INTO THE AMAZON

BY JEFFREY LEHMANN, '88

"AHEAD OF ME LIES 500 MILES OF WILD RIVER, AND IT WILL CALL UPON A LIFETIME OF EXPERIENCE TO EVEN SURVIVE THIS TRIP, NEVER MIND SUCCEED."

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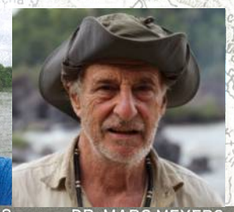
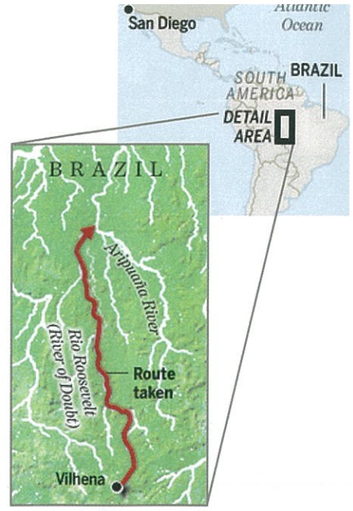
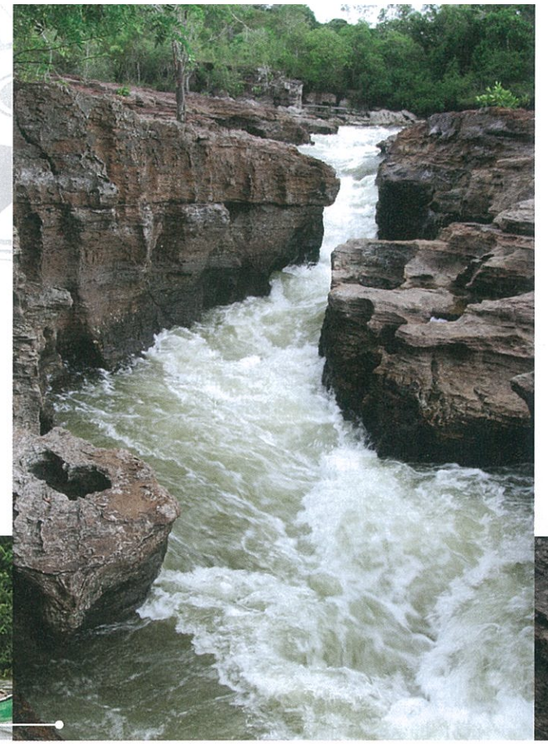


DR. MARC MEYERS

In the summer of 2013, alumnus Jeffrey Lehmann was drinking wine on the patio of Dr. Marc Meyers, a mechanical engineering professor at the Jacobs School of Engineering. Though nearly a generation between them, the two had become friends shortly after Lehmann graduated and applied his engineering degree to new energy technologies before becoming a full-time filmmaker. Meyers, raised in Brazil, mentioned the Roosevelt River and his nearly lifelong desire to conduct a scientific expedition down its waters. He asked Lehmann to document the journey, and a uniquely UC San Diego story was born—blending science, history and environmentalism into one audacious adventure.



After more than a year of preparation, the pair readied themselves with GPS and satellite image printouts at the launch site in the state of Rondonia, Brazil. Dubbing their journey The Roosevelt River Centennial Scientific Expedition, in honor of their presidential predecessor, the group included Meyers, Lehmann, and two Brazilian army colonels with a vast knowledge of the Amazon: Colonel Ivan Angonese, a 20-year jungle veteran, and Colonel Hiram Reis Silva, who led military road construction in the Amazon. Together, the group would spend 23 days on the water, travelling and conducting research through the thickest jungles of the Amazon. The following are excerpts from Lehmann's accounts:



Looking down at the dark rolling river reflecting the dense jungle, it's hard to believe I'm actually here. I have imagined this place ever since I was 12 years old, when I spotted the name "Roosevelt" curiously in the middle of a map of Brazil. In 1913, President Theodore Roosevelt co-commanded with Brazilian hero Colonel Candido Rondon the first scientific expedition down the "River of Doubt," the trip bringing the former president to the verge of suicide and his party to near-starvation. Later renamed for him, the still-remote Roosevelt River has changed little in the 100 years since, and still only a handful of people have run its length. At first sight, a beautiful pair of blue-and-gold macaws flew above the water squawking, making it seem like paradise. But I'm not naïve. These dark waters hide crocodiles and piranha and the forest harbors jaguars and poisonous snakes among so many other dangers. Ahead of me lies 500 miles of wild river, and though this is a dream come true, I know it will call upon a lifetime of experience to even survive this trip, never mind succeed.

