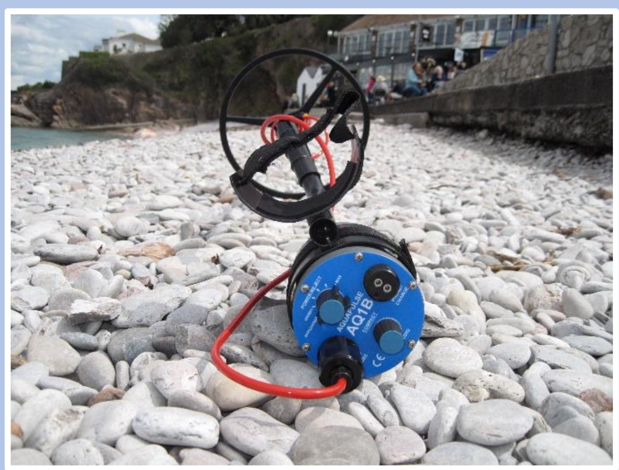
UNDERWATER METAL DETECTORS:
A VITAL TOOL FOR DIVING ARCHAEOLOGISTS

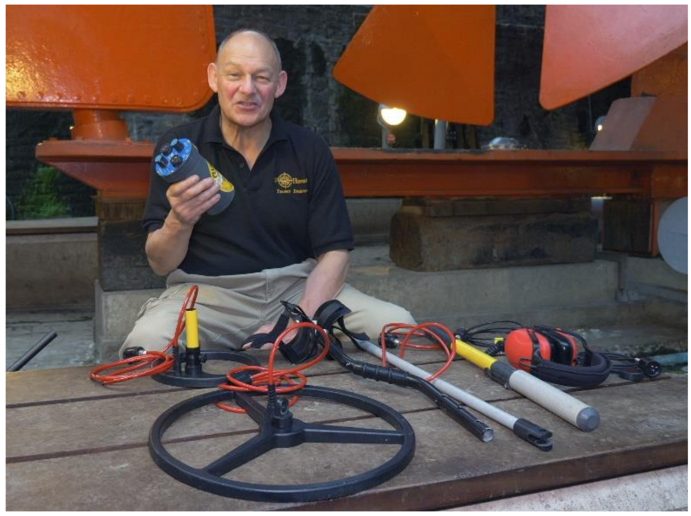
By MIKE HAIGH, Project Director Wreck Hunters

The image that most people have of ‘detectorists’ (as metal detector enthusiasts are often called) is probably derived from reports in the media of treasure being found in remote locations.
Archaeologists’ traditional view of this activity was not positive – many regarding these activities as nothing better than the vandalism of historic sites. In recent times, however, relations between metal detector users and archaeologists have improved.
Metal detectors are used in diving archaeology in three principle ways: During the pre-disturbance survey of the site to map concentrations of metallic objects and other isolated contacts; secondly, to ascertain the approximate position of objects in a layer which is about to be removed. The third use is to locate metal artefacts on bedrock, which are either invisible due to a covering of silt, because they are hidden in holes and crevasses; or in many cases disguised by marine growth.



Underwater metal detectors, like the Aquascan AQ1B unit *seen here* which we use, are called pulse induction metal detectors. The detector normally comes in two parts, an electronics pod containing the battery and circuitry which is attached to the coil or probe by a cable. The diver will see the presence of metal objects on a display, or more commonly by sound signals, either by using headphones or by using a ‘bone phone’. Instruments vary in the ways they report the presence of a target. In the case of the Aquascan unit a steady pulse tone builds to a continuous signal when the coil is over a piece of metal.

So how do they work?
In the case of the AQ1B unit, the detector works based on alternating a transmit and receive signal at a rate of a few hundred cycles per second. In the transmit stage a strong direct current pulse, lasting a fraction of a second, is sent out. This pulse energises the surrounding area and creates a response from any conductive material, this is called an 'Eddy Current'. In the receive part of the cycle any increase in sampled returned energy, from proximity of a conductive object, will raise the level in the receive path above the 'at rest' level. This produces the audible response we described earlier.



Most metal detectors used on land are known as VLF (very low frequency) detectors. The problem with these is that their signal is significantly absorbed by saltwater and generally relies on continuous motion to generate a response. Pulse induction (PI) detectors on the other hand are able to work well in saltwater and without requiring motion.

Due to the conductive nature of seawater a level of returned energy is generated for a short time after the end of the transmit stage; this energy increases in level and duration as water depth increases. A switch setting allows the point of sample to be slightly delayed allowing this unwanted early energy to dissipate. A secondary control allows the optimum threshold to be restored at any depth.

Maintaining optimum sensitivity allows maximum yield of contacts, albeit in many cases this will yield an old drink can or other discarded modern debris. However, the seabed will also provide many more metallic clues relating to maritime history. Sorting the ‘wheat from the chaff’ will probably only come with excavation of the site.

I would add in here a word about the care of these units. Most modern underwater metal detectors have undergone a long production span and most ‘weaknesses’ have been weeded out. They are, however, reasonably expensive pieces of equipment and care should be exercised by those using them. Try not to drop your weight belt or tank on them! Rinsing them in fresh water after use is a sensible idea.

So, what has been found using these instruments?

We must here differentiate between the activities of what we would term ‘treasure hunters’ and archaeological investigation. Of course, it is the discovery of treasure that hits the headlines, such as the exploits of Greg Bounds off Key West, Florida, and the location and salvage of the 1715 Treasure Fleet by Brent Brisben. On the latter site $4.5 million worth of gold coins were recovered on one day.

Captain Greg Bounds with some of gold coins found while treasure hunting off Florida

In terms of diving archaeology, metal detectors have had a positive contribution for longer than many would expect. In the case of the Kyrenia ship, dated to approximately 300BC, the lead sheathing of the vessel was located by a metal detector survey. Other electronic survey methods had missed this – which could have led to the destruction of this key find when the remains of ship were recovered. This survey took place in 1970.

Moving closer to the present, in 2019 a team from of Italian Navy Divers located a Roman wreck at 90m and using AQ1B units recovered swords and other artefacts. The image shown in this article, courtesy of Aquascan and Mario Arina of Global Underwater Explorers, shows a diver using an underwater metal detector on the site.

Diver using an Aquascan metal detector on the site of a Roman Wreck at a depth 90m of water in 2019, image courtesy of Aquascan and Mario Arina of Global Underwater Explorers

Perhaps the best example of how metal detectors can locate ancient wrecks comes from a site I came to know well, the Giglio Etruscan wreck. When Mensun Bound and Reg Valentine were searching for the site, some 20 years after its original discovery by Reg himself in 1961, no signs of a 'shipwreck' could be found. It was by using a metal detector, on loan to the project, that the team were able to locate metallic fragments of the vessel. So, what was then the oldest shipwreck in the world was rediscovered by using a tool more normally thought of by many as for use in finding sunken gold!

Next time we be looking at the use of photomosaics in wreck site investigation.

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