

Chapter 2

Timelines of Underwater Archaeology

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INTRODUCTION

The history of archaeology underwater is inextricably associated with the history of marine technology, for it is through the equipment and techniques of diving and underwater work that archaeology under water is made possible. The following timelines describe a few of the literally hundreds of milestones in the evolution of diving, marine technology, and deepwater archaeology. Undoubtedly, some readers will take issue with one or more of the entries in these timelines. Fortunately, the Historical Diving Society USA (HDS-USA) pointed significant errors in the draft, then helped put things to right. The discipline of underwater archaeology owes a debt of gratitude to the HDS, an international organization of loyal and scholarly volunteers who are preserving the history of the technology of diving. The timelines in this chapter will have served their purpose if they provide the reader with a better understanding of and appreciation for the remarkable inventors and their creations that allow us to confidently venture into the water, seeking evidence of our past that would otherwise never be revealed.

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TIMELINE FOR DEEPWATER TECHNOLOGY AND EXPLORATION

Major Categories of Diving

Ambient-Pressure Diving

Breathhold Diving

480 B.C. Greece: Herodotus wrote that Scyllias first becomes rich by collecting treasure for the Persians from the sunken wrecks of Xerxes' ships, then, according to legend, deserts to the Greeks by swimming 9 miles underwater; earliest record of diving for military purposes.

1913 A.D. Greek diver Stotti Georghios free dives to 200 feet (61 m).

1865 U.S. Navy diver Robert Croft sets a breathhold record of 231 feet (70 m).

1976 Frenchman Jacques Mayol Free dives to 330 feet (100 m).

1998 Gianluca Genoni sets a new world record for "no limits" breathhold dive: 443 feet (135 m), a dive that lasts 3 minutes 3 seconds.

Open Bell

350 B.C. Greece: Aristotle, in his *Problemata*, describes the use of a crude diving bell.

322 B.C. Alexander the Great purportedly dives beneath the sea in a bell named *Colimpha*.

1535 A.D. Italy: Guglielmo de Lorena explores Caligula's barges from Lake Nemi, near Rome; earliest reliable record of diving bell in actual use.

1642 United States: Massachusetts Edward Bendall dives in wooden bell in Charlestown Harbor, Massachusetts.

1691 England: Edmund Halley descends in diving bell and claims to have reached a depth of 60 feet (18.3 m), remaining 1.5 hours; air replenished by air-filled barrels.

1779 England: John Smeaton uses a crude air pump atop a very small diving bell to repair the footings of Hexham Bridge in the shallows.

Surface-Supplied Gas

1715 England: Andrew Becker demonstrates his metal helmet and leather-covered body armor in the River Thames, London, purportedly with air supplied from a bellows.

1754 England: Helmet divers conduct salvage, possibly with an air hose connected to a vacuum pump, allowing air to be pulled down to the helmet.

1773 France: In a dive suit with bellows-supplied air, Freminet dives to 20 feet (6 m) and remains for 3/4 hour.

1823 England: Charles Anthony Deane files a patent for a smoke (fire-fighting) helmet and dress that was soon adapted to diving (see below).

1828 England: Charles Anthony Deane and his brother John adapt the 1823 smoke helmet for underwater use and successfully complete trials in Croydon Canal; the system is referred to as an "open" type.

1829 England: Using their open system diving equipment, the Deane brothers salvage cargo from the wreck of the *Carn Brea Castle*, initiating successful careers as salvage divers.

1834 United States: Leonard Norcross patents and tests what is now believed to be the first successful "closed" (water-tight) diving helmet and dress.

1840 England: Combining his own designs and inventions with those of the Deane brothers and George Edwards, Augustus Siebe constructs a successful "closed" diving helmet and dress; the Siebe equipment sets the standard for practically all surface-supplied helmet equipment.

1905–1907 Britain: The Admiralty Committee for Deep Diving carries out open-water trials using new decompression tables designed by Professor John Scott Haldane, culminating in a world record dive to 211 feet (64 m).

1908 Haldane's decompression tables published.

1915 United States: U.S. Navy prints Stillson's "Report on Deep Diving Tests, 1915;" records diving procedures and equipment and introduces the prototype Mark V helmet and dress.

1916 United States: The Navy Department produces the “Diving Manual, 1916,” which standardizes diving procedures and equipment for the U.S. Navy; this manual contains the first appearance of the production Mark V helmet and dress.

1924 United States: U.S. Navy Experimental Diving Unit tests helium-oxygen mixtures as breathing gas for deeper dives.

1930 England: British Admiralty establishes decompression tables to 300 feet (92 m).

1939 United States: Using both air and helium gas mixtures, U.S. Navy divers salvage the sunken submarine *Squalus* from a depth of 240 feet (73 m).

Self-Contained Gas

1811 France: Frederic von Drieberg’s “Triton” diving system requires diver to “nod” his head to operate bellows connected to tank on diver’s back.

