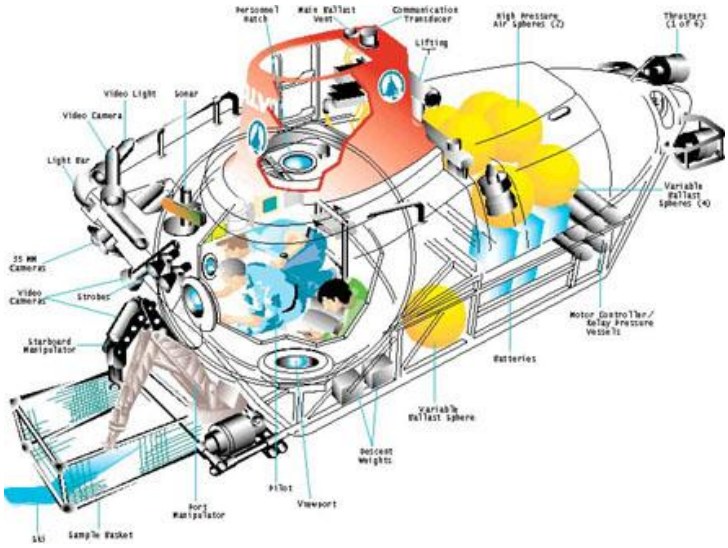
Lisa Nakata Becomes the Second MCS Elementary Teacher to Explore the "New Frontier"

In the Spring of 2002, an extraordinary opportunity was presented to MCS elementary teacher Jerry Mueller when he was invited to join a scientific investigation of the ocean floor off the coast of Mexico. This unique opportunity was made possible by a grant funded by the National Science Foundation, through the invitation of Professor Jim Cowen, former MCS parent, Board member, and current University of Hawaii at Manoa professor of oceanography.

Professor Cowen has once again generously extended this truly noteworthy invitation to another of our elementary teachers. Lisa Nakata, elementary 6-9 teacher in Room 2, will be participating in a scientific investigation of the new ocean floor uncovered by the movement of the Earth's crust off the coast of Oregon. Ms. Lisa's journey is now underway, and she will be at sea aboard the *Atlantis* – the premier research vessel in the country and mother ship to *Alvin*, the world's first deep-ocean submersible – from July 28 through August 13.

Ms. Lisa will be an active participant in all facets of this field-oriented research project, and her role as a classroom teacher is to share her experiences with students. Lisa's involvement will include science and logistical planning, preparation of equipment and supplies, and post cruise analyses and reports.
As a Montessori teacher, Lisa will have the opportunity to explore the ocean floor from a perspective as close to hands-on as one can get. The plans are to have Lisa participate in at least one deep sea dive in *Alvin* during the voyage, and because *Alvin* can travel to depths of 14,000 feet, Ms. Lisa will truly be exploring new frontiers.



Drawing of ALVIN by E. Oberlander ©WHOI

Since this voyage is taking place during the summer, Ms. Lisa will be sharing all her excitement and newfound knowledge with our students when school resumes this fall. In the meantime, our students and their parents can follow along with her adventures as she sends regular e-mail updates of her experiences aboard *Atlantis* and *Alvin*. Watch for her updates right here, and to track the progress of her voyage, visit the Woods Hole Institute's website ("Where is *Atlantis* Now?") http://www.whoi.edu/page.do?pid=8231 .

Ms. Lisa's E-Mail Log

(*ed. note:* Learn more about *Atlantis*, *Alvin*, and this voyage by visiting the Woods Hole Oceanographic Institution's website: http://www.whoi.edu/ .)

Days 1 & 2: July 28-29, 2008

Greetings from sea!

