

Wow! Last night as we crashed through the lower stretches of the Drake Passage, winds at 34+ knots, blasting water against the sides of our icebreaker, we asked if it would ever calm down. Then, this morning we awoke to fairly calm breezes, enough to just feel the salt water mist on our faces and bright sunshine which in spite of the cold temperatures, feels warm to the beholder. We are just reaching the South Shetland Islands, our first sighting of Antarctica.

We sort felt a bit like British merchant William Smith who was thought to be the first person to see them only to find out later his discovery had been beaten by three days. Knowledge of this event wasn't known until the 1940s when the records of the Russian Naval Officer were translated from their ten month Julian calendar into the twelve month Gregorian one we currently use today. It doesn't matter much who was first, but indeed, whenever we first see Antarctica we relive that same adventure of seeing land as if it came out of nowhere. Here we learned one basic requirement of science, the importance of recording data, of keeping records. Without doing so there is no way to demonstrate what you might claim.

It is difficult to separate the whiteness of the land from the clouds where they meet the sea but to be sure, there is no doubt in our minds that here is snow and ice covered land.

We make our first expeditionary landing this afternoon, bringing along our electronic science probes and laptop to make measurements of some of the sea ice characteristics. We are prepared to make magnetic, temperature, UVA and UVB measurements as well as temporarily place samples in our spectrometer. Forget for a moment that this is a lab science class and enjoy the moment!

We'll make our measurements, avoiding the Chinstrap Penguins, a rookery of which is all around us, as well as the many Antarctic terns, kelp gulls, snowy sheathbills and storm petrels. On the wide beach an old whalers dory lies weathering away. The serrated cliffs, carved by eons of winds and sea ices, abut the shore. It is summer here in the Antarctic so the beaches are no longer covered with snow, revealing their normally well kept secrets. This face of the Antarctic is inviting, compelling us to look forward to tomorrow's expedition. God, thank you for letting us see this most pristine and most awesome place in your world!

Saturday, 9 January 2010-1

We begin to appreciate the vastness of the Antarctic. Only God's finger could paint the scenery so white with so many shades of white and grey and make it look so beautiful. Every channel we enter is more awesome than the last and even the first is more awesome than anything we've ever seen before. Antarctica is the coldest, driest, highest continent on earth. On the peninsula they get something like 5 cm of snow a year but further inland only 2 cm. That is less than an inch. They say a ski report would be something like "5 cm of powder and five kilometers of base!"

Yesterday we landed at Half Moon Bay on Livingston Island. You could smell the penguin rookery before you saw it. Every student was involved in making measurements with our electronic sensors and computer. Temperatures of sea water and sea ice were compared with that of fresh water. Sea ice forms at -1.9 Celsius but the sea water was even colder because it was constantly churning. Even now we see white caps breaking over the swells of this Southern Ocean.

We are also plotting the Earth's magnetic field. Subtle changes in the field can mean differences in the numbers of cosmic rays reaching the lower levels of the atmosphere and cloud nucleation. Just what role does this play in the bigger picture? We're beginning to recognize how delicate and fragile the climate system is, how its balance hangs on but a thread!

We out trumped all the "polar swimmers" who dive into Lake Minnetonka on New Year's Day. Our entire class, a great bunch of students, and I dove into the frigid waters of the Antarctic. (Of course we took off our Explorer clothing leaving swim suits underneath.) So we are real polar swimmers. I went in twice. You know, 0 degrees Celsius air never felt so good as when you first get out of the even colder water. Students remarked that it was refreshing and stimulating. We are looking forward to the hot tub on the aft deck of our ship! We may even hold a class session in it!

Tomorrow we go through the Gerlache Strait, carving out a path separating islands of the Palmer Archipelago. We've seen some whales and are constantly on the look for more. Right after lunch some Minkie Whales were playing on the starboard side of our ship. Then a humpback spouted on the port side. This Strait is one that Amundsen sailed through. We can almost feel and tell what he was thinking then. Lined by steep walls, rising vertically out of the waters so snow cannot stay on them. But lichens and moss cling in desperation while they can before the cold winter returns. We see skuas defending their cleverly hidden aeries. How could we get closer to nature? How could we get closer to God?

