

# The Oldest Planetarium?

By Tom Mason, Director

The forerunner of the modern projection planetarium was built in Munich in 1923, but the story of planetaria may be much more ancient. In 1902 sponge divers in the Mediterranean recovered an odd geared mechanism from a Roman shipwreck. The artefact had been under the sea for over two thousand years. It is generally accepted that the mechanism, widely known as the Antikythera mechanism, was made in Rhodes at the height of the Roman Republic, as the island was known as the source of interesting mechanical automata. You can tell just by looking at it that the device is part of a larger object, and it is also obvious that there are geared wheels and other rotational elements within it. The device undoubtedly is an early computer and could be seen as the first planetarium. The Antikythera mechanism joins Stonehenge, Newgrange and the orrery as devices designed to explain and predict the motion of heavenly bodies. Calendars were very important for ancient societies as they allowed predictions of when to sow, plant and reap, as well as when to celebrate the turning point of cold dark winter and the certain return to the light and heat of spring and summer.

**“It was a very cleverly designed computer”**

The ancient societies of two millennia ago were advanced in many ways, but technologically backward compared to what we now take for granted. Previous work deciphering the structure and function of the Antikythera device hinged on X-rays and, by today's standards, rather crude ways of looking through the marine corrosion which encrusted but also protected the device. The advent of computer tomography techniques has allowed modern investigators to examine the relic without causing it any further damage. This twenty-first century imaging technology has provided a fascinating view of the details of this



Image Credit: Wikipedia.org

**The main fragment of the mechanism** Although corroded and encrusted it is clearly a product of sophisticated engineering..

artefact. The work, carried out by a team led by Professor Mike Edmunds of Cardiff University, is described in *Nature* 444, 587-591 (30 November 2006)

The modern imaging techniques have allowed the research team to make a more detailed analysis of the object. They have declared that it was a very subtle, cleverly designed computer that could be used to predict the position of planets and also predict eclipses of the Moon and Sun. This is a startling revelation to us, as there is no other discovery of such devices in the archaeological record. When it is considered how carefully it was made, and how precise its predications, it is a bit like presenting an archaeologist a century from now with a rusty Apple computer that has been under the water for a very long time, and then for the discoverers to state exactly what it did, why it was made and how it worked, all without being able to turn it on and having a total lack of manuals.

The Antikythera object originally was a bronze double-faced device, holding 37 toothed gear-wheels: it probably was fitted inside a wooden case that would have measured around 32 by 20 cm and 10 cm thick.

The machine is an early computer, which allowed not only for a 365-day calendar, but also permit-



**The interior of the mechanism** A recent computer-assisted reconstruction. The mechanism predicted leap years every four years. The researchers also claim that the mechanism predicts lunar and solar eclipses, and could be used as a star almanac, showing when stars and constellations rose and set. It may even have predicted the positions of the known planets. The most technically ingenious element of the machine explains those odd movements of the Moon that are caused by its elliptical orbit. For centuries this main lunar anomaly puzzled astronomers, including Newton. This part of the machine has suggested that the mechanism

could have been made to explain the Greek astronomer Hipparchos' pioneering work: he made the first star catalogue and also wrote about the main lunar anomaly in the 2nd century BC. This is the time at which the Antikythera machine was fabricated, maybe even under Hipparchos instruction! The evidence is flimsy but it includes the fact that the artifact was found in a shipwreck associated with pottery jars and coins from Rhodes, where Hipparchos is known to have lived.

According to lead researcher Mike Edmunds, "the computer is so advanced in its mathematics and technology that the history of ancient Greece may have to be rewritten". He goes on "we now must ask: What else could they do? That's a difficult thing, because this is really the only surviving metallic artifact of its kind. Who knows what else may be lost?" The Antikythera mechanism is on display in the National Archaeological Museum in Athens where not only is the original relic preserved, but there is also a working model. The object is dated on the style of the writing on its dials to 150-100 BC. For our US readers there also is a replica on display at the American Computer Museum at Bozeman, Montana.