Under a clear blue sky, the Research Vessel *Atlantis* silently slipped away from the port of Astoria at 9:00 a.m. on Monday, July 28, 2008.
On the *Atlantis* is a smaller vehicle, a three-person, deep-sea submersible named the *Alvin*. Tomorrow it will begin a series of 14 dives to the bottom of the sea in an area known as the Juan de Fuca Ridge, located 250 miles off the coast of Oregon. I am on board with the scientific team from the University of Hawaii under the Principle Investigator, Dr. Jim Cowen. One major goal of the expedition is to find and identify microbial communities under the ocean crust where boreholes were dug in previous years. What kind of life exists there, how are they surviving and what are they doing are some of the big questions these scientists are asking. 62 boxes and several large crates were sent over from Hawaii with specialized equipment so that scientists can learn more about what lies below us at the bottom of the sea.

Day 3: July 30, 2008

Greetings from sea,

The research vessel, *Atlantis*, was pounded by swells that crashed with terrific booms against the ship's hull the night before *Alvin*'s first dive.
Thankfully, the ocean calmed down by morning, still gray and cold, but without the powerful energy of the night before. Two scientists took off their shoes and climbed into the red tower leading to the small seven-foot cabin below. *Alvin* was picked up by cables connected to an A-frame tower and lowered into the ocean. Two swimmers who stood on *Alvin*'s back had the dangerous job of releasing the sub from its tethers with the ocean swirling around at their feet. Finally, all was complete. The divers swam to a rescue boat and *Alvin* sank quietly beneath the surface. Everyone watching silently wished the sub and its occupants a safe journey. Ten minutes later, however, *Alvin* reappeared. Due to electrical problems there were two aborted attempts to dive that day. Tomorrow, they will try again.

July 30, 2008, Journal entry on Day 3

Scientists work long hours setting up, running, and recording their experiments. The normal workday starts at 7:30 after breakfast. If a project is going on, some will be in the lab even earlier. For the last two nights, they have been working past midnight getting ready for a dive the next day. Twenty hours days are fairly common on these science cruises. The following is a report about what kind of work a team of scientists does at sea. Alvin's second dive was for the University of Hawaii. In preparation for the dive, the entire UH team worked throughout the day and night, until 3:00 the following morning. They were preparing the equipment that would bring back samples of the fluids from below the ocean crust.

Tina, Sean, Ryan, and UH microbiologist, Dr. Mike Rappe, were priming the McLane sampler that would be sent down on the Alvin the next day. There were 24 small canisters with tubes looping off the top and connected to an entry port. Deionized (DI) water needed to be shot into the entire system to keep the parts from collapsing under the pressure of water at lower depths. Reading the instruction manual again and again, they filled all the empty spaces only to find that air bubbles had become trapped in the tubing, an unacceptable condition that could cause the equipment to fail.

Tina Lin and Sean Jungbluth find air bubbles trapped in the McClane.

This meant making corrections to every part. It was already 11:30 p.m. and they had been working at it for two hours. Think, think, think. How do you get rid of the bubbles? Ideas were thrown around and another plan drawn up. It was midnight when they started all over again.

Ryan Matsunaga and Dr. Mike Rappe work on the McLane.

Ryan showed me how to operate the computer that told the McLane which cup to fill. DI water was shot through each piece of tubing and canister again in reverse, water spilling over the lab table and floor. It was not neat, but it was working. Sean, who had grown up in a Montessori environment, began wiping up the pools of water and wringing out towels, perhaps just like he did in his Montessori classroom. Another hour and more went by before they were finished.

At around 1:30 in the morning, the Chief Scientist, Dr. Jim Cowen and Sean carried the heavy water laden system outside. It was cold and windy with a chilly rain falling lightly. In spite of their fatigue, they managed to anchor the McLane down tightly to the Alvin basket. 3:00 a.m.; the task was finally done.

It was inspirational to watch these young people work independently, read and reread the instruction manual, come up with solutions, joke about rewriting the directions, stay calm and focused when a port had to be redone three times and laugh about taking a pizza break (which they eventually did at 3:00a.m.!). They maintained their good humor in spite of the frustration of not making progress. Scientists work hard to uncover new knowledge about microbial communities under the ocean floor!