Saturday, 9 January 2010-2

It has been a week since we began our expedition. We are seeing much of what we came for. This morning while we were savoring an extra cup of coffee at breakfast and planning our day, a pod of whales surfaced on the starboard side of the ship like a submarine pushing water aside. During our lunch period a huge humpback played at the stern of the ship, breaching time and time again. When he dived he flipped his tail at us. What an awesome sight!

Gentoo penguins were having a ball, diving and swimming and splashing in the bay. They are so awkward on land but in the water they are as streamlined as a bullet, and they move accordingly.

The Antarctic continent is nearly a stone's throw away from the ship. On shore of Culverville Island is an immense rookery of Gentoos. You actually could smell them before you could see individual birds. Icebergs dot the waters of the bay. Some have calved off the walls of glaciers, more because of fatigue induced from the lifting and dropping of them vertically by the tides. They are tinged with the prettiest of blue edges and if you look closely at them you can see that they are mostly under water. Fresh water ice floating in sea water suggests that 89% of the berg is below the surface. We remember the fate of the Titanic.

The weather is fantastic. It never gets any better than this down here. It is 6 degrees Celsius (above zero Celsius!) and there is no wind. I won't even need gloves on shore. In spite of the warm weather, we have nothing more to prove by swimming today. It was a lot colder when we did it yesterday.

This afternoon we will get to Port Lockroy, an anchorage where British sailors in WWII kept an eye on enemy shipping this far south. Today it is part of the Antarctic Heritage Trust, operating as a museum. We will get our passports stamped here. Not many people have passports with an Antarctic stamp in it. We can also mail postcards from here but we'll likely beat them home by two or three months.

The entire class vows they will return someday, somehow. Once you get the Antarctic "fever" you find yourself compelled by its vastness, its magnificent beauty, its solemn majesty to be drawn, almost mystically, to come back to it. Maybe it is God's way of drawing us closer to Him.

We woke this morning at 0600, early for us since we are three hours time difference. But wow, it was worth it. We were approaching the Lemaire Channel. This is arguably one of the more beautiful straits, only a few hundred metres across in places. The vertical rises of the almost straight cliffs to two thousand feet or more are breathtakingly beautiful. The peaks vanished into the misty clouds. The vastness of the region leaves one almost speechless. It is only 11 km long so we can get through it in a little more than an hour.

Our first landing today is at Vernadsky Station built by the British in 1947 and later (1996) transferred to Ukraine scientists. It was here that ozone depletion over the Antarctic was first discovered. Ukraine scientists not only have a variety of instrumentation they keep running but they also are quite adept at the production of vodka here. They will give free vodka to any woman who leaves a bra at the station. You should see how many are there. This is the Antarctic!

After we got back to the ship a message came to me how this UMAIE class (of students) made their day. Not only were they appreciative of the textile deposits left behind but the courtesy and kindness extended by ALL of our students was impressive. The ship's crew thanked me personally.

We watch whales playing alongside the ship. A humpback spouts water upwards like a hydrant just opening. I just love to see that tail wave and then slap the waters as the behemoth arches its back and heads downward, probably ingesting gobs of krill in the process. We can see and feel snowflakes hitting our faces. But these are light flakes, more so than even the earliest flurries of the year in Minnesota. They are powdery and large, and float up and down with the movement of the air, buoyed by the viscous forces, following Stokes Law, floating, settling and airborne again. They land more softly than a butterfly settling onto your shoulder. Hardly noticeable at all. We remember that the region receives less than 5 cm of snow a year. And still it piles up. There is more snow and ice now than there was on my last visit but that can be an anomaly and not necessarily a trend. And I am not even wearing a jacket. Except for the wind, it just doesn't feel cold.