1825 England: William James’ dive system was the first self-contained dress with a compressed air supply.

1865 France: Benoît Rouquayrol and Auguste Denayrouze invent a self-contained breathing apparatus with a back-mounted air reservoir and an automatic demand valve.

1879 England: Henry Fleuss patents first oxygen “rebreather,” with compressed-oxygen reservoir and carbon dioxide absorbent, permitting breathing gas to be replenished with oxygen, cleaned of carbon dioxide and recirculated.

1926 France: Yves Le Prieur modifies the Fernez surface-supplied apparatus to a self-contained free-flow system, recorded as the Fernez-Le Prieur Apparatus.

1935 France: Yves Le Prieur popularizes self-contained diving by establishing a recreational scuba diving club, Club des Sous l’eau, in Saint-Raphaël.

1935 France: René Commeinhes develops a firefighting apparatus with a demand regulator.

1937 United States: Using self-contained equipment, Max Gene Nohl reaches a world record depth of 420 feet (128 m) in Lake Michigan using a helium-oxygen mixture.

1942 Germany: Austrian free diver Hans Hass and German engineer Herman Stelzner modify a Drager submarine escape oxygen rebreather for scientific diving.

1943 France: Jacques-Yves Cousteau and Emil Gagnan invent the “Aqua-Lung” —the first simple, practical self-contained compressed air breathing apparatus. System’s “demand regulator” supplies air to diver as needed; the “Aqua-Lung” opening the underwater world to millions.

1960s–1970s Other rebreathers develop, including U.S. Navy’s MK 15 and MK 16, with computer-controlled electronic gas monitoring and control.

1980s “Technical diving” techniques and PC-based decompression tables develop, allowing recreational divers to push beyond depth limitations of conventional recreational SCUBA.

Saturation Diving

1938 United States: World’s first intentional saturation dive, 27 hours at 101 feet (30.8 m) in Milwaukee, Wisconsin, hyperbaric chamber.

1960 United States: U.S. Navy conducts first extended saturation dives; at 200 ft (61 m) in pressure chamber for 14 days.

1960s Edwin Link (Man-In-Sea), Jacques Cousteau (Conshelf), and the U.S. Navy (Sealab) conduct first open-water saturation dives.

1962 United States: Hannes Keller and Peter Small, using a diving bell and a gas mixture developed by Keller, reached 1000 feet (m) of Santa Catalina Island, California.

1977 France: COMEX divers conduct deepest working saturation dive, 1510 feet (460 m); later break own record at 1644 feet (501 m).

1980 United States: Duke University divers attain a simulated depth of 2132 feet (650 m) breathing helium-oxygen-nitrogen mixture.

2001 United States: U.S. Navy, Naval Sea Systems Command and Mobile Diving and Salvage Unit Two conduct 45-day saturation diving mission at *Monitor* National Marine Sanctuary.

*One-Atmosphere Diving**

Closed Bell

1774 England: In Plymouth Sound, John Day descends in sealed chamber within wooden ship to depth of 30 feet (9 m); dies in later attempt to reach 132 feet (40.2 m).

1831 Italy: Cervo tests closed bell in the form of a wooden sphere; dies in attempt.

1866 Spain: French engineer Ernest Bazin reaches 245 feet (75 m; three times previous record) and stays 1.5 hours without air supplied from surface; bell later supplied with compressed air.

1930 Bermuda: William Beebe descends to 1426 feet (435 m) in 2.5-ton steel bathysphere. reaches 3028 feet (923 m) four years later.

1939 Atlantic Ocean: McCann-Erickson Rescue Chamber rescues men trapped in submarine USS *Squalus* from 243 feet (74 m).

Atmospheric Diving Suit (ADS)

1715 England: John Lethbridge tests rigid diving suit consisting of wooden barrel with glass viewport, arm holes sealed with leather cuffs; reports reaching 70 feet (21 m).

1727 England: A Captain Rowe built and successfully used a system almost identical to the Lethbridge machine (above). The Rowe device is much better documented.

1856 United States/Canada: Canadian ex-patriot Lodner Phillips designs and possibly builds first ADS to provide many of the features found in much later designs.

1882 France: The Carmagnolle brothers design and build an ADS so advanced that certain of its features are still in use more than a century later.

1904 Italy: Two designs are proposed by Restucci: a fully-articulated suit with arms and legs and an ADS with a rigid lower section. The latter may be capable of depths exceeding 400 feet (122 m).

1906–1913 Germany: The salvage firm Kuhnke and Neufeldt patents version of ADS that right up to the middle of the 20th century. The suits are capable of reaching depths up to 600 feet (183 m)—although at that depth the joints become stiff.

1915 United States: Captain Harry Bowdoin of New Jersey, files patent for a new type of oil-filled rotary joint and a design for an ADS; ADS used to salvage precious cargoes.

1919 Mexico/United States: Victor Campos of New York patents ADS with fluid-bearing rotary joints; that Campos tests the ADS to depths exceeding 500 feet (152 m).