Aloha from the Atlantis,
Lisa Nakata

Day 4: July 31, 2008

Hi from the Juan de Fuca Mid-Ocean Ridge,

Drs. Mike Rappe and Brian Glazer

Another bone-chilling morning dawned with a light rain falling. Two University of Hawaii oceanographers, Brian Glazer and Mike Rappe, set off in the *Alvin* to an area where holes have been bored into the ocean crust, 2500 meters below.
Their task was to check on the flow of fluids from the well-like structures and to collect samples of hydrothermally heated water. By filtering this water, they hope to find what kind of bacteria and other organisms live below the ocean floor.
As precisely prepared as they were, the unexpected happened. One of *Alvin*'s robotic arms disengaged while attempting a maneuver and is now sitting on a platform above the borehole. The *Alvin* team is waiting for instructions before it attempts a recovery, hopefully tomorrow. There is much disappointment for everyone on board, but the crew continues to exert every effort to turn this temporary setback around.

Day 4 update:

This has been a trip of unanticipated happenings. Due to the loss of *Alvin*'s arm,
Dr. Cowen just suggested that I go down tomorrow on the dive to recover the missing part and participate in taking temperature readings at the corks. It is also called a “pit dive” for the pilot in training to practice. It’s a perfect opportunity for me to have the experience of a dive.

Itte kimasu (I’m setting off on my journey!)
Ms. Lisa

Day 5: August 1, 2008

Hi Montessori families and friends,

I will not be able to look at the ocean ever again in the same way. The vast mystery and immensity of the largest biome on our planet came to life as *Alvin*, the little submersible on which I rode, descended 2660 meters to the ocean floor. Full of playful sunlight near the top, the colors grew richer and darker in greens and blues as translucent jellyfish pulsed gracefully outside the porthole. Within ten minutes, we were in darkness, a black, black zone filled with bioluminescent light not unlike the Milky Way. Single lights floated by, while sparkling clusters of white lights looked like little houses decorated for the holidays. Time seemed to contract as though water pressure somehow affected its passage. Soon, two hours later, we were on the flanks of the Juan de Fuca mid-ocean ridge. Powerful lights mounted on the *Alvin* brought the abyss into focus. Brown silt flecked with white swatches was the predominating landscape.

A drenching of seawater for all first time passengers on the Alvin

This day's goal was to visit the cork observatories that were dug into the earth's crust below the ocean floor to check on the flow of fluids. Samples of the fluid will later be analyzed by microbiologists and electrochemists among others, to learn about the microbes found there.
An additional excitement was the recovery of one of *Alvin*'s arms that had come off the day before. The pilot expertly used the attached arm to hook and move the 200-pound left manipulator back onto *Alvin*'s basket for the trip back to the surface. Mission accomplished, we headed "home," back to sunlight and "ground" beneath our feet. My final thrill of the day was to be doused with seawater, a tradition bestowed on first time Alvin riders.

Aloha from the *Atlantis*,
Ms. Lisa

Day 10: August 6, 2008

Hi Montessori Families and Friends,

Unlike some hydrothermal vent communities with forests of tubeworms and an abundance of giant clams, the thickly sedimented flanks of the Juan de Fuca mid-ocean ridge are thinly populated. The animals that live here know that food is scarce and it is important to spread out. Slender tubeworms stand alone in a vast expanse. Sea stars, anemones, sea spiders, and slugs are also found thinly dispersed in every direction.

Still, a variety of creatures have appeared, as from a fairy tale, out of the gloom. One of particular nobility was an octopus that has been spotted at several locations in the area. Purple violet in hue, he looks about three feet in length as he glides gracefully across the sediment floor. On my trip under the sea, he appeared attracted by the submersible's lights and came up to my tiny porthole, practically eye to eye with me. Satisfied that we were not edible, he retreated with equal grace and dignity.

While *Alvin*'s pilot worked intently on the recovery of the 200-pound left arm that had come off the day before, three curious rattail fish cruised close by the action. Unlike other fish with flaring tails, their tails gradually diminish to a sleek point at the end. They have large eye sockets and small fins except for the one below which stretches from the pelvis to the end of its tail. The tragedy of another tale was not discovered until the day after the dive. One rattail had somehow gotten caught in *Alvin*'s red sail and had come up to the surface with us. I took a lot of pictures of him on board ship, but felt badly that he was the victim of scientific research.

