Underway

David L. Porter

I have wanted to work in the ocean ever since I saw the movie of *20,000 Leagues Under the Sea* (I was in third grade). Out of Jules Verne's mind (1870) came a great new ship, the *Nautilus*, that could sail under the ocean at speeds faster than surface ships could steam. I knew then that I wanted to be like Captain Nemo—plying the waters under the sea. This inspiration must be distinctly understood, for it shapes the story I am going to relate.

Underway at about 8:00 in the morning, we "steamed"[1] out of Groton and headed south. This ship was the largest vessel from which I had ever made oceanographic measurements. However, onboard space was at a premium. The program manager had arranged for me to berth with the XO (executive officer, second in command). The room had two bunk beds (I was on the bottom). There were two desks, but only one desk chair. To get into my bunk, I had to climb over the desk chair. There was a fold-out seat in the wall, too. The XO examined his crew members (much like board of reviews in the Boy Scouts), and they often met with him in his stateroom, sitting on this fold-out chair. A fold-out sink in the wall with a mirror over it served as the bathroom sink. There was a shared toilet between the CO (commanding officer) stateroom and the XO stateroom. These accommodations were luxurious compared with those of the 100 enlisted men who had to share one large bathroom with three showers, three toilets, and four sinks.

Once we were underway, we magnetically mounted our wind anemometer during the 12-hour surfaced transit to deep water. As we were steaming out, I had the opportunity to climb up to the bridge. I climbed a ladder up out of the pressure hull, and there were two more sets of ladders. The tube is big enough to allow only one person to climb, so I could lean back on the tube as I switched ladders. All this time, I was wearing a harness. Once I got to the bridge, there was a small steel grate to stand on. The harness was locked into a welded ring on the bridge. There was a Plexiglas windscreen. Intermittently, the waves broke against the sail, spraying me, the chief engineer who was sharing the small metal grate with me, and the lookout standing back on the top of the sail. The chief engineer looked at me, smiled, and said, "This is what going to sea is all about." I totally agreed! There was a Bernoulli hump on the foredeck; this is a fluid flow where water is accelerated over the foredeck as the ship moves forward. The green water hit a protruding sensor on the deck, sending a vertical cataract into the air, where it was swept away as spray by the wind. Behind us was a path of water turned white by the entrained bubbles produced by the immense power being delivered by the screw.

[1] In days of yore, one *sailed* away from port. Then, during the industrial revolution, side-paddles augmented sail. They used coal to produce steam, which was used to move a piston that turned the paddle, much like a steam locomotive turns its wheels. In a few years, side-paddles gave way to the more efficient propeller, but steam was still used to drive the shaft. Hence, vessels *steamed* from port or were *under steam*. Then diesel engines, gas engines, and gas turbines replaced the coal- or oil-fired boilers that produced steam. Hence, the phrase "She steamed out of port" became a colloquialism. These phrases, though, are still used to this day, even though a ship with a diesel engine has nothing to do with steaming. However, in the second paragraph, where I said, "We steamed out of Groton," this phrase is not a colloquialism. It is a fact! For with the advent of the atomic age, the nuclear furnace began to be used once again to generate steam. That steam drives a turbine, which in turn goes through a reduction gear and drives the propeller shaft. So, we "steamed" out of Groton.

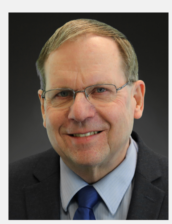
Left to right: Rajen Patel, David Porter (author), and Bob Naugle.

After about 10 minutes, I climbed back down the passageway. Once we reached water deep enough to dive, we dove. Traveling along at about 10 knots with about 5 atmospheres of water over us, we were just like the *Nautilus* in *20,000 Leagues Under the Sea*! Then it was dinnertime. The mess holds about 30 people total. We lined up in the long hallway outside and waited our turn. Finally—it was our turn. Down the hallway to the mess, a voice boomed out "Two!"—our order to enter. I grabbed a plate and served myself cafeteria style. The serving table was about 5 feet long and filled with trays of good foods, including salad and fruit. However, it was only the first day of the cruise, and these perishables would be disappearing soon. A crewman asked what I wanted to drink, "Orange, Purple, coffee, or water?" The Orange is orange-flavored drink, and the Purple is grape-flavored. The key ingredient is the water, which is abundant, for the heat from the reactor boils the seawater, condenses the steam, and makes all the water onboard. It is pure H_2O, with no salts or any other substances. The chief engineer said it is the best water on earth. I sat down at one of the four- or six-man booths and introduced myself to the stranger sitting across from me. We ate—quickly, because there were still people to be fed.

After dinner, the chief engineer took us on a tour of the engine room. What a feat of engineering! We cranked open a watertight bulkhead and entered the back half of the submarine. The reactor control room was a beehive of activity. There were three people at the reactor controls and a raised table at the back where the operator went through checklist after checklist. We were then led to the reactor. We could feel the heat from the core. To the right was the reactor core—about 20 feet away. To the left was the submarine hull with 500 feet of water on the other side. Yet, here I was standing in a passageway between two places that were contrasted by immense radioactive heat and cold ocean water! A small metal door was undogged to open a window about a foot in diameter and 18 inches thick. Looking through the window I could see the core. The power source of the submarine was about the size of a four washing machines stacked next to each other. There were backup systems upon backup systems to keep the core safe. It is incredible to think that the core generated enough energy for our 2,000-league journey. The energy not only propelled the vessel through the water, but it also made freshwater, cooled the boat, made oxygen, cooked the food, lighted the area, and ran all the electronic equipment, including the computer I'm writing this on now—all while we were underway!

We toured the mechanical part of the engine room and saw the giant propeller shaft turning as well as the plane and rudder pistons responding to the helmsman up in control. There were huge air-conditioning systems, pumps for salt water, cooling pumps, and backup pumps. It was an immaculately clean engine room that was very quiet compared with those on any other vessel I've been on, except the R/V *Atlantis II*, which had steam-powered pistons driving the shafts.

So in one day I went from the top of the bridge to the bottom level of the vessel, where I could see where the shaft and control surfaces exit the hull. When talking to the nuclear engineer, I told him that designing such a system, building such a system, and operating such a system were all engineering feats! Quite a day! Having now fulfilled a lifelong quest, I joined Captain Nemo in plying the waters under the sea.



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