On return from Vernadsky Station we cruised among many of the icebergs, some as big as a house, others much larger than our ship, especially if one considers the submerged portion. Atop some of them seals leisurely basked in the Antarctic summer. They seemed oblivious to our presence even though we were quite close. It must be neat not to have a care in the world! Occasionally they would grunt, sometimes a head would come up as well, just enough to assure itself (and maybe the others) that nothing was there to threaten them.

Our day of shore excursions ends with a visit to Petermann Island. This is important because we get to see Adelie penguins here and, if we climb high enough we can look over "Iceberg Alley." We've seen the Chinstrap and Gentoo penguins before but this is our first look at the Adelie. These are real Antarctic birds. We close our day giving thanks to the Lord for making all of this possible.

Our expedition to explore Climate Change takes us now from the cold and ices of the Antarctic to the tropical paradise of Costa Rica. What a change!

Costa Rica is a place that is so inviting with warm and friendly people. Our guide, Melody, says she wants to learn English better (actually she is really quite proficient) but it seems more like an opportunity for us to practice our Spanish. We'll see just how good that stack of Spanish CDs I listened to while driving to school for the past semester pays off. A lot of people thought it was good enough to just know *Banjo* and *Cerveza* but we are becoming more conversational and can even order our meals in Spanish.

The airport is not in San Jose. That means we can head directly for La Fortuna and the Arenal Volcano. Arenal (with emphasis on the first syllable and pronounced "air") is one of 112 volcanoes in this spectacularly diverse country. La Fortuna is on the Atlantic side of the continental divide. Arenal is actually an active volcano. Before we even get to our lodging for the night we find a Three-Toed Sloth hanging from a nearby branch. It looked stiff as if rigor mortis had set in. But then he slowly turned his head to me and winked, letting us know this is just how he prefers to be. After all, he is a sloth.

Before dinner we have to check out the surrounding. Lush green forests, a stark contrast to the whites of snow and ice in the Antarctic surround our cabins. My students make it clear this is great but that there is no way to compare Costa Rica with the Antarctic. They are in totally different leagues. But each is a different way to recognize what climate change is doing to the Earth and how it is progressing.

We ate the traditional dinner in Costa Rica. Every meal has rice and beans. Then there are some other accompaniments but they may vary meal to meal. Recall that I mentioned in an earlier blog that we had gone swimming in the Antarctic. Now we are treated to a dip in the hot springs of the volcano. Aaaahh!

This feels just like our hot tub back home. I told Melody that this reminded me of our hot tub except for the fact that we immerse ourselves in the hot water amidst snow and freezing January temperatures. Costa Ricans just don't know what they are missing! Maybe it is just us.

We wake up early. Who can sleep late knowing we start our first full day in this lovely country. Before we can board the bus to take us to the foot of the Arenal Volcano we see two Toucans flying back and forth, teasing us and keeping just out of reach as if they wanted to lead us in a different direction. Finally we let them go their way and we'll go ours. The hike to the volcano is interesting. We spotted a Long Nosed Coati, reminding us of a slender, rather extended raccoon. Its long tail is similar to that of a monkey. He continues about his business since we keep our distance and let him be.

From the top of the trail we stop and take in the spectacular views. Suddenly Arenal rumbles, sounding like a railroad train moving along. We are told that this is normal and there several such events daily. The last major eruption was in 1968 and another in 1991 but that gases are vented daily. We get a chance to explore the surrounding area, carefully watching our footing amidst the igneous rocks ejected from Arenal in the '92 event. Locals ignore warnings of another eruption but like people who live in flood plains, forests prone to fires, etc, they fall on deaf ears.

Subtle signs of Climate Change show us that pineapples are being grown in places they could not thrive in recent times. There are no glaciers to melt here but the tropics is where water vapor is concentrated. This is significant since it is the dominant greenhouse gas in our atmosphere. Our studies allow us to examine the thermodynamics of dry and moist air and the impact of volcanic particulate matter on the reflection and absorption of solar radiation. What a laboratory we have been blessed to be able to experiment in. First the polar climate and now the tropics. We pause to admire the works of the hand of the Grand Experimenter, and thank him for showing us His wonders.