There is an amazing world full of unknown creatures still to be discovered in the ocean around us.

Aloha from *Atlantis*,
Lisa Nakata

Day 23: August 19, 2008

Question: What do scientists, sailors, and deep-sea submersible pilots have in common?

Answer: They all work hard for a living and love what they are doing.

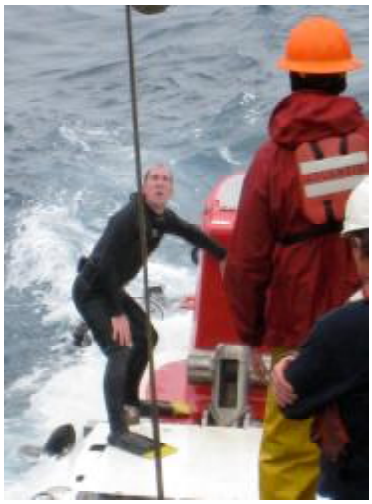
This I found having spent seventeen days at sea working and living among this colorful group of people.

Former MCS parent and Board member, Dr. Jim Cowen, was the Principle Investigator for the cruise "Sub seafloor Basement Microbial Observatory"

There are many mysteries about the sea that scientists want to investigate. On this trip, the focus is to discover what kind of life exists below the ocean crust. How they live and what they do are big questions researchers ask. Each day is busy going down on the submersible to gather samples of fluid from beneath the crust. Long wells called boreholes bring fluid from the depths under layers of sediment. After an eight or nine hour trip, Alvin surfaces around 5:00 in the evening. Then the scientists begin their work in the lab running many tests and waiting for the fluids to seep through very fine filters. These will be later studied in the lab at the University of Hawaii. The work often goes on until late at night and even into the wee hours

of 2:00 and 3:00 in the morning. The hours are long but they look forward to what they will learn from their experiments.

The crew of Alvin's mother ship, the Atlantis, is equally dedicated. Teams of seamen and women stand eight-hour watches throughout the day, every day, while the ship is out at sea. There is often night work that continues beyond their usual responsibilities. It is hard to know what day of the week it is because every day is a working day. This goes on for three or four months at a time before a crewmember has a vacation. Every person I spoke with onboard ship said they would not trade this schedule for a five-day workweek on land. Twice a year, there is a three-month vacation and many of these oceangoing mates love to travel. From handling the operations to maintaining equipment and assisting scientists with their experiments, the Atlantis team is cheerfully industrious.



Able Bodied Seaman, Patrick Neumann, prepares to grab Alvin's line

Alvin's team of pilots is equally outstanding. Their mission is to take people to one of the harshest and most extreme environments on earth, the bottom of the sea. To accomplish this, Alvin's instruments and operations must be maintained in exquisite detail every day that it dives. Hours before the trip, the crew is out checking the basket that carries down scientific equipment as well as the condition of the ship. On a passenger airplane, this work would be done by mechanics. On the Alvin, the pilots do all the checks with help from three other pilots in training. During a dive, one pilot works in the sub while another sits in the control tower keeping track of Alvin's location and mechanical functions. After a full day underwater, the pilot collaborates with Atlantis operators to bring the sub back on deck, rinses off the saltwater, checks for damages to Alvin's hull, goes through maintenance checks, writes dive reports of the day's activities, and finally, gets the basket ready for the next day's journey. The commitment of the pilots to their work is only surpassed by their obvious pleasure in what they do.

Alvin pilots, Mark Spear and Bruce Strickrott discuss the next day's dive with Dr. Cowen.

Working and living at sea among independent, hardworking people has been an honor. The ocean does not divulge its secrets easily and there are infinite questions to be answered. For all who have a curiosity to ask and the determination to search for clues, it is a rewarding life at sea. The Pacific Ocean, stretching to the horizon in every direction is a rolling canvas of colors and moods. It has been a remarkable journey, the tales of which I hope to tell back at home at Montessori Community School.

Aloha from the Atlantis,
Lisa Nakata