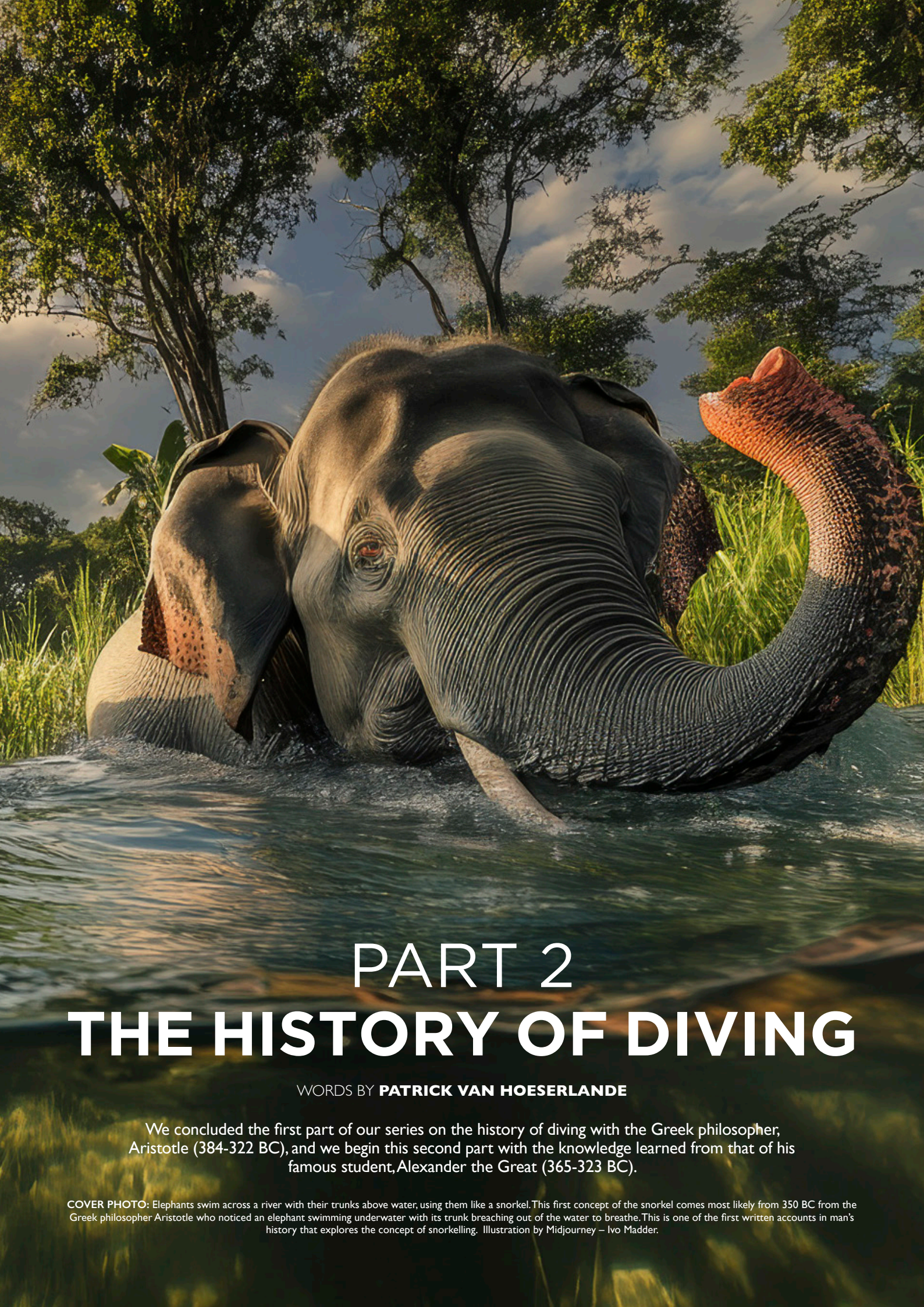




PART 2
THE HISTORY OF DIVING

WORDS BY **PATRICK VAN HOESERLANDE**

We concluded the first part of our series on the history of diving with the Greek philosopher, Aristotle (384-322 BC), and we begin this second part with the knowledge learned from that of his famous student, Alexander the Great (365-323 BC).

