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COLUMN ONE

Mining destruction for data to help others

In the aftermath of events like the Haiti quake, teams of 'disaster researchers' rush to the scene to study what happened. It's not morbid curiosity: Their work will alleviate future catastrophes.

By Karen Kaplan

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William Holmes was at his desk at a downtown San Francisco engineering firm when a message from the U.S. Geological Survey flashed onto his computer screen: A magnitude 7.0 earthquake had struck 10 miles from the Haitian capital of Port-au-Prince.

Within minutes, Holmes was making plans for a team of geotechnical engineers, architects and seismic design experts to scour Haiti's devastated landscape and collect data to be analyzed in laboratories back home. Theirs will be a humanitarian mission in the broadest sense. The beneficiaries might be thousands of miles, and many years, away from the Caribbean.

A handful of researchers have already begun trickling into the country; dozens more, including Holmes' team, will follow. The National Science Foundation, the primary funder of such missions, is now evaluating proposals from investigators hoping to study the geologic and engineering aspects of the quake, such as the way houses crumpled and how soil moved and changed. Other scientists are interested in the human side, such as how quake victims responded to the anarchy and how relief agencies coordinated their missions.

This attraction to misfortune may appear unseemly, but events like the Haiti quake are opportunities for an idiosyncratic breed known as disaster researchers. These scientists flock to places devastated by quakes, hurricanes and intentional acts of destruction to study the consequences.

"We're not waiting for these things to happen, and we don't want them to happen," said Jonathan Bray, chairman of the Geo-engineering Extreme Events Reconnaissance Assn., a National Science Foundation-funded organization of scientists and engineers who gather geotechnical, seismic and other data from disaster sites. "But when they do, we want to be able to learn the lessons that can be learned."

Dispassionately measuring cracks in walls, gathering soil samples and observing emergency relief operations can be emotionally difficult amid widespread suffering. The scientists' instinct is to alleviate the distress in front of them. The work itself is grueling, with teams staying in the field up to 16 hours

straight to gather as much data as they can before rain, aftershocks, clean-up crews or looters destroy ephemeral evidence.

But they are guided by the principle that their forensic work will help alleviate future catastrophes.

Disaster researchers have been credited with bolstering building codes that make structures more resilient. They have identified specific genetic variants that make some people more susceptible to post-traumatic stress disorder. They have developed new methods for decontaminating floodwaters in as little as 15 minutes. And they have zeroed in on the factors that influence whether people heed or ignore evacuation orders.

It can take months or years for researchers to extract meaningful lessons from the chaos. When they do, they will present their findings at scientific meetings and publish the details in scholarly journals and government reports.

The geo-engineering association's official motto sums its mission up best: "Turning disaster into knowledge."

Such work has never been more crucial.

The global population is soon expected to reach 7 billion, with more than half of those people concentrated in urban centers or along coastlines. That increases the damage potential of a single hurricane, earthquake, tsunami or terrorist attack.

"We like to live in areas where there is danger," said David Neal, director of the Center for the Study of Disasters and Extreme Events at Oklahoma State University in Stillwater.

When horrific events occur, these researchers are ready.

Immediately, they scour media reports for information. They strategize about the best way to reach the affected area. They pull strings for access to places that are off-limits to the general public. And, more prosaically, they file grant applications. Because their data-gathering research is focused and relatively inexpensive, funding can come surprisingly quickly.

As soon as news of a disaster breaks, "the wheels start turning," said sociologist Tricia Wachtendorf, associate director of the Disaster Research Center at the University of Delaware in Newark.

Sometimes, enterprising investigators will decamp to the site of a predicted disaster -- such as a category 5 hurricane -- so they can be on the ground when it hits.

More typically, researchers take at least 72 hours to get to a disaster. That gives first responders time to carry out search-and-rescue operations without undue interference, said Bray, a civil engineer at UC Berkeley.

"We don't want to be in the way of people who are trying to save someone's life," he said.

The scientists bring cameras, GPS devices, voice recorders, safety equipment, water purification tablets and sturdy shoes.

After Hurricane Katrina, scientists in protective suits trekked through soggy neighborhoods in New Orleans collecting samples of mold from bloated walls. Others paddled around Lake Pontchartrain,

filling plastic soda bottles with water samples and dissecting fish to check for contaminants they may have ingested.

The experience is more personal than traditional scientific endeavors.

Earthquake researcher Andre Filiatrault of the University at Buffalo remembers the long lines of 1995 quake survivors in Kobe, Japan, who waited six hours each day just to collect a few gallons of potable water. "These people are suffering, and you're walking around with your hard hat and you want to help," he said.

Scientists have been studying disasters for more than a century.

The Smithsonian Institution in Washington, D.C., sponsored small fact-finding missions in the aftermath of earthquakes, hurricanes and other natural disasters in the 1800s.

The federal government's first large-scale effort to understand the causes and consequences of an earthquake came after the San Francisco quake of 1906, said Marc Rothenberg, the historian for the National Science Foundation in Arlington, Va.

When Congress established the foundation in 1950, it took on primary responsibility for funding studies of U.S. quakes and other natural disasters. The government's investment varies based on events, but most initial grants are in the range of $10,000 to $50,000. After Hurricane Katrina ravaged New Orleans and the Gulf Coast in 2005, the foundation handed out more than $5 million for about 70 data-collection projects, said Dennis Wenger, the agency's program director in charge of disaster research funding.

The National Institutes of Health has also gotten into the act, sponsoring research on mental illnesses that often arise after disasters.

"It gives us an opportunity to learn something about the risk for psychopathology that can't be studied in other contexts," said Farris Tuma, chief of the Traumatic Stress Research Program at the National Institute of Mental Health.

After four major hurricanes hit Florida in 2004, scientists studied survivors' medical records and gathered blood samples to tease out the role of specific genes in causing PTSD, generalized anxiety disorder, depression and suicidal thoughts.

"You have this more level playing field of vulnerability, which gives us a better way of trying to identify what's protective for people and what puts people more at risk," Tuma said.

The first researchers began arriving in Haiti about a week after the Jan. 12 quake.

It's too early to predict what they might learn. "Every earthquake has a surprise," Bray said.

The 1994 Northridge quake had a huge surprise: More than 100 steel buildings cracked along the joints where the horizontal beams were welded to vertical columns. The discovery led to an emergency change in building codes, and the method is no longer allowed in new construction.

"There are now ways to build such buildings that we consider to be adequate," said Holmes, the San Francisco engineer, who helped uncover that problem.

As head of the Learning from Earthquakes Committee of the NSF-funded Earthquake Engineering

Research Institute, Holmes is now focused on the lessons that will emerge from Haiti. About a dozen members of the institute have already gone to Haiti, where they assessed the safety of buildings at the behest of various nongovernmental organizations. The institute will send six to eight researchers as part of a formal reconnaissance team in another two to three weeks.

"There's always something to learn," Holmes said. "We don't want to miss anything."

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