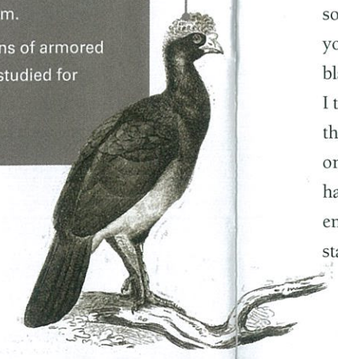
Mornings start early, many shortly after 4 a.m. Breakfast is gruel; dinner is either freeze-dried camping meals or a rice, onion, garlic and dried meat concoction popular with the Brazilians. This was often augmented with freshly caught fish. I eat twice as much as everyone else, what Marc refers to as "double rations."

Our kayaks carry minimal amounts and the supply canoe carries everything else. I call them "the Ferraris and the semi."

NATURAL SELECTIONS

This unique area of the Amazon yielded rich material for scientific research. A sampling of what was studied:

- **The bite force of the piranha:** This first scientific measurement of the fish revealed their strength is surprisingly low.
- **Rocks from Navaite Falls:** The Amazon region is rife with kimberlite, a link to diamonds. Studying the properties of the rock will help determine how the deep channels resist erosion.
- **The structure of curassow feathers:** An amazingly light and strong material, UC San Diego graduate student Tarah Sullivan will soon test its strength inside a scanning electron microscope.
- **"Exploding Trees" crack propagation:** Meyers intends to establish whether these cracks reach the speed of sound, creating a sonic boom.
- **Fish scales:** The trip yielded specimens of armored catfish, whose unique scales will be studied for potential engineering capabilities.



Early on it became clear that my primary role is to supply the paddle power, though my scientific contribution is to map a cross section of the river and estimate its flow at points along the way.

In the upper reaches, the river is narrow, winding, and swift. In many places a single fallen tree can stretch across the entire river. On the third day, we came on Navaite Falls that Roosevelt described, "It seemed extraordinary, almost impossible, that so broad a river could, in so short a space of time, contract its dimensions to the width of the strangled channel through which it now poured its entire volume." We were no less fascinated. The water tumbles over a waterfall that is just a couple of meters high and about 30 meters across. This water is then forced through a constriction narrow enough to jump across in places, forming tumultuous rapids that run for hundreds of yards. Ultimately, the water comes out in a steady calm flow of similar pre-falls velocity. My measurements show that the falls literally turn the river on its side. Marc and I found it fascinating that this constriction had not been eroded away by such huge water forces, and we collected rock samples for further testing of what properties could make this possible. After the falls, the river flattens out again. It widens each day until it is more than a half mile wide and with no discernable flow, making paddling the canoe arduous.

The heat is pervasive, and I wanted desperately to get in the water yet was still wary of being attacked by piranha. When Hiram carefully got in thigh-deep on the first day, that was all the invitation I needed. I have since taken every opportunity I can to soak in the cooling waters.

One night, Angonese was on shore catching piranha while I soaked nearby. I felt a small twinge in my arm, much like hitting your funny bone. I took a step toward shore and—BAM!—I was blasted in the arm by a jolt akin to that from an electrical socket. As I tried to take another step, BAM! I was hit again with another jolt to the leg causing me to fall back into the river. I regained my footing on the river's steep edge just as Angonese arrived with a helping hand. For all their time spent in the Amazon, the others had never encountered an electric eel. I had been there just a few days. This started the running joke that Amazon animals "liked" me.

They seem to like me especially at night. Each night I stay up for hours doing camera work while the others sleep. On top of that, I'm a light sleeper and though the jungle is alive with sounds in the night, any strange noises wake me. One night it sounded like a rhino was coming through camp. I exploded out of my tent thinking I was about to be trampled only to come face to face with a giant anteater, who was just as startled. He turned tail and fled back into the jungle. I feel lucky since just this past summer two men were killed in separate incidents by cornered anteaters.

Marc's fascinating research focuses on biomimicry, how evolutionary design can be translated to modern engineering problems. His early research focused on the beak of the toucan, which is incredibly strong yet light. Marc's in-depth scientific knowledge of the Amazon makes each day more fascinating than the next. At night, we fish for piranha and test their bite strength. We also collect interesting rocks and feathers for microscopic analysis back home.

