



## Team tracks temblors in P.R.

Scientists say activity in February a bit higher than in other months. Page 3

### Scientific team tracks P.R. quake activity

#### Researcher: A big quake could strike anytime, anywhere

By CHRIS HAWLEY  
Of The STAR Staff

"There," said seismologist Christa von Hillebrandt, leaning forward to trace where the squiggly gray line on her computer screen burst into a mess of needle-sharp peaks.

Mother Earth had a heart attack last night.

Von Hillebrandt began clicking her mouse. One after another, seismometers buried across Puerto Rico begin spilling lines across the screen. Slowly the story emerged:

At 3:41 Wednesday morning, nine miles under Guayanilla, something cracked or slipped in a gigantic slab of rock, and the earth trembled. First came a shudder, then a round of slow shock waves that rippled through the ground.

It was the first of 17 quakes that shook Guayanilla from Wednesday to Friday — one of less than a half-dozen "swarms" that hit Puerto Rico every year. At 2.8 on the Richter scale, Wednesday morning's earthquake was a barely perceptible quiver. The next one might level a city — or it might not.

Either way, von Hillebrandt and her team of scientists and student workers will know all about it. They run the Puerto Rico Seismic Network, which from its office at the University of Puerto Rico Mayaguez Campus keeps tabs on one of the six most active earthquake areas in the territory of the United States.

They do it with 14 digital sensing stations scattered across mountains, buried in cow pastures, and perched on lonely islets in the Caribbean. The seismometers inside keep up a constant stream of data about the earth's rumbles.

A weight suspended by springs inside each seismometer creates a tiny electrical current as it vibrates. An amplifier strengthens the signal, and a radio transmitter powered by solar panels beams the information to a U.S. Geological Survey computer in Cayey.

The Cayey computer keeps a record of the last 30 seconds of data from every seismometer. If at least three stations report a tremor at the same time, the computer starts recording data from all over the network until the quake is over.

Every morning, scientists transfer the data to a computer in Mayaguez, where they look at graphs of the vibration to determine at what time the fast-moving "primary waves" and the slower "secondary waves" reached each station. With that information, they can determine the strength and location of the quake.

What they can't determine is when or where the next "big one" will hit.

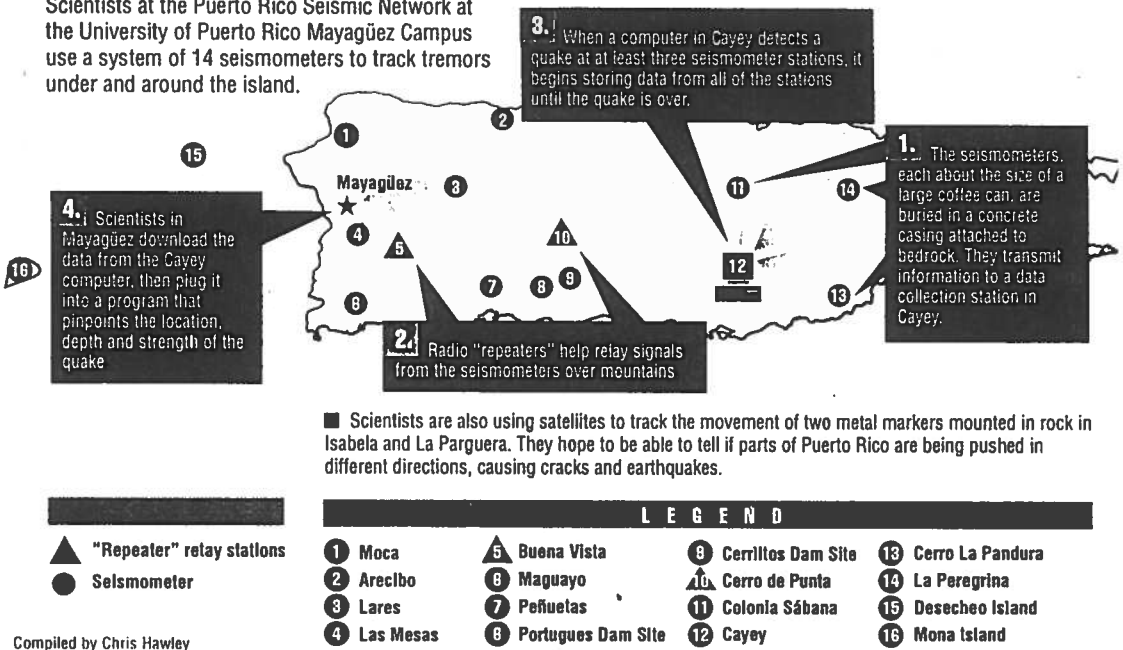
"People have studied earthquake prediction for years, and then suddenly have said, 'Forget it,'" von Hillebrandt said. "The most frustrating thing is that I can study them, but I can't predict them and I don't foresee anybody being able to predict them for a long time."