We are getting used to warmer temperatures and everything else Costa Rica has to offer. The unit of currency is the colon with about 550 Colons per US Dollar. This results in thousands of Colons for most purchases. But the neat thing is that Costa Rica really caters to us. They accept US Dollars and price many items in both the Colon and the US Dollar. And the people, in part because they are so well educated, are warm and friendly and willing to help. It seems there are few who do not speak English as well as their native tongue.

We entered the cloud forests of Monte Verde. Verde means green so we are on the mountain of green. Indeed, it is. The canopy of the cloud forest is well over a hundred feet above us. We have as our laboratory the environment about us. Yes, we can use our instruments here but we are in fact, observing the world, far more than any closed lab room might permit. When we come down to it, our eyes and other senses are really important. I am reminded of a dear friend, an astronomer, Albert Jones, who lives in Richmond, New Zealand. He spends every night that it is possible, under the stars. Even the Anglo-Australian Observatory in Siding Springs calls him to verify their electronic instruments against his eyes. The human eye is indeed sensitive but so are our other senses, especially when trained to be sharp.

We've been without internet access for a couple days, in part due to travel, and in part due to connections. So I've got a bit to catch folks up on. Monte Verde is a paradise of a cloud forest. It is almost always cloudy here and does not rain as much as the rain forests. Our explorations take us to both as well as a visit to Carera Parque, a transition forest. Carera means river of crocodiles. They almost looked artificial to us watching from the bridge above them. Then, when they open their mouths to assist with cooling or watch them crawl forward you know they are real. And so big! It is good to see them and see just what climate does to them and other wildlife.

Atop Monte Verde we went "sky walking" which is a local term for following paths through the jungles that cross a number of very high suspension bridges. It is beautiful from up here. You can see so far when you are above the canopy in places. Nobody was really concerned about safety as the suspension cables are strong and hold us easily. Local restrictions require that no more than ten people can cross at once so Melody (our guide) and I each lead half of the group. There were five of these high bridges.

Following this we took an entirely different look at the canopy of the cloud forest. We went on zip lines. The wind was blowing, (Melody said it was officially 25 kph but it seemed higher.) We had to take a tram to the top of the mountain of green and then climb another hundred feet or so up a tower. The wind rattled through our hair and we bundled up. Yes, the wind chill was enough to need a jacket here in Costa Rica. Then we zipped across roughly a quarter mile, more in some cases, just above the canopy. Because it was windy on some of the lines we doubled up and zipping quickly. They say top speed is about 46 mph which is a pretty good clip. My partner hung on tightly. Students managed to take some videos but I just zipped. We went on nine lines plus a practice one. It actually was fun.

We left Monte Verde and just arrived in Quepos. The agents overbooked our rooms and so we got placed in a fantastic resort hotel for the same rate. Students cannot believe how nice it is here. Tomorrow we go to the rain forests. Comparing these different climates right here in one country is

helpful to understanding climate and climate change. We know the climate changes every year with the seasons but how does it act in the long term? We have paleoclimatological data from ice cores in Greenland, Lake Vostok in the Antarctic, from ocean sediments, stalagmites in caves across the globe, and recorded history. Sure, recorded history is not numerical data, but records of where grapes were grown over centuries tells us what the climate was like. It help us understand more completely what has gone on and what is happening today,

I am lying alongside the pool as I write this blog. Dinner is in an hour and we can see the Pacific Ocean right in front of us. I hope we can catch a glimpse of the green flash. From here we can also do some astronomy work since we have access to a clear sky. We couldn't do that with the canopy of the cloud forest overhead or the volcano outgassing around us.

We count our blessings as we look to the end of the course. A couple more lab write-ups and a final exam and we will complete our academic requirements. There are no definitive answers to climate change. But we can better understand the processes that contribute to it. We have three more days before we begin our journey home. Thus far it has been spectacular. Together the journey has been an experience we'll not ever forget. I will never forget these students who journeyed with me.