Earthquakes 3-22-57

SF, State Shaken By Earthquake

A rolling, jarring earthquake which rattled windows and rocked ceiling fixtures in the Monterey bay area caused some damage in San Francisco and along the peninsula.

The seismograph at the University of Santa Clara started recording the quake at 11:44½ a.m. and continued to react to the earth's motion for four minutes.

A spokesman said the center of the earthquake was placed by instruments about 10 miles southwest of Santa Clara. A magnitude of between 5 and 6 was recorded on the Richter scale.

A much lighter quake was felt in San Francisco at 10:48 a.m. today.

According to the Associated Press, San Francisco buildings swayed violently during the second quake. It was felt heavily in Marin county to the north and in San Mateo county, south of San Francisco.

San Francisco's dial telephone service was jammed so badly within minutes after the quake that calls were much delayed as subscribers sought information or offered reassurance.

Paul O'Brien, clerk of the U.S. court of appeals, a veteran of the devastating 1906 quake in San Francisco, said today's "felt just as heavy."

Mill Valley, in Marin county, felt the shock heavily. At Santa Cruz, down the coast, windows rattled.

It was felt very sharply at Hollister, San Benito county. People ran into the street in alarm.

The third floor of the Emporium, a department store in Stonestown, on San Francisco's southern border, was badly damaged. Merchandise was strewn in the aisles and showcases were smashed.

University of California said the shock, with a Richter magnitude of "at least 5," was recorded at 11:45:20 a.m. The needle was thrown off the scale of the seismograph.

Dr. Charles F. Richter of California Institute of Technology at Pasadena, said his instrument indicated a magnitude of 5½.

This reading is much less than one-tenth of the total energy released in the 1906 quake that destroyed San Francisco.

Dr. Richter said the quake appeared to have centered south of San Francisco.

Display windows were shattered in several sections of San Francisco.

The Palo Alto high school had just completed a fire drill and the pupils were entering the building when the earthquake jolted the place. They started to run out again, but stopped quickly with the realization there was no damage.

Plaster was knocked from second floor walls in the old city hall at San Jose, where the quake was felt as a strong rolling movement, but very brief.

FAIR WEEKEND SEEN

San Francisco (AP).—The signs point to a fair, mild weekend in northern and central California, aside from a chance of a little rain in the extreme north on Sunday.