COVER PHOTO: Elephants swim across a river with their trunks above water, using them like a snorkel. This first concept of the snorkel comes most likely from 350 BC from the Greek philosopher Aristotle who noticed an elephant swimming underwater with its trunk breaching out of the water to breathe. This is one of the first written accounts in man's history that explores the concept of snorkelling. Illustration by Midjourney – Ivo Madder.



ABOVE: Archimedes' "Eureka" moment! Illustration by Midjourney – Ivo Madder. **BELOW:** The one-person bell designed by Guglielmo de Lorena.

We concluded the first part of our series on the history of diving with the Greek philosopher Aristotle (384-322 BC). He wrote about the use of snorkels and diving bells. We do not know whether he ever went underwater himself. However, he wrote about the underwater adventures of his famous pupil Alexander the Great (365-323 BC), who used his knowledge of diving during his conquest. We begin the second part of this series with this famous Macedonian.

Alexander learned how to use a diving bell from Aristotle, amongst others. As a conqueror, he put all available knowledge to use on the battlefield and he employed a diving bell during the siege of Tyros in 332 BC.

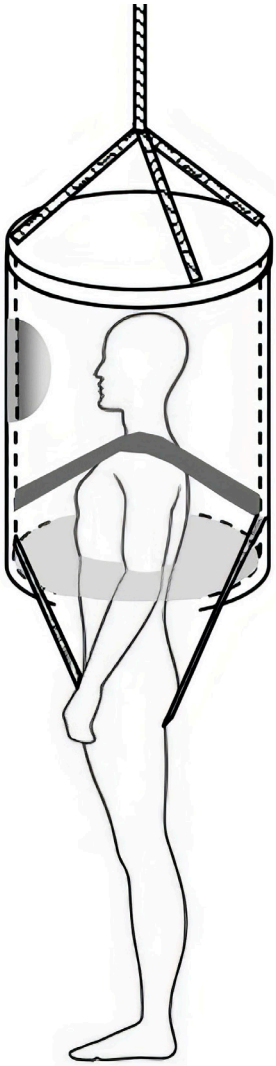
The diving bell served as a base for free divers who had to cut through the pole erected by the defending Phoenicians to prevent enemy ships from reaching the city. This made the Macedonians the first to use "demolition divers". Alexander is said to have watched the progress of the underwater works by diving in a glass diving bell called the "Colimphax". The description of this diving bell can be found much later in a French manuscript from 1250. During his dives, Alexander is said to have seen enormous sea monsters, including a fish so long, that, although it swam very fast, it took three days to swim past.

FLOATABILITY

The last Greek in our story did not realise during his days that he would play such an important role in diving. Archimedes of Syracuse (287-212 BC) lived on the Italian island of Sicily and was a well-known scientist more than 200 years before our era. In his role as advisor to the court, he was given a special assignment by his King. The King had a crown made from a lump of gold. But was the crown made entirely of gold, or had the goldsmith secretly added cheaper silver? The latter lived beyond his means, which the King found suspicious. The weight was correct; it was exactly the same as the lump of gold that the King had given the royal goldsmith. But that did not guarantee that the crown was made entirely of gold, and with the science of the time, it was not possible to prove that the goldsmith had "stolen from the crown".

The brooding King asked Archimedes to investigate whether the crown was 100% gold. Archimedes set to work. He knew that gold had a higher density than silver, but at that time it was only possible to calculate the volume of regular shapes. He could have hammered the crown into a cube, but the king had expressly ordered him not to damage the golden object. After all, if it was all gold, the King wanted to keep the crown.

