

## Thresher and Magnetics

by Jim Heirtzler (LDEO 1959-1987)-3

In the spring of 1963, immediately upon return from a long cruise, the Director of Lamont asked if I could come to his office. He said that a new Navy nuclear submarine had just sunk (on April 10) with about 120 persons on board. It was last known to be about 400 km east of Boston in about 2500 meters of water. So far, several weeks after the sinking, ships had not been able to locate the remains on the seafloor. It was important to find and study the remains since it had a nuclear reactor and that may have caused radioactive contamination. There were seven ships searching a 10 by 10 mile area. One of these ships was Lamont's new addition, the Conrad. See accompanying story by Sam Gerard.

In those days it was rarely necessary to precisely identify a location on the deep sea floor: a precise location to which one could return. Ships used techniques that identified things only in the immediate area around the sensor, and, frequently, one didn't know where the sensor was, except that it was on the end of the long wire from the ship. In looking for the *Thresher* bottom photography was the main tool. Lamont had a bottom camera that took literally thousands of bottom photos on each lowering. Each roll had to be developed by the usual wet process so processing and examining the photos was a very intensive business on board.

In my meeting at Lamont Dr. Ewing asked if I thought we might find the remains of the *Thresher* with a magnetometer since the Navy had used magnetometers to find submarines in World War II. By coincidence, before coming to Lamont, I had measured the magnetic field of submarines on a classified Navy project. There is a major submarine base at New London, Connecticut. In testing different types of magnetometers for the General Dynamics Corporation we had operated magnetometers on the lighthouse at the entrance to the Thames River which led to the New London submarine base.

Submarines passed, on the surface, within a few tens of meters of our instrument and we could easily see, by eye, how far the submarine was away when it produced a signal of a given strength. Thus I was well acquainted with the magnetic signal of a nuclear submarines.

To accurately locate the *Thresher* we felt that we need a bottom, not surface, magnetometer. At that time no marine institution in the US had such an instrument in operation.

Our brilliant engineer, Jim Cottone, had built our proton precession magnetometers, and thought we could build one that would operate on the bottom for this search. Within 24 hours we had packed up all the equipment that we thought we might need and took a flight to Boston to meet the Conrad.

We arrived in the search area at night and the situation seemed just short of chaos. Many ships were operating close together and many of them were trailing long cables over the side with real risk of getting them tangled. The 10 by 10 mile area was divided into four parts with a couple of ships in each 2.5 by 2.5 mile area. There were two buoys with radar transponders and our ship had a split screen radar to allow us to locate ourselves by taking two simultaneous bearings from the two buoys. Joe Worzel seemed to be in charge of the Conrad and had things under control but the ship, her Captain and crew were new and we didn't know how far to good they were at precise navigation, so the scientists did the navigation. Just turning a ship in the space of a mile is not easy since the wire was more than a mile in length. Furthermore, with a wire over the side the ship can only turn in one direction.

We got a magnetometer operating in short order. However our bottom instrument package contained tuned circuits whose electronic component were temperature sensitive. Since the ocean floor is much colder than the surface this caused a bit of a problem. By using some local refrigerated boxes we were able to make the instrument operate in simulated bottom temperatures. At surface temperatures the instrument would not operate correctly but we knew it would

come into operation on the bottom. By careful ship operation we were able to deploy the magnetometer cable at the same time that we deployed a camera cable.

Debris from the *Thresher* had been turning up on the surface and an attempt was made to see from which direction the debris was coming. The results were confusing, but we were ordered not to dump any trash over the side. (In those days it was legal to dump garbage over the side.) There was a general area, away from the search area, that was designated for dumping. Very early in the morning, on June 12, we went on a garbage dumping run, but kept the magnetometer deployed. It was on this run, away from the detailed search area, that we got a magnetic signal that I knew could only be that of a submarine. We tried to carefully mark this location.

There was some worry that this may be from some other, older, sunken ship and excitement was held in check pending confirmation. It took four more days of bottom photography in this area before we got confirmation. These were pictures of compressed air tanks that are only used on US nuclear submarines.

An "official" account of the *Thresher* search was given by Spiess and Maxwell in a 1964 Science article. This search illustrates that it is more difficult than one might expect to find a spot on the sea floor. It may not be evident here but from my participation in several searches, I know that what seems like the most logical plan may not always be the best. When to use one technique or another, or when to stop the search altogether, depends heavily upon the experience of the people doing the search and cannot be done by a committee.

By mid-August the Navy had brought the submersible *Trieste I* from the west coast and had actually seen the remains of the *Thresher*. Shortly after that a ceremony was held on the surface over the *Thresher* and a wreath was laid on the water honoring those who had lost their lives.