Investigation of Aleutian Trench

June 7, 1964

Does an extension of the Aleutian Trench, a deep and narrow crease in the earth's surface that parallels the Alaskan peninsula, continue as far south as the U.S.- Canadian border, or even farther? A scientific party from the University of California, Scripps Institution of Oceanography hopes to find out this summer.

The seven-member group, headed by Dr. George G. Shor, Jr., an associate research geophysicist at Scripps, will leave San Diego July 8 for a one and one-half month scientific trip on board the 100-foot research ship Oconostota.

Their purpose, as they head toward the Gulf of Alaska, is to study the continental shelf and the deep area of the ocean farther out to sea. On previous trips Dr. Shor and his associates have gathered evidence that a trench might continue from the end of the Aleutian Trench at least as far south as the U. S.- Canadian border but the continuation is buried under sediment from land.

"We want to confirm that evidence and see if we can follow it north to where it shows topographically near Cordova and then continues west," he said. "We have already followed the Aleutian Trench east from Kodiak as it gradually fades out."

Dr. Shor described a trench as a long deep crease formed by a dip in the earth's crust. Trenches are found closely paralleling the shore line and are found around most of the margins of the Pacific Ocean. Trenches in the Atlantic are not so apparent owing to sediment but the Puerto Rico Trench in the Northwest Atlantic near Puerto Rico exists because sediment has not filled in that area.

The 11 known trenches in the Pacific Ocean include the world's deepest, the Marianas Trench near the Mariana Islands, which is more than six miles deep. The Aleutian Trench is four miles deep at its deepest point, near the west end of the Aleutian Islands.

This summer Oconostota will start near Vancouver, Canada and zig-zag its way northwest following the coastline to Kodiak. Although the work was planned prior to the Good Friday earthquake that struck Alaska, Dr. Shor said Oconostota will do some work near and in Prince William Sound to see what evidence of faulting can be found in the sea floor.

Dr. Shor was granted his Ph.D. in 1954 by the California Institute of Technology in the field of seismology. Since coming to Scripps in 1953 he has participated in seven oceanographic expeditions that have taken him from the Gulf of Alaska almost to the Antarctic Ocean. His trip this summer is part of a continuing study of geology of the sea floor near Alaska that Scripps has been conducting since 1956. Dr. Shor returned to the area in 1957 and again in 1961 to continue the work.

"Every summer we find enough problems to want to go back and do more work tf he said. "We are just now finishing up the problems found on the 1961 expedition. Now we are going back to look at, in detail, what we did before," he said.

On past trips many different means of study were used, including coring, seismic refraction, and dredging. The trip this summer will use only seismic reflection equipment to map the bedrock beneath the sediments.

Through reflection methods, the scientist is able to get what amounts to a cross section picture of the layers of sediment on the ocean floor. Reflection works on the same principle as the navy's Sonar system but at much lower frequencies. Sound waves sent out from the ship are reflected from the ocean floor and from layers below it, returning to a series of hydrophones trailing behind the ship.

Sound is reflected at the various layers owing to the differences in the density of the layers. The waves picked up by the hydrophones are monitored by the ship and recorded on a series of graphs giving the scientist a picture of the ocean floor.

On Oconostota the noise is produced by an electric discharge from eight 18,000 volt condenser which produce a loud spark through power cables under the ocean surface. According to Dr. Shor, the noise produced is about equal to that produced by two grams of TNT.

Oconostota will trail a 220-foot hose fitted with 10 hydrophones to receive the echo of the spark. A spark is fired every two seconds giving the scientists a picture of the ocean floor about every 17 feet as the ship travels at about five knots.

While similar low frequency reflection systems have been used by the oil industry on land for about 35 years, it is only within the last few years that the system has been used extensively by oceanographers. Prior to this, most studies of the earth's crust under the ocean were made through the seismic refraction method which is similar to reflection but gives greater penetration with less detail.

Refraction studies were begun at Scripps in 1948 by Dr. Russell W. Raitt, Professor of Geophysics. Tn the refraction method a much more powerful explosion is set off a good distance from the hydrophones and at a lesser frequency.

Due to the distance from the recording hydrophones and the lesser frequency of the blasts, a much greater area of the earth's crust is recorded by the sound waves. Any small topographical changes within that area are nearly lost on the graphs and the scientist must work with an average reading of the area.

While the reflection method gives a great deal more detail in a smaller area, it is not a cure-all for studying the geography of the ocean floor, according to Dr. Shor. It carries only power enough to penetrate little more than any sediment. The best penetration Oconostota will be able to achieve will be about one kilometer, or a little more than half a mile into the crust.

While Dr. Shor and his colleagues hope to increase their knowledge of the Aleutian Trench, the trip will by no means be the last. Dr. Shor is already making plans for another scientific study of the Alaskan area in the summer of 1965.

Dr. Shor's work will receive support from the Office of Naval Research and the National Science Foundation.