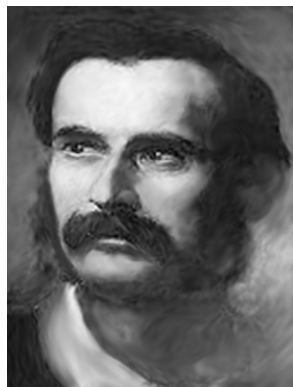


10.4 Narcís Monturiol

Monturiol, a visionary and peaceful revolutionary, wanted to improve the social and economic lives of his countrymen. Moved by the suffering of coral divers due to their extremely dangerous working conditions, Monturiol built a submarine to transport the divers to the reefs. He hoped that in time, his invention would also help people understand the ocean world.

Birth of a Spanish inventor



Narcís Monturiol was born on September 28, 1819, in Figueres, Catalonia, a region of northeastern Spain. Monturiol's father was a cooper—which means that he handcrafted wooden barrels that held wine, oil, and milk. Narcís was one of five children. At an early age he showed an interest in design and

invention. When he was ten, he created a realistic model of a wooden clock.

His mother wanted Narcís to become a priest, but he earned a law degree instead. He never practiced law, however. Instead, he became a self-taught engineer.

Monturiol was active politically. He supported socialism, communism, and the ideal of a utopia where everyone lived together in harmony. He turned to science with the hope of creating that utopia.

The perils of coral diving

Monturiol was concerned about the danger involved in the work of Spanish coral fishermen. A diver, holding his breath for several minutes, dove nearly 20 meters beneath the ocean surface to retrieve valuable pieces of coral. The divers risked drowning, injuries from rocks and coral, and possible shark attacks.

In 1857, Monturiol formed a company to design and build a submarine. His goal was to develop a vessel to help coral divers with their physical work and to lessen the risk involved.

Monturiol was not the first to build a submarine. Historical records show that Aristotle, Renaissance period inventors, and others had attempted to build submarines. These models were often created for warfare. Most early submarines were unsuccessful and dangerous.

Ictineo I

Monturiol's first submarine, *Ictineo I*, made its first dive in 1859. The name *Ictineo* is derived from Greek, and is translated "fish ship." During its initial dive, *Ictineo I* hit underwater pilings. Repairing what he could, Monturiol sent *Ictineo I* on its second dive within a few hours.

Monturiol's seven-meter submarine had a spherical inner hull built to withstand water pressure, and an elliptical (egg-shaped) outer hull for ease of movement. Between the two hulls were tanks that stored and released water to control the submarine's depth. Oxygen tanks were also stored in this space. The submarine was powered by four men turning the propeller by hand.

Ictineo I was equipped with a ventilator, two sets of propellers, and several portholes. The submarine had the ability to retrieve objects and was equipped with a back-up system to raise it to the surface in an emergency.

Ictineo I made nearly 20 dives that first year, to a depth of 20 meters. The submarine eventually stayed underwater for nearly two hours.

Ictineo II

Monturiol created a second and improved model called *Ictineo II*. Rather than relying on manpower, the *Ictineo II* had a steam engine. These engines were traditionally powered by an open flame. Monturiol created a submarine-safe alternative to power the engine using a chemical reaction. The open flame would have removed oxygen, but the chemical reaction added oxygen to the cabin instead.

The *Ictineo II* was 17 meters long, had two engines, dove to depths of nearly 30 meters, had many portholes, and remained underwater for almost seven hours.

Unfortunately, Monturiol ran out of funds and was forced to sell his submarine for scrap. Although he didn't receive much credit for his inventions during his lifetime, he is now recognized as an important contributor to submarine development. Monturiol died in 1885.



Reading reflection

1. What moved Monturiol to create a submarine?
2. Identify key features of the *Ictineo I* and *II*.
3. **Research:** Where are model replicas of *Ictineo I* and *II* located?
4. **Research:** What happened to Monturiol's *Ictineo I*?
5. **Research:** Name three things Monturiol invented in addition to the submarine.
6. **Research:** How did Spain honor Monturiol in 1987?
7. **Research:** What is the Narcís Monturiol medal?