She pointed to map on the wall showing color-coded "high risk" areas on the island. It's worthless, she says.

"If there were a map like this of Japan, the [1995 Kobe, Japan quake] would be here," she said, and tapped the blue "low-

#### The Seismic Network in Puerto Rico

Scientists at the Puerto Rico Seismic Network at the University of Puerto Rico Mayaguez Campus use a system of 14 seismometers to track tremors under and around the island.



STAR graphic by Gabriel Sz

### New documentary features P.R. 1918 quake

By CHRIS HAWLEY  
Of The STAR Staff

When told about the Leap Day 1996 tremor that knocked objects off shelves in Mayaguez, Enrique Sanz chuckled.

"Do you know what it's like to go home and see your house split open along the bricks so you can see the light outside? That's an earthquake."

Sanz would know. As a 10-year-old, he survived the most violent tremor ever recorded in Puerto Rico, the Mona Passage earthquake of Oct. 11, 1918. The quake is the subject of a new documentary by Sacred Heart University Professor Sonia Fritz, and it re-

mains seismologist's favorite example of the "big one to come."

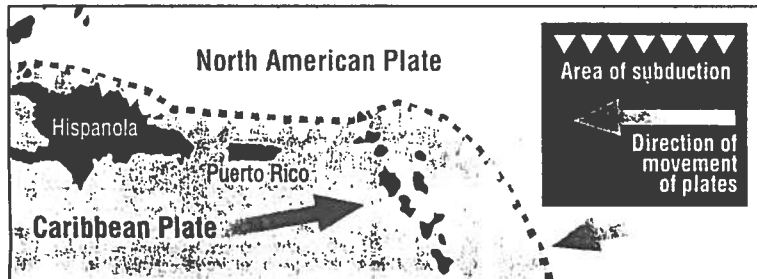
The quake took place at about 10:30 a.m. at the point where the Mona Channel Fault meets the Puerto Rico trench, about 40 miles off the north coast of the island. Traveling at three miles per second, shock waves that registered 7.5 on the Richter scale slammed into Aguadilla and Mayaguez, flattening buildings.

One of the two towers of the Mayaguez cathedral was toppled, and a broken electrical cable set the University of Puerto Rico Mayaguez Campus on fire, Sanz said. Moments later, a 20-foot-high tidal wave crashed into cities along the northwest coast, killing 32

people and destroying more than 300 homes in Aguadilla alone.

In all, the quake killed 116 people, caused millions of dollars in damages and left more than 800 homeless. Violent aftershocks continued for two days, and cities left without clean water were hit with a flu epidemic that lasted almost five months.

Fritz's 18-minute video documentary features interviews with earthquake survivors as they revisit neighborhoods that were devastated by the 1918 tremors. It was commissioned by the Civil Defense and will be shown at 7 p.m. Wednesday in the Emilio Belaval Theater at Sacred Heart University.



STAR graphic by Gabriel Szoke

risk" area along the northern mountains. "A big earthquake could happen anywhere, anytime in Puerto Rico."

Last month was a busy one for earthquakes, researchers said. There were 44 tremors in February, including a trio of powerful snucks in Cabo Rojo and Lu-

quillo, and a 3.9 quake in Mayaguez. The Leap Day quake knocked objects off shelves "for the first time in a long time," von Hillebrandt said.

What does the activity mean? Not much, researchers say.

"It was slightly higher than other

months, but the number of earthquakes always fluctuating," said Victor Hufano, a data analyst for the network. "It might mean something or it might not."

That's the most exasperating part of the job, seismologists say — spend years tracking disasters they will never be able to prevent. "Hindsight is 20-20 seismology," von Hillebrandt said.

The most researchers can do is try to map how the earth is put together and attempt to track its movements for a glimpse of what is happening in the darkness miles beneath the sunlight oceans.

