Bitsakis 614). They show that the device had some sort of operation guide for the user, and could possibly be meant to be used as a teaching device; or it was meant to be used by someone other than the inventor, as the creator would have already known the stars very well in order to mark them all down on the device itself. There are also extra dial hands on the front which serve as markers for the relative positions of the constellations and moon phases relative to the solar year, in addition to dials that, upon further examination done at a later date, have been suggested to track the revolution of some of the planets in the solar system, the planet Venus being the most likely candidate (Freeth 80).

The back of the Antikythera has two medium-large dials, which are smaller than the one on the front. The first displayed what is known at the Metonic Calendar, which is a series of 235 lunar months, equivalent to the 19 solar year cycle that marks the passage of time it takes the sun and moon to be in the same positions relative to each other once more (Freeth 81 and Freeth, Jones, Steele, and Bitsakis 615). There are two smaller dials attached to the Metonic dial, which rotate at different rates due to the gearing systems in place. The first was originally thought to be some sort of 76 year Callippic dial, but thanks to modern imaging, the glyphs have been deciphered around this dial; they read out the names of different Pan-Hellenic games in the order in which they took place over a four year cycle. (Freeth, Jones, Steele, and Bitsakis, 615). These include the 'crown' games of Isthemia, the Olympic games, Nemean games, Pythian games, and two lesser games, the NAA at Dodona and a second games which has not yet been deciphered (Freeth, Jones, Steele, and Bitsakis 616). This dial has been subsequently recognized as a four year dial, and dubbed the name, The Olympic Dial. The other small dial near the Metonic Calendar is now seen to perhaps be the 76 year Callippic dial (Freeth 81). The larger dial on the lower half of the back plate indicates the ecliptic cycle known as the Saros Lunar Eclipse Calendar, and represents the 223 lunar months that it takes for the eclipses to reset into their original positions relative to the sun and moon (Freeth 81). There is a small dial attached to the Saros dial that rotates by a third of a turn every Saros cycle (223 lunar months), to represent the eight hour difference present with the eclipse calendar (Freeth 81). The glyphs around this Saros dial have been deciphered using the same imaging techniques, and have been determined to name the time in both lunar and solar perspectives at which the eclipses would occur (Freeth, Jones, Steele, and Bitsakis 617). As such, the original purposes for the dials were not all originally known, and have just recently been discovered as the markings around them have become decipherable with modern imaging technology.

The Gear System

The Antikythera, in all its splendid complexity, is operated by turning just a single crank on the side of the device, which rotates the front dial and then passes the motion through an elaborate concert of gear systems that ultimately differentiate the movement by using a varying number of teeth in their cog mechanisms (Wright 2). It is thought that the number of gears involved in the entire mechanism totals around thirty (Pinotsis 224). How exactly it alters the gear rotation throughout the mechanism is the subject of intense study. Price originally thought there to be a differential gear system between the solar and lunar wheels, in addition to an epicyclic gear system in the back controlling the eclipse calendar (45 and 60). The differential system that was meant to change the rate of rotation of a given gear based on the rotation of another. The epicyclic gear system was meant to place cog wheels inside each other and have each rotate a different number of times by relating the number of rotations to the movement of the dial, which was achieved by using a different number of teeth on each wheel. Wright has done extensive work examining the gear systems in the Antikythera, and has concluded that Price, without the advantage of modern imaging technology, was mistaken in thinking that a differential gear system operates in the front, and an epicyclic in the back (27). He proposes, instead, that there is no differential gear system, and that what is operating the large dial on the front and relating the solar calendar to the lunar on the Antikythera is indeed an epicyclic gear system (Wright 51). That means that the originally proposed epicyclic gear system in the back of the mechanism is in fact a fixed-axis train of gears that leads it to the Saros Calendar (Wright 52-53). Freeth, too, has constructed a model of the Antikythera mechanism and examined the most probable configurations of its gearing system. He maintains that there is a large, central dial for the solar calendar, operated by a hand-crank, which then leads to a series of different gear trains in the device (80-81). In the model Freeth has constructed, the gears are comprised of an epicyclic Lunar gear train, which accounts for the differences in motion of the moon and sun, the Metonic gear train to track the 235 lunar month cycle, the Olympiad dial to track the Pan-Hellenic games, which is coupled with the Metonic calendar dial, the eclipse gear grain, which is coupled to the Saros lunar eclipse dial, to track the 223 lunar cycle for eclipses, with the corresponding small dial that kept track of the eight hour time adjustments for every passage of a Saros cycle (81). In this way, the different methods of operating the dial system, as well as different ways of representing the system, have been reconstructed and studied.

Indeed there are many ways in which the underlying gears involved in operating the Antikythera mechanism have been modeled. Some of the most intriguing are the virtual constructions made using computer modeling programs. Among the earlier virtual models are flattened perspectives from the front or back of the mechanism, where the circular gears have been pushed together and are all overlapping on the diagram in an interlinking two dimensional model (Price 37-40).

