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Agua Azul

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Eighteen oceanographers embarked on a 10 day research expedition to explore the source of the Gulf Stream—the earth's circulatory system.

Introduction by Ron Faig

THE WATERS SURROUNDING CUBA are officially off-limits to Americans. But Frank Muller-Karger wanted to go there. A USF Marine Scientist, Muller-Karger had been studying the Gulf Stream—the currents of the Gulf of Mexico and the Caribbean Sea—for decades using remote sensing satellite imagery. He longed to measure the actual waters to calibrate his instruments and confirm his data. But that required sailing into Cuban territorial waters.

Enter Nelson Melo, a researcher at the Institute of Oceanology in Cuba. The two scientists met in Caracas, Venezuela, at a 1990 conference sponsored by the United Nations. They began talking about the waters around Cuba and how they could help each other with data each had collected.

"The Cubans have had a long history of marine research over the past 40-some years," says Muller-Karger, "and probably some of the best in the Caribbean. In the spirit of international cooperation, Muller-Karger and Cuban researcher Nelson Melo put together a research expedition that attracted 18 research scientists from countries throughout North America. The U.S. government allows and sometimes encourages open exchanges of cultural and scientific information, says Muller-Karger. After months of wrangling with the State Department, the 250-foot Cuban research vessel Ulises sailed into USF St. Petersburg's pier on March 17 to pick up the scientists and supplies. It marked the first time a Cuban ship had docked in an American port in almost 40 years.

The ship cast off for a 10-day voyage with 52 research stops. It cruised along the coast of Cuba, through the Yucatan Strait, into the Gulf of Mexico, then back up the west coast of Florida.

Also on board was Chris Rish '95, the 20-something producer of WUSF-TV's Beyond Science program. He was there to produce an episode. In the following story, Rish takes you along on his sea adventure, sharing his first-person impressions of this historic scientific and cultural exchange.
Karger has been studying these spinning in some vortex. I've seen this before. "Gyrocompass no workin'," he answers. Cool. At least we're not spinning in some vortex.

Still puzzled by how we've been moving along for hours without any apparent help from wind or engines, I move to the nautical chart and try to ask where we are, "Dónde está el Ulises?" The chart shows the Southeastern Gulf, and it's covered with the pencil marks of navigation. Rather than get new charts every year, the Cubans take their older ones to the marine survey office and have them updated by hand.

Rubén sees my interest, cracks a wry smile and marks an easterly arrow between the Keys and Cuba. "Corriente del Golfo," he says and I finally get it. We're in the Gulf Stream. I laugh at my obvious ignorance. The Gulf Stream and Loop Current are why we're here.

Drifting through the Straits of Florida on the Cuban Institute of Oceanology's research vessel, the scientists are busy studying the phenomena of weather inside the oceans. Just as the atmosphere moves around the globe in continuous, chaotic cycles, ocean waters circulate through inner space in unending gyres. And just as meteorologists study the jet stream in hopes of predicting tomorrow's weather, oceanographers study currents to gain understanding of how water movements might change global climate.

Our example here is the Loop Current. Imagine a faucet south of the Yucatan, shooting a jet of water into the Gulf of Mexico. The flow is so great it swallows all the mud and pollution of the Mississippi and Rio Grande rivers, yet still runs crystal clear, moving enough water to fill more than 8 billion gallon-jugs in a second. In fact, the Loop Current moves an average of 28.5 trillion gallons of seawater every 24 hours. Churning from the Caribbean, through the Yucatan Strait between Cozumel and the western tip of Cuba, it lassos the Gulf of Mexico. The Loop merges with more Caribbean and Atlantic water while sliding past the Florida Keys to become the Gulf Stream. Swirling up the East Coast, the same water eventually bounces off Cape Hatteras, N.C. while squeezing between the mainland and Bermuda on a tropical cruise to Europe. "Boundary Currents" like the Gulf Stream are the planet's circulatory system, and through its heart flows the "agua azul" fabled by pirates and fishermen. The Gulf of Mexico has some of the clearest, warmest waters in all of the world's oceans.

And on days like today, when the sky is...
clear and the sea surface like glass, you might imagine yourself floating in an endless supply of Bombay gin. And when the entire ocean lights up between 10 in the morning and 2 p.m., visibility is “top to bottom” and sunlight can penetrate almost 1,000 feet down. That’s when the busy work on deck increases to a frenzied pace. We’re here to quantify that clarity, to compute ocean color and compare it to what satellites see from orbit.

A professor from the University of Puerto Rico at Mayaguez, José Lopez explains what’s going on. “I’m interested in the amount of sunlight hitting the sea surface. Some of that light is absorbed by phytoplankton, but much of it is back-scattered.” José explains that phytoplankton are the tiny plants floating in the oceans that produce over half the world’s oxygen supply. “They’re very important, because they also combat the greenhouse effect by trapping atmospheric carbon and sinking it to the bottom when they die.” By differentiating between the colors bouncing off plants and the colors that reflect from water molecules, researchers can estimate ocean productivity.

Every sunny day, José and his colleagues measure reflectance by winching expensive equipment over the side of the ship. But he explains that it won’t always work that way. “N.O.A.A. (National Oceanographic and Atmospheric Administration), NASA (National Aeronautics and Space Administration) and various polar orbiting satellites pass overhead twice a day. They take wide spectrum pictures of the sea surface.” The scientists hope to use ocean color remote sensing to infer the concentration of plants and their rate of photosynthesis. They just need to be sure that their proven instruments agree with the satellites. Eventually, they’ll work from their desktops, reducing time at sea by using satellite color imagery.