A Whole Lotta Shakin' Goin' On

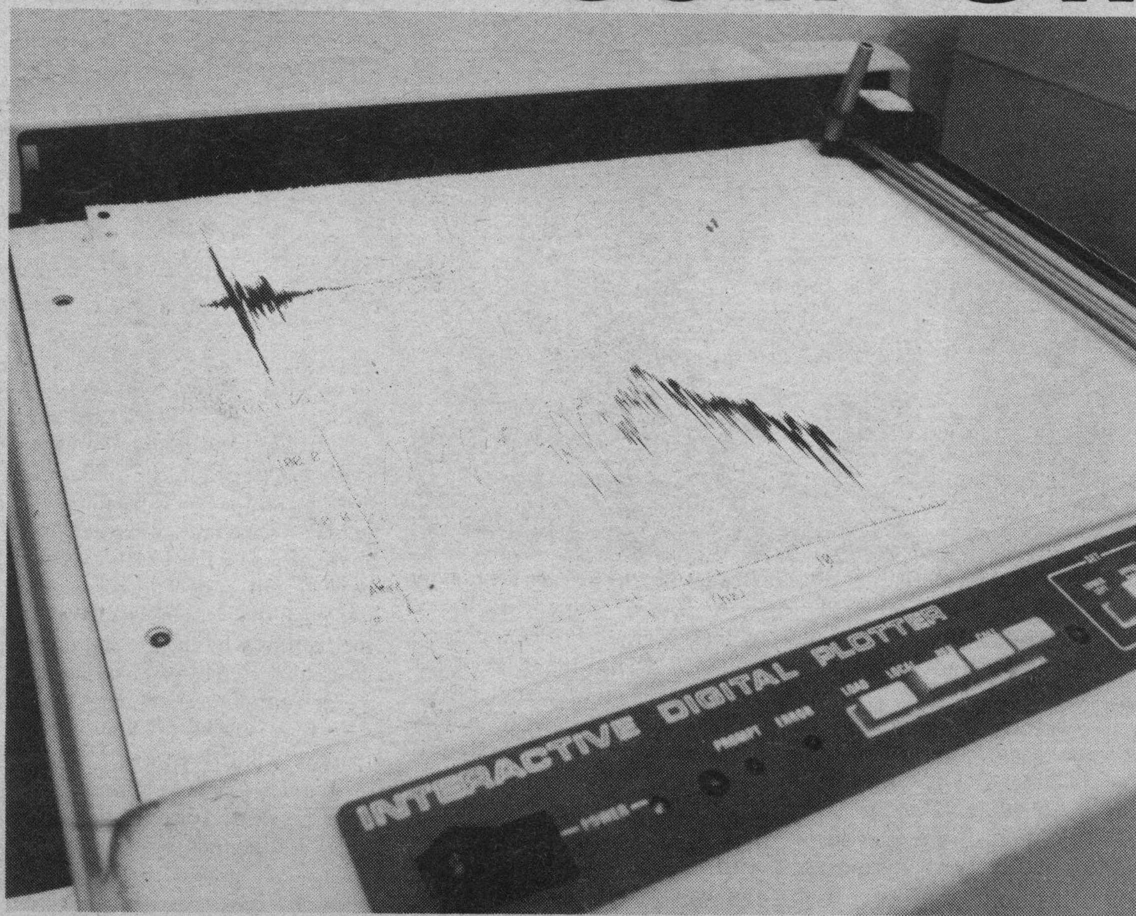


PHOTO: DON FUKUDA

Dave Barber

They have "events" every week up at UCSC's Richter Seismic Laboratory. That's what seismologists call it when the earth makes its sudden moves. Even when the jolt isn't strong enough to rattle china on the kitchen shelves, it's still called an event. This business of events, in other words, isn't always so eventful. Then again, there promises to be weeks like the first one of this month.

Hours after a magnitude 6 earthquake rocked the small central valley town of Coalinga on the afternoon of May 4, UCSC lab personnel were nowhere near their lab. They were southbound on Highway 5, soon to be the first seismological team to arrive at the scene of the quake. Like the meek tremblor that barely sends a shudder through walls, Coalinga was an event. Unlike that meek tremblor, Coalinga was an event worth getting dust-caked and losing sleep over.

"Those first hours afterward are the most crucial in terms of data-collecting," says Richter Lab director, Karen McNally. "It can get pretty feverish. We knew immediately that we were the closest station to the site and had to get down there as quickly as we could."

Seismology — literally, "the study of earthquakes" — is young as sciences go, and the Charles Richter Seismic Laboratory is about as young as they come. Dedicated just last December, the Richter Lab is the newest addition to California's pride of research centers devoted to recording, interpreting and otherwise keeping tabs on the earth's pulse.

Christening the lab in Richter's name made all kinds of sense. Now 83 years old and a professor emeritus at Cal Tech, he has been called the godfather of American seismologists. By virtue of the famous magnitude scale that bears his name, seismic events can be substantially measured in terms of energy released, not just rubble accumulated.

Since its invention in 1935, the Richter scale has remained the cornerstone of all seismic data collecting. It allows researchers to examine quake disturbances within a clear, standardized model. It permits them to compare a 7.9 magnitude quake in September, 1981, say, to one of identical magnitude that shook New Guinea just two months ago. It even reduces the chaos attending major quakes to a simple numerical statistic that amateur aficionados can memorize like birthdates or batting averages.

But easy accessibility isn't all that Richter figures are about. The scale is more complex than a first glance or a swift radio bulletin would have it. Because it is based on a logarithmic model, each whole number on the scale represents 30 times the energy release of the last whole number (actually 31.5 times, if you want to split hairs). The point is, the destructive capacity of a magnitude 7 quake isn't just slightly greater than that of a magnitude 6 quake. The difference is enormous.

Misconceptions over the Richter scale's form and function are indicative of the pronounced rift between earthquake phenomenology as seismologists know it and the popular quake mythology propagated on movie screens, in paperbacks and the lurid headlines of supermarket tabloids. The circus of it all at times eclipses the science. No doubt, those people who delight to Universal Studios' gaudy Sensurround-simulated quake down in Hollywood outnumber those who could describe what a fault line is with any vague accuracy. And one wonders how the psychics would ever cope if they couldn't routinely announce which fault-straddling cities are going to be ravaged and which San Joaquin grapefields are due to become idyllic oceanfront property.

