Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Director, Institute of Marine Sciences, UC Santa Cruz.

#10 August 30, 2008
Drilling into the sea floor

Nearly 50 years ago, an ocean engineer who thought way outside the box, proposed that we mount conventional oil well drilling equipment on a large ship and drill a hole into the deep-sea floor. Willard Bascom's goal was to drill through the Earth's crust, which is much thinner under the oceans than under the continents, and find out what the underlying mantle was composed of. We believed that there was an abrupt boundary between the cold, rigid and thin crust and the hot, viscous and thicker mantle, which had been named the Mohorovicic discontinuity, or Moho for short, in honor of its discoverer, Andrija Mohorovicic. While we had indirect evidence about the nature of the mantle from the earth's gravity, from earthquake waves and from the composition of meteorites, we really didn't have any direct evidence about this huge, 1800-mile thick portion of the Earth's interior.

Bascom convinced the National Science Foundation to support this bold experiment, named Project Moho after the drilling target, and in the early 1960's a large barge was outfitted with the necessary drilling equipment to test the concept. The drilling rig, named the Cuss I, was successful in boring the first two holes ever drilled in the deep sea floor, one off San Diego and a second in water 12,000 feet deep off of Baja California. There was a lot of initial speculation that drilling from a floating vessel through 1000's of feet of water into the deep sea floor simply wouldn't work. One major concern was how could a ship manage to remain stable enough to remain at sea at one spot and drill for days at a time. But by using a series of anchors and surface buoys connected with taut wires, and large outboard motors on each of the four corners of the ship, the drilling vessel could maintain its position in deep water and successfully drill into the ocean bottom. The drill bit penetrated as far as 1000 feet into the seafloor in this pioneering effort, still a long way from the Moho, which was perhaps five miles deeper, but this project was a major breakthrough and proved that this could be done.

Forty years ago in 1968, the year I began teaching at UCSC, the National Science Foundation launched the Deep Sea Drilling Project with a large, uniquely constructed ocean-going drill-ship named the *Glomar Challenger*. This was the beginning of an innovative partnership between the federal government, university

marine scientists, and the drilling industry to carry out scientific drilling into the sediments and rock of the ocean floor. By extracting long cores of sediments and sedimentary rocks from the ocean floor, scientists for the first time had history books that would help them understand the history of the Earth and the oceans and how they have changed over time. Prior to this effort, our understanding of the seafloor and the historic record that was preserved in its sediments was based on short cores of sand and mud obtained by dropping a weighted piece of pipe onto the ocean floor.

No one knew at that time that the oldest rocks in the ocean basins were only 200 million years old, relatively young geologically speaking, and that they only recorded a fraction of the Earth's 4.6 billion year history. But as the drilling program continued and the ship criss-crossed the world's oceans collecting cores, the discoveries from the sediments quickly revolutionized our thinking about the oceans and the Earth and their evolution. Throughout the history of the oceans, the record of all that has transpires in the overlying seawater is preserved on the seafloor as sediment and the remains of marine life settle on the bottom. We now have an entirely new group of scientists, paleoceanographers, who's careers are dedicated to spending months at sea, recovering long sediment cores from the ocean floor through ocean drilling, and then painstakingly analyzing these sediments for the information and millions of years of history they contain. In my next article, what have they learned?