Several days later, I’ve figured out that everyone on board has dedicated their life’s work to science. While I’m dreaming at night, several researchers are keeping a sleepy watch on deck, logging their second week in a row pulling all-nighters. When we return, they’ll follow the cruise with months of number-crunching. Even while I’m admiring the sunset, someone is down below staring at a computer screen, watching for a change in water temperature.

There are marine biologists, physicists, ocean chemists, and every other variety of research oceanographer on board. They came from Nova Scotia, Maine, Puerto Rico and Mexico to join the Cubans in Florida. The scientists pooled their resources to feed and outfit everyone. In return, the Cuban Institute of Oceanology provided the ship, its fuel and crew. All the excitement and new friendships aside, the past week has now shown me a serious work trip. The Ulises plans to make 52 research stations in 10 days.

Just being here and having access to these waters is exciting. The B. I. C. Ulises, (Research Vessel Ulysses) is in uncharted scientific territory and it might as well be a daydream, because even the crew can hardly believe it’s happening. Cuban ships have been banned from the United States since Fidel’s revolution, more than 40 years ago. Furthermore, merchant ships leaving Cuba must make an intermediate stop before they’re even allowed to enter U.S. waters. Yet we’re at sea on a Cuban ship. And it sailed directly from Havana now a week ago to pick us up at the USF’s docks in St. Petersburg.

N.O.A.A. scientist Doug Wilson carries a shiny, black satellite phone to check in with
the office. He spends entire months at sea, measuring the volumes of water circulating in the Atlantic. He’s used to being way offshore, but not incognito. He comes over, laughing. “Check this out. We can’t even call home from here.” He has to turn it on again for me to see the warning message, but it’s there in LCD: “Restricted Area.” U.S. phones won’t work in Cuba. We’re only 85 miles from Key West, but we might as well be in Oz.

“Where’s the front today?” I repeat a word I’ve heard again and again. The boundaries between warm and cold water masses are called the same thing in the ocean as they are in the atmosphere. Even the cruise has been officially titled Ecofront-1. Frank Muller-Karger, a tall, mustashioed specialist in remote sensing from the USP’s Marine Science department comes over to show me yesterday’s satellite image. “You see that change in color from orange to blue to green?” he points to the false color map. He’s showing me where cold, deep water is rising to the surface. Frank explains as only a Ph.D. can, “Nutrient rich waters that come up from depths of over 100 meters work like fertilizer on your lawn. This process of upwelling brings nutrients to sun-lit waters, nourishing phytoplankton. That’s what causes these areas of intense primary production along oceanic fronts.”

We’ll be chasing the front Frank showed me for the next several days, crossing and re-crossing it, taking water samples and casting acoustic current meters over the rail. Someone will be looking at the kinds of plants and animals we find, someone else will measure the transmission of light, comparing warm to cold water, as others check the intensity of the sunlight.

For me, it’s a working pleasure cruise. For the scientists, it’s hard work with great scenery. I take pictures and document everything for the TV series Beyond Science. The researchers take pictures too, but their documents will go into scholarly journals written in other languages.

One afternoon, we have swim call, and another the captain serves everyone ice cream. My videographer fishes with the crew while the research assistants chum for data. I get the pleasure of smoking a real Cuban cigar, but the cigarettes I’m given turn me greener than a landlubber in a hurricane. One night we show the captain and crew some movies. The surf flicks are a big hit. American films are popular everywhere, and even Cuban eyes aren’t immune to them. The captain returns the favor of entertainment, and Steven Seagal is hilarious with his voice dubbed in Spanish.

Several evenings, I sit with the ship’s doctor listening to Cuban league baseball, Santiago de Cuba on the radio. Afternoons, I meet Doug Wilson and his assistant Christiane in the sauna. A sign above the door reads “Cofre de Calor.”

The whole ship reads like a socialist fairy tale. Slogans painted on the walls read “Venceremos!” (We will win!) “Para Cuba con Fidel!” (For Cuba, with Fidel!) But the fresh coat of paint on everything fails to hide that the original, onboard equipment needs repair. None of the ship’s four launches will start, foiling my plan to get pictures of the ship from a distance, and causing me to wonder if the lifeboats would float. There are no books in the ship’s library, and the optics guys have ongoing issues with the kitchen dumping waste while they’re measuring water clar-
The last night: The crew gave a party for the captain and the scientists. Delicacies included canned tuna, anchovies, potato salad and orange slices.

The last morning: The U.S. flag is raised at sunrise off Fort De Soto. It is traditional, when visiting a foreign port, for a ship to fly that country's flag.

Down time: Ron Bigford, Beyond Science videographer, fishes for grouper. Fishing provides staple food for the expedition.

The scientific mission ends like my cruise: many surprises, a few hassles, but mostly a productive trip marked by the spirit of cooperation. Everyone seems pleased at the quality of his or her data and the relative ease of attaining it. Scientists from around the Americas saw past their governments' political squabbles, and convinced their state departments to let them work together. The truth is, it's in all of our interests to have scientific exchange. As put by Muller-Karger: "There's more work left to be done than any one nation of scientists could ever hope to complete. Through international collaboration we can make meaningful studies that will help us understand the planet."