Archimedes decided to take a bath to think things over. He sat down in the bath, saw the water rise and the tub overflow. Then he knew it! When an object is immersed in water, the water rises. And so, he figured out that objects made of the same material and weighing the same must also displace the same amount of water. "Eureka!" (I've got it!), he cried. He jumped out of the bath and ran naked into





ABOVE: Urinatores: professional Roman divers. Illustration by Midjourney – Ivo Madder.

the street, shouting "Eureka!" (according to the story). Later, he showed the King and the court how he could figure out the volume of an object based on the amount of water that ran out of a bucket. According to Archimedes' calculations, the crown was indeed not made of gold alone. Archimedes never formulated his law as such, but his story is at its core. That is why we know the relationship between mass and volume as Archimedes' Law.

URINATORES: PROFESSIONAL ROMAN DIVERS

We find references to underwater activities involving diving bells and free divers in ancient Egyptian, Greek, and Roman writings. If there was one professional group in Roman society that remained at the bottom of the sea and of the social ladder, it was the 'urinatores', the divers who earned their meagre wages as pearl, sponge or treasure divers in the port of Ostia, in the River Tiber and off the coasts of Italy. They were seen as daredevils who played with death. Without diving masks or other equipment, they descended, weighted down with stones, to depths of sometimes more than fifteen metres. Every day, without fail. Each dive must have been a painful experience. Their eyes were red and swollen from the salt water and their ears suffered greatly from the differences in pressure. To prevent their eardrums from bursting during the rapid descent, some of them pierced holes in them. With pieces of sponge or olive oil in their ears, they hoped that the seawater would not enter the Eustachian tube through their pierced eardrums. It is clear that the life expectancy of these divers was not very high. No matter how hard they worked, no matter what risks they took, they could not count on any social advancement. Those who earned their living at sea were considered unsavoury, and those who descended into the sea and ventured into this hostile element were considered completely insane and far removed from the norms and values of agricultural society, even though they were useful to that society.

Divers were therefore shunned. Only when war situations made it necessary for them to disable enemy ships as a kind of military diver "avant la lettre" were the Romans prepared to temporarily overcome their aversion. This was the case in 194, when divers in the service of Emperor Septimius Severus played a decisive role in the siege of Byzantium. They swam to the enemy ships, drove nails with long cables attached to the bottom of those ships and then pulled the ships from their moorings.

The Latin word used to refer to divers conveys contempt. Although the Romans had words for diving and going underwater (demergi, inmergi, submergi), the word urinator, derived from urino(r), was the term used for this group. Although urinator is not exactly a word that expresses appreciation, divers themselves used it to refer to their profession, as there are inscriptions with the name of their trade association, the "corpus urinatorum".

The question of how the Romans came up with this name is still unanswered. The traditional explanation is that urinator is related to the word "urina" in its original meaning of water. Urinatores were therefore people who were submerged in water or people from whom "water dripped". Another explanation is that urinatores refers to the derived meaning of urine. Based on the fact that divers in cold water, due to the pressure of the water column and the cold, tend to urinate spontaneously underwater, they would have been called urinatores. Although this condition is not serious and does not affect divers above water, they were nevertheless labelled urinatores. The explanation can probably be found in the book "Les Secrets de la Mer Rouge" by the explorer Henry de Monfreid. De Monfreid spent a lot of time with pearl divers and during those trips he was repeatedly struck by a terrible stench when the divers were on board. When he asked where the stench came from, he was told that young divers suffered from urinary incontinence. It is a disease that affects divers under the age of thirty when they descend to depths of fifteen to eighteen metres, weighed down by a large stone.

Although the urinatores were important to the port of Ostia, the beating heart of the Roman economy, and in times of war, to outsiders they stayed urine collectors who stank and were best avoided.

