

## ANCIENT GREEK TECHNOLOGY: THE ANTIKYTHERA MECHANISM



Dr Amelia R Brown looks at ancient technology, and how it's affected modern technology

The last two decades are generally described as an era of technology, characterised by the rapid development and global distribution of new technologies, especially in relation to transportation, by land or by sea.

The ancient Greeks, however, are often described as overly traditional when it comes to technology, as they did not achieve modern levels of industrialisation.

However the Antikythera Mechanism has been influential in changing opinions about ancient technology, as it is the most sophisticated geared machine to survive from Antiquity: a veritable primitive computer.

Before its discovery on a shipwreck off the island of Antikythera in 1900, the existence of devices like it was hardly dreamed of, and in recent years it has been subjected to a battery of modern tests, though it is surely hiding secrets still (see Marchant's *Decoding the Heavens*).

Three things seem clear, however, about ancient Greek technology, and about the Antikythera Mechanism.

First, the Greeks knew how to work in bronze to a very high level of sophistication. Second, the Antikythera Mechanism derives from a context related to the city of Corinth, the origin for the names of the months on its dials, and the Greek city most famous for its bronze work.

Finally, the mechanism was created to fulfil a perceived need in Greek society of its time, surely through incremental developments in technology, and NOT necessarily to fulfil the 'needs' which we perceive in our society today and which can be fulfilled by our technology. Our English word technology is derived from an Ancient Greek compound of the terms *techne* and *logia*: *techne* meaning our 'Arts and Crafts': skilled human action, or production based on knowledge, of everything from music to tools.

This term, *techne*, is joined with the common suffix *logia*: enquiry, discussion or academic study of the *techne*. In the Ancient Greek language, and thus in Latin as well, the compound *technologia* meant any systematic study, rules or writing about an art, a *techne*, an area of human activity. So, technology meant to talk about art or to write about technology, to lay out the rules for the practice of what we would deem an art or a craft (see Aristotle's *Rhetoric*).

At the end of the Hellenistic era, about 70 BC, the Roman orator Cicero wrote to his friend Atticus about a book called the Republic which he was writing, modelled on that of Plato.

Cicero called his book a *technologia*, a technical work, on the art of good government. Also around this time, a ship rounding the southern tip of Greece went down in a storm off the small island of Antikythera. Onboard was a cargo of bronze and marble sculpture and our only preserved ancient computer, the Antikythera Mechanism. The wreck was discovered in 1900 by sponge divers, and excavated piece by piece from a depth of 182 feet without the aid of scuba gear. This was the first archaeological excavation of a Mediterranean shipwreck, and among the finds were three fragments of a device of 32 interlocking bronze gears. It provides an absolutely unique window into the state of Greek technology at the end of the Hellenistic era, in the world of Alexander the Great's successors' kingdoms: Antigonid Greece, from Thessaloniki to Corinth, Rhodes and Delos; Pergamum, the Seleucid Near East, Sicily; and especially Ptolemaic Alexandria with its famous Lighthouse, Library and Museum (the Muses' Sanctuary of Scholarship).

The Hellenistic kings who ruled these cities, and their cosmopolitan elites, commissioned military marvels - giant ships and siege engines - but also funded inquiry into literature, math, science, technology and many other fields of human endeavour, including astronomy. The works of these savants, mostly now lost, then formed the foundation for Roman research and writing by scholars like Vitruvius, Pliny and Ptolemy. The Antikythera Mechanism seems to have been a sort of orrery for predicting the movement of sun, moon and zodiac across the months of the year, a complex kind of astrolabe. That the months inscribed on the dials are Corinthian puts its likely origin in Corinth, or one of her colonies, most temptingly Syracuse, where Archimedes (of 'Eureka' fame) lived about 150 years before the Antikythera wreck. The Antikythera Mechanism represents not only a highly sophisticated level of Greek craftsmanship in bronze, but also a tool to fulfil one (or both) of two specific needs very closely entwined for the Greeks and the Romans: navigation and astrology.

To calculate the position of the sun relative to the moon, the time of eclipses, and the relative movement and placement of planets and stars is helpful for navigation, to tell both time and position at sea, by day or by night. At the very end of Hero of Alexandria's 1st-century *Dioptra*, a work devoted to surveying instruments, chapter 34 describes the construction of an odometer, a box (kibotion) with worm gears tied to the axle of a cart, with pointers on the exterior of the device tied to the gears to indicate distance travelled by the cart, up to a hundred miles or more.

In chapter 35, the very last chapter of the *Dioptra*, Hero then describes devices for measuring even longer distances, between the islands, on the sea, or on trackless land, as most travel was done in Antiquity, with no recourse to a wheel turned by the travel itself. One would think that here would be the perfect spot to describe a device of a box with internal gears and external pointers like the Antikythera Mechanism.

But instead Hero gives a purely mathematical and astronomical method: use the two times when a lunar eclipse is observed in two places, for example Alexandria and Rome, and Eratosthenes' calculation of the size of the globe to calculate long distances. But to have a portable tool for calculating the position of the moon, planets and stars so precisely, particularly the twelve signs of the zodiac - the 'little animals' of the heavens - is not just useful for navigation- it can also be used in astrology, in the casting of horoscopes for particular people and days. This may seem a trivial thing to us, but in Antiquity it could show who would be king- or how best to manipulate them. In conclusion, the needs of navigation and the needs of astrology probably both drove the progress of ancient Greek technology, and motivated the development of a device as sophisticated as the Antikythera Mechanism.

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