There are more questions than answers, researchers say. All scientists know for sure about seismic activity on the island is that it is related to the Puerto Rico trench, an underwater fault about 30 miles north of San Juan where the plates carrying North America and

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## Quakes

the Caribbean meet.

Part of the North American plate seems to be wedged under Puerto Rico, von Hillebrandt said. On a map of recent earthquake sites, it shows up as a cloud of dots curving more than 100 miles into the earth.

The southwest area of Puerto Rico is another zone prone to earthquakes, and seismologists think the border of a "platelet" floating on the main plate may cut across this area. But they're not sure.

In fact, beyond the trench, Puerto Rico's structure is full of mysteries. Researchers haven't been able to map all the faults that crisscross the island, each one of which could be the site of a major earthquake. Scientists have not determined if the North American plate is still being jammed deeper into the Caribbean, they don't know why

there is a high concentration of tremors near Vieques, and they still can't accurately predict the probability of a major quake.

Revelations come slowly. It took nine years — from 1986 to 1995 — just for scientists to determine that Puerto Rico's plate is moving

*"A big earthquake could happen anywhere, anytime in Puerto Rico."*

**Christa von Hillebrandt**

seismologist

east, rather than northeast, at about 1 inch per year in relation to the United States.

"It's slow work . . . you have to work on a lot of things at once," said Glen Mattioli, a geologist at UPR-Mayaguez who worked on the plate-movement study.

Mattioli and fellow geologist Pamela Jansma are now trying to settle another nagging debate — whether Puerto Rico is a single block of rock or if it is being moved differently in different areas, causing cracks and earthquakes.

They have installed metal markers on the northwest and southwest coasts of the island and are using satellites to measure how far the markers move.

Once a year, they set up Global Positioning System (GPS) receivers directly over a tiny pit in each marker. The GPS receivers pick up signals from U.S. Department of Defense satellites, then use trigonometry to determine the marker's location.

After five days of taking satellite readings, the receiver's computer knows the marker's location down to the millimeter.

If Mattioli and Jansma can determine the coasts are moving at different speeds, it would shed light on the shaking that plagues southwest Puerto Rico.

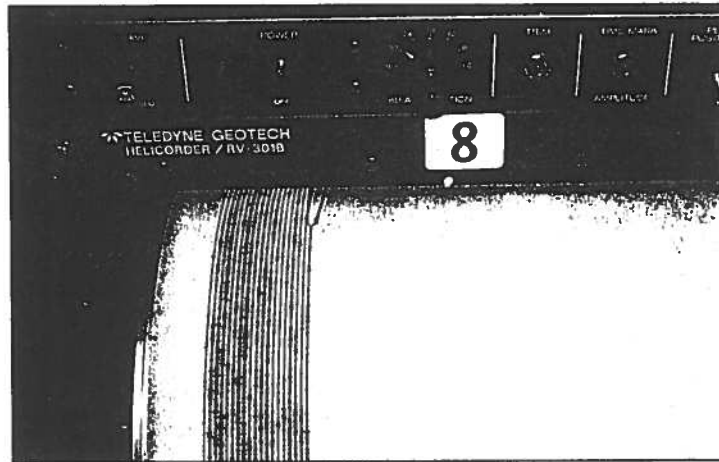
Similar studies in the Dominican Republic have shown where parts of the plates are "stuck," Jansma said. That could point to an impending earthquake.

Small breakthroughs like that — when years of study and mapping start revealing the wrinkles in the earth's crust — are what make the job worthwhile, von Hillebrandt said.



Photo special to the STAR by Javier González

Christa von Hillebrandt directs a team of scientists and student workers whose job it is to hunt earthquakes with the aid of sophisticated equipment and computers at the Puerto Rico Seismic Network, located at the University of Puerto Rico's Mayaguez Campus.



The seismographers show in graphic terms what is registered by the seismometers within the 14 digital sensing stations scattered across the island. The thin black lines on the white paper allow scientists to know when the earth has moved.

Photo special to the STAR by Javier González

"Little by little, you get information," she said. "Every earthquake is a little clue."

"The exciting part is when things start lining up, when you can see a new seismic zone showing up. It's when things start making sense."

Last week's swarm fell in a rough north-south line extending from an already-known fault in Guayanilla Bay. Von Hillebrandt added it to a map of cracks in western Puerto Rico. One more piece of the puzzle was in place.