FIRST DIVING LAW

In the first century BC, a thriving salvage industry developed along the main trade routes of the Mediterranean. In 77 AD, the inhabitants of the island of Rhodes were doing





ABOVE LEFT: A "corpus urinatorum" inscription. **RIGHT:** The catch of a tasty fish by the fisher on the vase (in his right hand) proves the the benefits of a dive mask.

such a thriving business salvaging valuables from sunken ships that it was considered an important matter requiring a law to set up the rights of the various parties involved. The first diving law stipulated that divers would receive a share of everything they recovered from the sea, with the compensation depending on the difficulty of the salvage, in this case the depth of the wreck. At a depth of 25 feet (7.6m) or more, the salvager's share was half of all salvaged goods. From 25 to 12 feet (7.6 to 3.6m), the share was reduced to one-third, and in shallow water where they could stand, the share was only one-tenth of the value of the goods. That was all they were allowed to demand from the owners. Similar laws exist today in almost every country in the world.

FIRST BREATHING TUBE

In the year 77, Pliny the Elder wrote an encyclopaedia of 37 books. In this extensive work, he mentioned the technique whereby military divers attach a breathing tube to a surface buoy. The use of military divers was so widespread that Roman galleons at anchor were recommended to set up a guard system against divers. Having your own diver who could stay underwater for a long time was a great advantage.

We know that underwater warfare was important from, among other things, the work "De Re Militari" from 375 by Publius (or Flavius) Vegetius Renatus, a writer from the Roman Empire. The original work no longer exists, but a new edition was published in 1511. In this book, we find illustrations of a helmet with a long snorkel and an armed free diver. The diving techniques in both images were probably very limited, but they do show the continuing interest in this field.

FIRST DIVING MASK

As in so many fields, interest in the underwater world waned after antiquity. There were probably free divers in our regions who dived for natural and anthropogenic treasures, but few traces of this can be found. We have to cross the Atlantic Ocean to find anything about diving in these centuries. In the arid Nasca desert in southern Peru, fish and other marine animals from the nearby Pacific Ocean were essential food sources, and those who fished these riches from the Pacific were respected in Nasca society, unlike in Roman society. These fishers wore distinctive headgear: a turban with a pointed knot at the front, as can be seen on a Peruvian vase depicting a diver. The style of this headgear appears to have been functional. Similar to a fish's fin, the protrusion at the front was intended to help fishermen dive and swim through the water more quickly and easily. The catch of a tasty fish by the fisher on the vase above (in his right hand) proves the belief in the benefits of the fishing gear. The eye part of this headgear resembles a type of diving mask and could be the first image of this diving equipment.

It is not possible to find out when exactly the diving mask first appeared. In the 1300s, possibly earlier, Persian and Polynesian pearl divers began to use visual aids underwater. They had 'glass' made by thinly cutting and polishing the outer layer of turtle shells. Several centuries earlier, the prototype of modern diving masks were used by the many free divers in the Pacific Ocean, such as the Ama from Japan, to harvest food and resources underwater. These masks were often made from polished sea or turtle shells. The invention of diving masks seems to have arisen from a natural, progressive need for visibility, without a single precursor or real origin. Rather, it seems that knowledge of their use was passed on through trade and occasional contacts between coastal dwellers.

FIRST DIVING APPARATUS AND DIVING HELMET

It is not until 1190 that we encounter something interesting, and once again it is a military activity, namely the siege of Acre, a city in the north of present-day Israel. According to the Arab writer Bohaddin, an Arab diver used a device to breathe underwater. This diver was the Egyptian Ahsan-ul-Ghawasin, also known as Issa, and he may well have been the inventor of the first diving apparatus. He served in the navy of the Turkish Sultan Saladin during the Third Crusade. In order to bring supplies to the city of Akko, he is said to have made a device with a bellows. Weighed down with a stone, this device allowed him to stay just below the surface of the water and swim past the Christian guard posts. The report tells colourful stories about Issa's horror when he saw the hundreds of Arab bodies lying on the seabed, "which served as a feast for eels, octopuses, and crabs". He too became one of those bodies after being spotted by a patrol of crusaders and shot dead by an arrow. However, he went down in history as the first person to develop a kind of diving helmet.





