Earthquakes

Outsider's quake 'discovery' may rattle the experts

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SAN FRANCISCO — The old dream of scientists to someday predict earthquakes just before they strike took a shaky step forward — and slid several backward — when the Oct. 17 quake hit Northern California.

Scientist theorize that a major earthquake should reveal through various precursors that it is about to strike. Signs could include events such as swarms of smaller quakes or an increase in stress along the fault. So seismologists eagerly plunged into the data collected since the quake, hoping to find something that might have tipped them off that the fault was about to rupture.

"We did not find anything," said William Prescott of the U.S. Geological Survey.

Prescott noted that the region in the Santa Cruz Mountains where the October quake was centered is not as heavily instrumented as some other areas in California, but many seismologists thought that the kind of instruments scattered throughout the region should have detected changes in the fault system just before the quake.

"There was nothing that we could clearly identify" as a precursor, Prescott told the fall meeting of the American Geophysical Union in San Francisco last week.

As often happens in the world of science, however, an outsider made an interesting discovery; and what he found may shake up the earthquake experts.

A team of scientists from Stanford University just happened to be conducting a Naval research project in the area right over the quake's epicenter when the temblor struck.

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The team, led by electrical engineer Antony Fraser-Smith, was using a sensitive instrument to measure changes in the Earth's magnetic field as part of a project aimed at submarine detection. Since the area around Stanford has so much "background noise," caused largely by electrical generation facilities, Fraser-Smith set up one of the instruments in the home of a sister of a graduate student near Corralitos, just four miles from the epicenter.

Fraser-Smith, who has been studying electromagnetic fields for many years, said during the San Francisco meeting that the instrument, called a magnetometer, began recording very strong signals in the weeks and hours prior to the earthquake.

Since rocks under pressure can generate a small electrical current, and thus a magnetic field, Fraser-Smith showed his data to several seismologists who became, as he put it, "quite excited."

Some theorized that if rocks under strain prior to the quake were responsible for the signals picked up by the equipment, Fraser-Smith might have stumbled onto something of profound importance to the field of earthquake prediction.

Seismologists caution that even if that turns out to be the case, however, it doesn't mean all earthquakes would be preceded by such signals.

A lot of research will be needed before the signals can be fully understood, but Fraser-Smith believes they clearly were related to the earthquake.

"I consider this one small step for mankind," he said.

That must be balanced against the fact that seismological sensors in the region, including strain meters and seismographs, detected absolutely nothing.

That disappointment is somewhat ironic in that seismologists had been expecting the Bay Area quake sometime in the next few years, even though it did not tip them off in the days before it struck. It ranks as the most costly earthquake in the history of the United States, and it was the most powerful quake to hit Northern California since 1906.

The Loma Prieta quake, as scientists call the October temblor, had been "forecast" by scientists, meaning the historical and seismic record showed that a quake on that segment of the San Andreas Fault was likely to occur within the next three decades. That long-term forecast is helpful in that it serves as a reminder of the danger, but it does not tell anyone when to get out of town.

The lack of seismological precursors leading up to the October quake suggests that a long-range forecast, rather than an immediate prediction, may be the best that science will be able to provide — unless, of course, the electromagnetic signals detected by the Stanford team turn out to be a real breakthrough.

Thus, much of the effort today is aimed at determining which faults are likely to rupture over the next few decades. Some hope to eventually reduce that long-range forecast to a few years rather than decades, and the October quake did offer a little encouragement there.

Karen McNally, a seismologist with UC-Santa Cruz, told the convention that "pre-shocks" grew progressively larger and deeper in the months preceding the October quake.

None of the foreshocks was startling enough to warn seismologists that the quake was in the immediate future, but they did indicate that the region was changing gradually, she said.

If that pattern holds true for other quakes, it might be possible to issue a warning within a year or two of a major quake, she added.