



**NOAA Teacher at Sea  
Mark Friedman  
Onboard NOAA Ship RAINIER  
June 9 – 20, 2008**

**NOAA Teacher at Sea: Mark Friedman, Marine Biology teacher from Animo Leadership High School, Los Angeles, CA**

NOAA Ship RAINIER

Mission: Hydrographic survey and ocean bottom features mapping (*see vocabulary help at end*)

Geographic area: SE Alaskan marine waters, especially inside passage, Sitka and Kodiak areas

Dates: Monday, June 16, 2008

**Science and Technology Log**

Each day the RAINIER's "Ship's Officer," in collaboration with the field operations officer and the ship's commander, issue a "Plan of the Day" also known for short as the POD. (Who knows what marine animals move in groupings called a POD? First one to reply from Los Angeles gets a free Alaskan souvenir!)

The POD contains important information such as, for Sunday, June 15, Sunrise was at 0415 (4:15 am), and sunset is at 2139 (9:39 pm!) It will be a long day! I rise at 6 am to read the POD and find my assignment.

***POD Revelations***

The ship's position is:  
Anchored, Palisade Is., AK.  
The POD also has tide levels, U.S. Coast Guard beacons in the area, the weather, and who the officer on duty is.



**Here I am studying nautical charts as preparation for the Tidal Gauge expedition.**

The weather you ask? How important, especially because many of us are going out on launches and the smaller skiffs for specific assignments. The launch drivers need this especially to make sure all operations are safe. The winds are mild, coming in from the south at 5-10 mph, cloudy with showers, air temperature a balmy 51F with seas of 1-2 foot waves.

The POD has major assignments for anchor watch and officers on duty. Safety is a constant refrain as there are anchor watch positions around the clock to staff the bridge (command center)

sending regular weather reports to the Coast Guard and National Weather Service and maintaining a secure and safe environment.

The POD also lists all the assignments for the launch vessels being dispatched by the mother ship—no not *Battlestar Galactica* or the *Enterprise*, but the RAINIER. Today two vessels will be doing sonar readings around San Christoval Channel and North San Fernando Island. The other two, one of which I will be on, is going to remove a tide gauge and do a recon (reconnaissance) mission for a new tide gauge location.

### ***The Journey Begins***

7 am- We are all up for a hearty breakfast, made by three talented chefs (especially in the omelet, soup and dessert department).



Here I am learning to withstand the cold in my Arctic survival suit.

7:30am- I struggle into my arctic survival suit and boots in preparation for a “wet landing.” I feel like Sylvia Earle in her “Jim Suit” as I waddle like a penguin to the stern of the ship to board a skiff for an hour journey up narrowing channels and over rapids to reach our destination. (I have put on all layers of clothing that I brought with me from Los Angeles, preparing for frigid temperatures and lots of wind and mist en route.)

8:30 am- With a spraying salt mist and a wind chill factor making the temperature about 20 degrees Fahrenheit, we race up the labyrinth of islands and channels to our destination. A deer and her fawn stare blindly at us on our port (left) side, a humpback whale breaches on our starboard (right). We even glimpse a couple of sea otters playing/rafting in the kelp (seaweed).

### ***On Location***

9:30 am- We have reached the tide (marine), or water level, gauge. Our assignment is to remove it after ensuring calibrations have been correct. The tide is coming in and the shore is covered with algae, mini-white barnacles, a sprinkle of clams, a species limpets and small purple mussel beds which are thriving.

### ***What is a tide gauge and why are they important?***

*Water level gauges* are instruments to measure water surface elevation over long and short durations of time. They have been used for centuries by mariners to improve their knowledge on the depth of water and apply this information to the chart. This information can aid in the calculation of tidal currents, the ebb and flow of water as the tides change. More modern gauges need a power supply to relay information via satellite to appropriate organizations interested in this data.

A tide gauge consists of a number of instruments including, foremost, a measured, calibrated *staff* that is securely mounted into rocks to give a visual baseline of water levels. It is connected to benchmarks by using a survey instrument called a level, which optically measures height differences on a survey rod, which I held during the operations.

Benchmarks used by NOAA, and previously by the U.S. Coast and Geodetic Survey, are brass survey discs (see photo right) that are imbedded into bedrock and stamped with a code that correlates in NOAA data banks to date of installation, project, location number, etc. Five of them are traditionally imbedded at various locations in the vicinity of the staff. They are leveled between each other and the staff, establishing a mathematical correlation. Gauge measurements are all related to the benchmarks, which hold the permanent datum for the tide station.



**A NOAA tidal gauge benchmark**

### ***The Underwater Component***

Another component of the *gauge* is an orifice (brass pipe with an open end) that is placed where it is continually submerged. It is connected to an electronic readout instrument via strong plastic tubing that is filled with nitrogen. As the gas comes under more or less pressure, based on the pressure exerted by the quantity of water pressing down upon it (water pressure), it registers the height of water levels. (Similar to how air pressure is registered by a barometer, a little



**NOAA divers retrieve a submerged tidal gauge**

remembered instrument but critical to meteorological forecast and studies).

The information on depth is thus recorded and electronically transmitted out of the area thru solar powered equipment.

In addition to water levels for meteorological (weather) purposes, over time these tidal gauges, when coordinated with others and register actual sea level rise which is now occurring more rapidly due to glacial melting from global warming. They have also been used to register tectonic plate movements.

We disassembled the land equipment after completing our benchmark surveys. Later we scouted for a new location further south for a new tidal gauge and benchmark installation site. Then the divers went into action (see above photos). Their job was to retrieve the submerged gauge and piping for future use. In the process they took a video of part of the undersea flora and fauna.



**A sun star, a type of sea star, was observed during the tidal gauge dive.**

### ***Back on the Ship***

All equipment is secured, checked and prepared for the next installation site. The gauge team tomorrow will secure benchmarks for the establishment of a new tide gauge station. (Guess what? At the installation site they found a 1927 benchmark still intact and functional!!)