ABOVE LEFT: Mariano di Jacopo's long snorkel design. **RIGHT:** A leather diving helmet with a long tube.

The Middle Ages were a time without much progress. Even underwater, it stayed dark, and we had to wait until the Renaissance to discover anything new. In 1450, we meet the "Sienese Archimedes" Mariano di Jacopo, il Taccola (1382-1453). This Italian scientist described a breathing apparatus, in fact a long snorkel, very similar to a horse's nose cap. A rather impractical design, but it does signal a hopeful revival of interest in diving. More importantly, he also provided the first European illustration of a piston pump.

FIRST SCUBA AND MODERN SNORKEL

Later, the Italian Leonardo da Vinci (1452-1519) described systems for breathing underwater and is sometimes credited with the first design of SCUBA equipment. It is likely that others had done so before him, but we do not find much evidence of this, and his sketch is very similar to our current equipment. In his Codex Atlanticus, he described equipment with an air supply and a means of controlling buoyancy. He did not want to give details so as not to give unsavoury characters any ideas (such as sinking ships for their treasures or for robbery and murder). That was not such a strange thought at the time, as pirates and beachcombers were more common than they are today.

When the Turkish fleet sailed towards Venice to attack the city, the city council realised that their small fleet would be defeated and called on everyone to come up with solutions. Of course, Leonardo had to respond. He designed diving equipment to sink the Turkish fleet. The diver could breathe through two tubes attached to a float. One tube was for inhaling, the second for exhaling. With this, Leonardo solved the problem of dead space, and his diver would suffer less from headaches. His proposal also included a kind of fin, although it was intended for "swimming" with the hands. After all, his diver had to walk across the seabed to the Turkish fleet. Unfortunately, the Turks did not invade Italy, so there was no need to produce and use his diving equipment. It did not however, leave the design stage. Nevertheless, Jacques-Yves Cousteau is said to have been inspired by this design.

Leonardo also devised a full leather diving suit with an integrated mask that could float or sink thanks to a leather bag to control buoyancy. By breathing in and out of this air bag, the diver would be able to dive autonomously. This design was therefore a first sketch of SCUBA equipment. Leonardo had thought of almost everything, as he even integrated a small bag to collect the diver's urine in case of an emergency! Had he read about the Roman epithet "urinator"?

FIRST SUBMARINE WITH PROPULSION AND SUBMARINE ATTACK

The earliest mention of a self-propelled underwater vehicle can be found in the writings of the Swedish historian Olaf Magnus, who recounted that during an expedition by the Swedish King Haakon to Greenland shortly before 1505, two submarines made of sealskin, each with three men on board, were captured. They had been devised because the natives wanted to take revenge on visiting European traders for their dishonesty. The Greenlanders managed to drill holes in the bottoms of a handful of European ships before they were captured. These submarines were propelled by oars protruding from their sides and were used not deeper than a few metres, as the sealskin hulls would never have been able to withstand the increased water pressure at greater depths.

FIRST USE OF A DIVING BELL

The Roman emperor Caligula ruled in the first century and was best known for his extravagant parties. He even had several luxurious pleasure galleys that sailed on Lake Nemi, found about 30 kilometres from Rome. These ships, laden with treasures, sank in the lake, and although many searched for the wrecks, they were never found. In 1531 (other sources mention 1535), the Italian Guglielmo de Lorena designed a single-person diving bell. The bell was carried on the shoulders and lowered into the water with cables, which also served to keep the bell upright. The pressure in the bell was equal to the ambient pressure. The air for the diver was refreshed with barrels. In later versions, air was pumped through pipes to maintain a consistent air flow. In July, Guglielmo de Lorena and Francesco de Marchi began their search and a few weeks later they found the galleys. This is not only the earliest known use of a diving bell, but also the first underwater archaeological investigation. It was probably not a pleasant experience, as Francesco described diving with the bell as follows: 'From your elbows up, you were warm, but below that, you were cold.' The neoprene diving suit had not yet been invented.