1932 United Kingdom: Joseph Salim Peress designs series of suits that culminate in the “Jim” suit of 1969. The first suits are heavy and not as elegant as later models, but all use the ball and socket (or cylinder/piston) approach, supported by a fluid bearing. The design is quite successful to depths of 400 feet (122 m).

1965 United States: Giusta Fonda-Bonardi and Peter Buckley develop the “UX1,” a 600 foot (183 m) suit design utilizing a combination of rotary bearings and an accordion-like system called a “rolling convolute.” A series of limbs are extensively tested and are successful, but the program (funded by Litton Industries) is cancelled before a complete suit is built.

1969–1980 United Kingdom: Joseph Peress begins to work on ADS systems again, in concert with Michael Humphrey and Mike Borrow; resulting in several advances on original Peress fluid-bearing joint of the 1930s; all rights to are acquired by Oceaneering International before 1980.

1985 Canada: In 1984 Phil Nuytten patents combination of knife-edge seal and fluid bearing that ultimately becomes the 1000-foot (305 m) rated ADS “Newtsuit.” Several generations of Newtsuits are produced between 1985 and 1995.

2002 Canada: A lightweight free-swimming ADS called “Exosuit” is in prototype stage. Developed by Phil. Nuytten (Newtsuit), the “Exo” is said to be more flexible and less costly than predecessors. Reported depth is 750 feet (229 m).

*Of the many one-atmosphere suits that were proposed, few were actually built; of those, fewer yet were even marginally successful. This list is limited to those units that were used successfully to carry out work underwater.

Submersibles and Submarines

1578 England: William Bourne describes concept for a primitive submarine in his book, *Inventions and Devices*.

1620 England: Cornelius von Drebbel builds two wooden-hulled submarines, reportedly testing them in Thames River; however, according to one report his craft has open bottoms and, if so, do not qualify as submarines.

1776 United States: David Bushnell's wooden submarine, *Turtle*, uses hand-operated screw propellers for moving forward, backward, up and down, and variable ballast for buoyancy control. *Turtle* is first submarine employed in warfare; during the American War for Independence, *Turtle* uses detachable explosive charge in failed attempt to sink HMS *Eagle*.

1800 France: American Robert Fulton launches his copper-hulled submarine *Nautilus*.

1851 Germany: The crew of the submarine *Brandtaucher* performs the world's first submarine escape, from a depth of 60 feet (18.3 m).

1863 France: The French submarine *LePlongeur*, run by compressed air, is launched.

1864 United States: Confederate States Submarine *Hunley* sinks USS *Housatonic* off Charleston, South Carolina; first time in history that a submarine sinks an enemy ship.

1881 United States: John Holland's gasoline-powered submarine *Fenian Ram* is successfully tested; one of first submarines to operate on surface using internal combustion engine.

1886 France: The *Gymnote* becomes the French Navy's first operational submarine; called by some the "world's first modern submarine boat."

1887 France: *Goubet I*, one of the first battery-powered submarines, went into service.

1897 United States: John Holland develops forerunner of conventional military submarines, operating on surface by gasoline engine and underwater by battery-powered electric motor.

1898 United States: Simon Lake's *Argonaut Junior* launched; first submersible built for peaceful purposes.

1948 Belgium: Swiss research scientist Auguste Piccard dives to 4,500 feet (1372 m) in autonomous submersible FRNS (Fonds National de la Recherche Scientifique).

1951 Belgium/France: The third generation FRNS (FRNS-3) launched; George Houot ultimately reaches 13,700 feet (4177 m) in 1954.

1951 Japan: University of Hokkaido launches *Kuroshio*, a large (12.5 ton) research sub with a 600-foot (183 m) operating depth.

1955 United States: U.S. Navy launches world's first nuclear submarine, USS *Nautilus*.

1959 France: Cousteau-developed "Diving Saucer" launched; the small, lightweight, tetherless system with rated working depth of 1000 feet (305 m) uses water jets for steering and propulsion.

1959 United States: *Deep Diver* launched, first small submarine (submersible) with chamber permitting divers to "lock out" to work.

1960 Switzerland/United States: Jacques Piccard and U.S. Navy Lieutenant Don Walsh descend to 35,820 feet (10,916 m) in the bathyscaph *Trieste* (successor to FRNS-3), in Mariana Trench, deepest known spot in the oceans.

1961 France: *Trieste* successor *Archimede* launched; capable of reaching full ocean depth.

1961 United States: *Sportman 300* built by American Submarine Company; rated at 300 feet (91 m) and one of first commercially-produced sport submarines; more than a dozen built.

1962 United States: John Perry produces the *Cubmarine*, rated at 150 feet (46 m); first of long series of recreational, scientific, and commercial work class subs.

1962 United States: Submaray 2-person, 300-foot (91 m) sub developed by Douglas Privvet; prototype for *Nekton* and *Delta* systems.

1962 United States: Westinghouse Electric announces the *Deepstar* series; several successful subs were built.

1963 Switzerland: First "tourist class" deep submersible, the 1000-foot (305 m) rated *Auguste Piccard* carried thousands of eager tourist to the bottom of a Swiss lake during the Swiss exposition.



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