One night there was a torrential downpour for a couple of hours. After the rain cleared up, there wasn't a cloud in the dark starry sky. Suddenly, I heard a booming clap on the other side of the river, like a bomb had gone off. Often we would hear great trees come crashing down somewhere deep in the veiling jungle, but this night the sound was totally different, much louder, maybe 1,000 times or more as loud. It was as loud as a thunderclap yet there was no storm. I looked out my tent expecting to see a bright

flash of light appear where the sound came from, but there was nothing. The sounds continued irregularly throughout the night.

The next morning Marc explained what created the booms. Young trees, in their race for survival, shoot up to reach sunlight. Only then do their trunks expand and strengthen to support their weight. After a hard rain, huge amounts of water race up a tree's trunk. The additional weight of this water becomes too much for some young trees still strengthening, and they actually split under the axial compression load. Marc believes this critical failure causes the crack to propagate faster than the speed of sound causing a sonic boom—the noises I was hearing. I christened this phenomenon "Exploding Trees."

Bugs and the brutal equatorial sun required Lehmann to cover himself head to toe in clothing as well as wear gloves and a large floppy hat. Says Lehmann, "This is survival, not a fashion show."

The insects are relentless. The air is literally dark with them around sunrise and sunset, and their buzz sounds like rush hour traffic on Highway 5. I'm what the Brazilians call "new blood"—for every bite the Brazilians receive, I receive countless more. And they itch! Only after I replayed a video selfie a few days in did I realize how bad it was; my face is now completely mauled. Photos taken throughout the trip show that most days there are 60 bites or more on just one side of my face.

The jungle is so thick it is like a prison. The river is the only way out. The jungle doesn't just go to the water's edge; it protrudes over and into it. Often I paddle for many miles, overheating and legs cramping from being folded up for too long, yet there isn't a single foot-wide clearing on the steep banks to stop and get out for a few minutes rest and stretch. Many times, I have to resort to jumping out of the canoe into over-the-head high water, though this makes getting back into the canoe without tipping it over a challenge.

It's funny—before I left California I dreaded the prospect of paddling in the rain all day. Now I pray for rain to come. Storms are the only thing that block the brutal sun's rays and cool me down. Most days it rains three to five times, sometimes torrentially, one to two inches an hour. Murphy's Law is alive and well in the Amazon—days in the blazing sun, with everything packed in our water-resistant bags and containers, are typically dry. The minute we stop to make camp, however, a downpour is sure to ensue. This not only gets everything wet, but prevents us from ever drying out. After days of this routine, the stench of mildew has become pervasive.

Despite the challenges, everyone contributes to make this expedition a success, especially the colonels. Angonese, for example, is like a scout on steroids. He packs and unpacks the canoe, clears space for tents, collects firewood, hangs the protective tarp for our fire, and catches fish to eat. Hiram constantly pours over the printed-out satellite images of our route and checks the GPS to determine up coming rapids and appropriate camps. The colonels constantly collect things along the way to help the expedition, from capybara dung to spread around the campfire in order to keep the mosquitos at bay, to a special type of tree bark that works like lighter fluid to start fires.

There has not been a single night that I haven't seen lightning. Even if the sky is filled with stars above us, there is lightning somewhere in the distance. It is magnificently beautiful to see these flashes of light backed by dramatic black clouds with the golden hues of sunset streaming through clearings in the sky.

EPILOGUE

My extensive preparation for this expedition taught me that the Roosevelt River is an incredibly unique wilderness; despite the many hardships, I cherish the time that I spent there. Unfortunately, encroaching development threatens the area and the wildness of the Roosevelt River will disappear in the next few years without protection. Since stepping off the plane in Brazil, my new ambition is to work with my Brazilian friends to create a World Heritage Site of the entire 500 miles. I intend to write a book on my experiences and to create a documentary film on the expedition. It seems this adventure of a lifetime may turn into a life's work, all of it made possible by a continuing connection and lasting relationship to UC San Diego.

Jeffrey Lehmann, '88, is a fourth-generation Del Mar native. While at UC San Diego he bought and operated a medium sized travel agency, and after graduation he engineered new energy technologies at General Atomics. He is currently the Emmy-awarded host and producer of the "Weekend Explorer" travel series, provided free to PBS nationally airing in more than 20 foreign countries.