This is somewhat representative of architectural plans. There is also a method of turning the gears into boxes on a line and placing them on a diagram from a top-down perspective, as if looking at the gear system from the top of the mechanism (Wright 3). This allows one to see exactly which gears are in the front of the cover plate or behind it, which is useful in constructing more detailed models. This visual method is somewhat reminiscent of placing the locations of genes on a chromosome. Some of the newer diagrams have moved towards a three dimensional model mapping the gears, separating them from one another while viewing the system from the side, in order to create a sense of depth, which helps in distinguishing individual gears and gear systems (Freeth 80-81). While in reality, there was only a few millimeters in between these gears, it is helpful to visualize the gears as being separate from one another so that the image does not become jumbled. This method is most related to an interactive computer model showing a three dimensional diagram with all the gears connected to one another, with accompanying arrows to show the distance and mechanistic relationships between the individual gears and gear systems.

The Antikythera Mechanism and its Purpose

When examining the nature of the device, and what it had once measured, including the paths of the moon, the sun, the stars, the heavenly bodies, and also the constellations and the Greek Games, it is interesting to ponder why such a device would have been created. It is quite unlikely that the Antikythera was the first of its kind. There most likely had to have been predecessors which were constructed beforehand, in order to refine the process of relating the various calendars together using complex dials, and building those mathematical relationships into one fairly small device. Clearly it took much time and many resources to afford the incredible amount of practice it took to design and construct the earlier models that were almost certainly necessary to ultimately create such a sophisticated device in so accurate a form.

The question is then proposed as to why someone would put such effort into building a device like the Antikythera, especially one that was so small in comparison to a larger version which would have been easier to construct in comparison. By decreasing the size, the creator was certainly made the device harder to design and construct (Freeth and Jones 2.4.2). One might think that if simple academic study or precise measurements served as the only motive behind the Greek invention, then the inventor would have made a larger, stationary mechanism which would have been held in a single location where it could be frequently accessed, observed, and even studied by many others. Perhaps the Antikythera was made small because the inventor of the Antikythera traveled often, and wished to show his creation to others far away from home. Perhaps the creation was kept with the inventor at all times, in order to be studied it or even protected from others. It is quite possible that the Antikythera, as advanced in scope as it was for the time of its invention, could have been a test model for what would have eventually become a commercialized product. The invention could have been reproduced and sold for use at academic institutions and universities all across Greece and the Mediterranean lands, and indeed, there were many scholars who would have delighted in studying this invention all across the known world. But, if this were the case, then why would there not have been some indication that this plan was the ultimate goal? To begin with, why was there only one model? Were the others stolen, accidentally broken, or destroyed out of fear of the invention being stolen? Perhaps all the other models were simply never found because they were lost to time, deteriorated beyond the point of recognition. With the odd circumstances surrounding the discovery of this device, is it possible that the other models were simply undiscoverable. All of these inquiries arose shortly after the discovery of the Antikythera mechanism, but no concrete answers could be pinned down, for there was still too much mystery surrounding the device and its origins.

Another, related question which calls to attention to itself is that of why the Romans were supposedly taking the Antikythera mechanism from Greece back to Rome? Was it given freely as a gift or meant to be displayed as an example of Greek technology, or was it taken by force? Perhaps it was especially commissioned by a Roman statesman, philosopher or mathematician. Maybe it was meant to be studied back in Italy, and used as an influence to designs of new devices. At this point, it is rather impossible to tell. It is interesting to note that from what is available today, no written account of the Antikythera ever existed; of course at that time, it would have gone by a different name, perhaps the more generic one of an astrolabe or something of the sort. Perhaps the inventor desired to know how the change of location might affect their perception of the solar and lunar calendars, though with the device having been already built this is not likely. The device could have served horologic purposes by tracking the constellational calendar; however, if this were its primary purpose, the complexity of the device would be unwarranted.

Perhaps its main purpose was that of a navigational device. Navigation at that time was often based on the locations of the moon and the stars and their relative positions throughout the year. Having such a device could have saved sailors who were caught out at night, when the sun was no longer there to guide them. There was a history of using one's surroundings to navigate through difficult or unknown waters. Even the Vikings used to observe which way birds were flying after feeding in the ocean, as this showed them the direction of land. In addition, they used rather simple stones of spar calcite and feldspar, known as sunstones, in order to determine the direction of the sun on cloudy days by measuring the diffraction of the sunlight through the stone, and then adjusting their course appropriately. There are similar, but more simple devices that other civilizations have used to guide themselves when traveling conditions that were less than favorable. The comparatively modern sextant, first used in the early 1700's, is capable of measuring both the angles between celestial bodies and the horizon, or the angles between two different celestial bodies, which when compared to a chart or map could be used to determine either latitude or longitude, respectively. Perhaps then, due to these celestial methods of navigation, the Antikythera was made relatively small in order to be portable enough to take on sea journeys, when it would have been used to navigate more safely. There was a main meridian that crossed at the island of Rhodes, one place that the Antikythera could have originated, which might explain the origin of this idea (Pinotsis 224-225). It seems that many of the Ancient Greek inhabitants of Rhodes traveled great distances by ocean, and in addition, they had a great tradition of art, innovation, and culture (Pinotsis 225).

