Drilling and Discovery in the Bengal Fan

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For the past 2 months I've been onboard the scientific drilling ship JOIDES Resolution, surrounded by nothing but the deep blue Indian Ocean. We're on an expedition for the International Ocean Discovery Program, drilling at 7 sites spanning a massive accumulation of sediment that covers the entire floor of the Bay of Bengal called the Bengal Fan. We're studying sediment that has been eroded from the Himalayas to learn about connections between this mountain range and climate. The age and composition of these sediments will provide clues about the collision of India with Asia, the resulting uplift and erosion of the Himalayas, and the development of the Asian monsoon.

Although a geochemist by training, I'm sailing as part of the Education and Outreach Team. My job is to communicate the onboard science to audiences around the world. Every day, we hunt around for engaging scientific and personal stories for social media posts, blogs and videos. We connect with shore-based educators to provide resources and schedule live video events that include ship tours followed by Q&A. We've held 60 live broadcasts with over 3200 students in 17 countries, from Belgium to Bolivia, and Morocco to Malaysia.

Communicating with all of these schools in different time zones is no easy task. At first we were on the night shift to accommodate audiences in North and South America. I actually enjoyed night shift, which I hadn't expected. There is something wonderfully quiet and peaceful about starting your day at midnight. And then around 6 am, it's tradition to meet up on the top deck (a.k.a. "steel beach") to watch as the sky slowly begins to brighten and turn unimaginable shades of pink and orange. A few weeks ago, we made the difficult transition to the day shift so we could connect with other countries and cultures on the opposite side of the world.

Each classroom is a unique experience, watching how the students interact with each other and listening to their questions. Some of my favorite moments include the nine-year-olds from France politely asking their prepared questions in groups of four, the library packed full of inquisitive New Zealand students with their arms waving in the air, and the school in Nepal where the Internet wasn't working so the teacher invited the students (all 75 of them) to his home.

Above:
Photo by Lisa Strong.

Below: Diane describes a core for students in the lab onboard the JOIDES Resolution. Photo by Tim Fulton.

Above: Live broadcast with fourth graders at Sunnyside Elementary School, San Francisco. Photo by Gerrit Dekens.

Early on, a high school student asked us something that we quickly realized needed to be addressed during the broadcasts. If we're studying the mountains, why are we in the middle of the ocean? We explain that, despite being the highest mountains on Earth, much of the Himalayas have already been eroded away. About 80% of this material ends up in the Bengal Fan, giving us the most complete record of past climate and history of these ancient mountains.

This discussion often leads to another question: how do these pieces of the Himalayas get all the way out to the Bengal Fan, 3000 kilometers away? Students understand that rivers carry the sediment to the delta, but it isn't clear what happens next. We describe how the material is transported by fast-moving sediment-laden currents of water called turbidity currents, kind of like an underwater avalanche. To help illustrate this process, two of our resident scientists and technicians built a small tank to generate these currents, which we filmed to show the students, along with real examples of turbidite deposits in our cores.

Of course sometimes there are some funny questions like if we can see Mt. Everest from the ship, if we're allowed to go swimming, and my personal favorite, if we've found any light sabers. Older students tend to ask more insightful questions, like the Nepalese students who wanted to know how a landlocked country such as theirs benefited from an ocean drilling expedition, and the Bolivian students who asked why we weren't studying the Andes instead.

I consider myself lucky to have been given the chance to help tell this story and inspire a new generation of scientists. It's truly incredible that we can use the Earth's ancient magnetic field recorded in magnetic minerals to tell time, and how the tiny shells of foraminifera and nannofossils can tell us what ocean and climate conditions were like millions of years ago. It's a wonder that we can even study these materials in the first place, given that we're drilling below the seafloor in almost 4 kilometers of water. We've recovered over 1700 meters of core, full of turbidites, calcareous "oozes," plant fragments, woody debris, and even volcanic ash layers.

With so many cores to describe, analyse and interpret, life onboard is busy. Everyone works a 12-hour shift, 7 days a week. Considering this international endeavour has been 10 years in the making, there's no time to waste. But it's not all work, we find ways to relax and have fun. We've watched Bollywood movies in the lounge, translated by our Indian colleagues when the subtitles were missing. We recently wrapped up our pool tournament, where despite my best effort, I was no match for the ship's chief mechanic. We even had a "hump day" celebration, complete with camels taped around the ship, at the halfway point of the expedition.

That seems like a long time ago now. The last core of the expedition was recovered today, March 28th. This much anticipated event was marked by cheering, clapping and an overwhelming sense of accomplishment. Next stop: Sri Lanka. We have a short 2-day transit to Colombo, and then everyone will go their separate ways. From labs around the world, we'll continue to piece together this ancient puzzle of continents colliding, land rising, mountains crumbling, and climate changing.