Another, slightly different interpretation of the purpose and function of the Antikythera is that it served as the world's first computer mechanism, being able to add, subtract, multiply, and divide both hours and days of time in its calculations (Lobell 42). Subsequent studies on the cog wheels have determined that the number of teeth on each gear can be mathematically determined by the relationship between the solar and lunar calendars (Wright 54-58). The relationship between the size of the gears, the number of teeth on the gears, and the configuration of dials with one another in the Antikythera all represent the appropriate mathematical calculations for the orbits relating to the sun, moon, stars, constellations, and planets. In this way, the Antikythera can be viewed as the first representation of complex mathematical applications in a single device - in other words, a computer of time.

The Mastermind behind the Invention

When examining the intricacies and peculiarities of the Antikythera mechanism, the most natural questions which arise are where it came from and who may have created it. The best indications of where the Roman boat was coming from point to the Island of Rhodes in Greece, but this location is not entirely certain (Price 9). With regards to the creator, clearly there was a tremendous amount of skill required to craft the complex sets of gear systems and dials by hand, and as such, it was most likely a highly skilled artisan or craftsman who made such a device. One suggestion as to who might have created the Antikythera is Posidonius of Rhodes, due to the school he directed on the island of Rhodes, where he taught such related knowledge (Pinotsis 220). It could also have been created by Hipparchus, also of Rhodes, who was known to have theorized the elliptical movement of the moon, thereby enabling him to plan the assembly of such a device (Freeth 83 and Lobell 44). The construction of the Antikythera was, by most interpretations, influenced by Archimedes and his methods of orrery constructions (objects pertaining to astronomical events). Then again, another perspective, based on inscriptions hidden on the Metonic calendar (based on 235 lunar months), may suggest that the device was of Corinthian origin and could have possibly been meant for use in one of the Corinthian colonies (Freeth 83). Yet another possibility is that the device originated from Sicily due to the fact that Syracuse, the main city on the island, was home to Archimedes and that according to Cicero's account of Archimedes' death, the Roman general Marcellus took an astronomical instrument made by the great inventor after he died (Freeth 83.) The mechanism referenced in Cicero's account is most likely not the Antikythera, however, because Archimedes most likely died before the device was created; but, what Marcellus took could have been a precursor of the device which would have later been used to construct the Antikythera mechanism. Because so little is certain about the origins of the device and its creator, it is reasonable to say that the true history of this device could be any one of these explanations or even some combination of different theories. The interpretation that would make the most logical sense would be that the Antikythera mechanism was created by an inventor from the island of Rhodes, who had previously studied the work of Archimedes and learned how to build the basic mechanisms of the device from Archimedes' construction methods; however, as more symbols are continually deciphered on the Metonic calendar, there is growing evidence that the Antikythera is actually Corinthian in origin.

A Modern Antikythera

In many ways, the Antikythera has launched the archeological field into the modern era of how new and complicated artifacts are retrieved and thoroughly analyzed. The recovery of artifacts from the shipwreck off the coast of Antikythera was one of the most prominent examples of a successful excavation from an underwater site, despite the setbacks encountered. Numerous representations of ancient Greek culture were returned to the surface, and are still proudly displayed in a museum in Greece. After its discovery. the Antikythera mechanism was later tested using X-Ray and Computed Tomography (CT) imaging technology, which brought many details which were previously hidden underneath the corroded and calcified remains into the light. In doing so, modern scholars have revealed what turns out to be a more complex device than anyone had ever anticipated. In this way, the methods with which the Antikythera has been examined to date are cutting edge, meaning that this sets a definite precedent for future samples that are recovered. These methods have profound implications for the field of archeology, and as such, the discovery of the Antikythera mechanism, while extremely significant in its own right, really turned out to be much larger than itself.

The Antikythera mechanism represents what is probably the most sophisticated and complex piece of technology to be found from the Ancient World. In this vein, the ancient world had reached a pinnacle of knowledge and craftsmanship ability before the turn of the first century AD. Realizing that the Antikythera mechanism is so advanced means that one must reevaluate everything that was previously deduced about the level of technological prowess in the Hellenic World (Price 5). Clearly, there was an instance of brilliance in the design of this device, as the level of astronomical, mathematical, and technical knowledge needed to construct such a mechanism is highly impressive, especially considering the time frame for when it was created. For all its wonderful complexity, the Antikythera mechanism was truly ahead of its time, as the design was too intricate and the tolerances too tight, for the engineering capabilities of that age. In the words of the experts, "its design conception exceeded the engineering precision of its manufacture by a wide margin" (Freeth and Jones 2.2.4). This meant that while revolutionary in its conception, the Antikythera mechanism did not quite operate to the level at which it was designed, the nature of hand-made work being slightly imprecise. This should really not take away from the fact that the design was present in the ancient world, however. If the Antikythera was at all indicative of what technology would have been created had the device reached its destination or been further developed, the near future held some fascinating inventions. The pinnacle of portable, mechanical technology was not meant to have been lost for two thousand years to the bottom of the ocean. Perhaps that Roman shipwreck was a more fateful event than originally realized.

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