All this theatricality would perhaps be more palatable if it were clear that its effects are harmless. But that isn't clear at all. Is there a relationship between psychic Clarisa Bernhardt's scenario of a "beautiful Kansas riviera" after the next Big Quake and the fact that California's Seismic Safety Commission is budgeted a laughable $400,000 a year? Is there a link between a film like 1973's *Earthquake!* and the currently contemplated 50% reduction in federal earthquake hazard funds throughout the West? Is there a conflict between the seriousness seismicity demands and the sideshows it inspires? One must suggest there is.

Earthquakes, of all things, should be taken seriously. In seat 22, row 74, section KK of the UC Berkeley Memorial Stadium, a spectator can jam a fist through a crack in the tier behind him or her that transcribes the exact path of the notoriously active Hayward fault. The crack hasn't always been there. In Daly City, post-war tract homes huddle snugly between the San Andreas Fault and sheer seacliffs. The cliffs are closer than ever before.

But until the Coalingas, the Magnitude sixes or sevens that shrug houses off their foundations, until the UPI photos of collapsed staircases and crushed Chevrolets begin to circulate, the science of seismicity takes a decided backseat to both cinematic overkill and bureaucratic insouciance. Until the Coalingas, seismology labors away in a shadow.

Until the Coalingas, someone like Karen McNally goes about her work in relative obscurity. "That got to be something of a problem," she says of the Coalinga aftermath. "There we were scrambling for our data, setting up our instruments and all of a sudden there was the press corps wanting our time."

She laughs, "They kept asking, 'Where are the seismologists? Where are the seismologists?' "

The seismologists are where they've always been. They're in the hills at the sites of ruptures and fault zones.

The San Andreas is only the grandest and most storied of the veritable riot of faults that sprawl beneath the California topography

They're taking their readings around the outskirts of recent epicenters. They're in the hum of their laboratories translating the undulating scribbles of seismograms into hard equational data.

The seismologists are puzzling over the large and the small of it: the land's next massive lurch and this year's next two inches.

Two inches a year — that's the approximate pace at which a town like Santa Cruz is making a beeline for Alaska's Aleutian Islands. It is a measurable two inches, a somewhat faithful two inches and a strikingly instructive two inches, for it captures in intimate, familiar terms the complex geophysics shared by all land masses.

The earth's surface, confirms those two inches, is composed of plates — seven major ones, to be exact. It is assumed that once upon a time these plates were lumped into a single, immense continent, but for the last 200 million years or so they have been sliding inexorably and independently over the planet. When two plates encounter each other, the inevitable colliding, scraping and straining accounts for some of geology's great *tour de forces:* mountain ranges, tidal basins, earthquakes.

You couldn't ask for much more dramatic evidence of this confrontation of plates than California's San Andreas Fault. Consider: the San Andreas is not only magnificent in breadth, but precisely describes the great jagged division between continents. It's 600 miles worth of proof that all those New York cracks about California being divorced from the rest of the country couldn't be truer — the slice of the state that lies to the west of the San Andreas actually belongs to an entirely different continental mass, the Pacific Ocean Plate.

Here's where those two inches come in. That's the average annual rate at which the Pacific Ocean Plate is shoving northward past the southbound North American Plate. There goes the neighborhood.

But leave it to Californians to exaggerate something that needs no exaggeration. For all its true enormity, the San Andreas has also been swaddled in enormous myths. Even a born and bred native here and there still harbors the delusion that every seismic twitch and shudder is attributable to the San Andreas alone.

Others insist on picturing it as a sleeping giant of a fault, due to awaken any day now. There it lies, deep in slumber, dreaming of turning Los Angeles into another Atlantis and Bakersfield into a beach resort.

Nothing, however, could be more fallacious than the notion of a dozing fault. The earth never really stops moving. A fault by definition is a fracture between the restless crustal blocks which occupy the top layer of those wanderlusting plates. The San Andreas is only the grandest and most storied of the veritable riot of faults that sprawl beneath the California topography.

The earth moves and it moves in two basic ways: with ease and with difficulty. When all goes smoothly and the crustal blocks slide by one another like greased hands, it is called "slow creep." It takes a learned, or at least perceptive, eye to notice the signs of this phenomenon: a distorted streetcurb here, a displaced winery wall there.

The going isn't always smooth though. Huge masses of rock have a huge potential for strain, conflict and tension. Crustal blocks can "hang up" as they shift (catch and lock, if you will). Progress is often temporarily arrested in these instances, with the emphasis on the temporary. Sooner or later, the stress becomes unmanageable, the elasticity of the rock snaps and California rides out yet another earthquake.

By quake or by creep, the plates get their two inches.

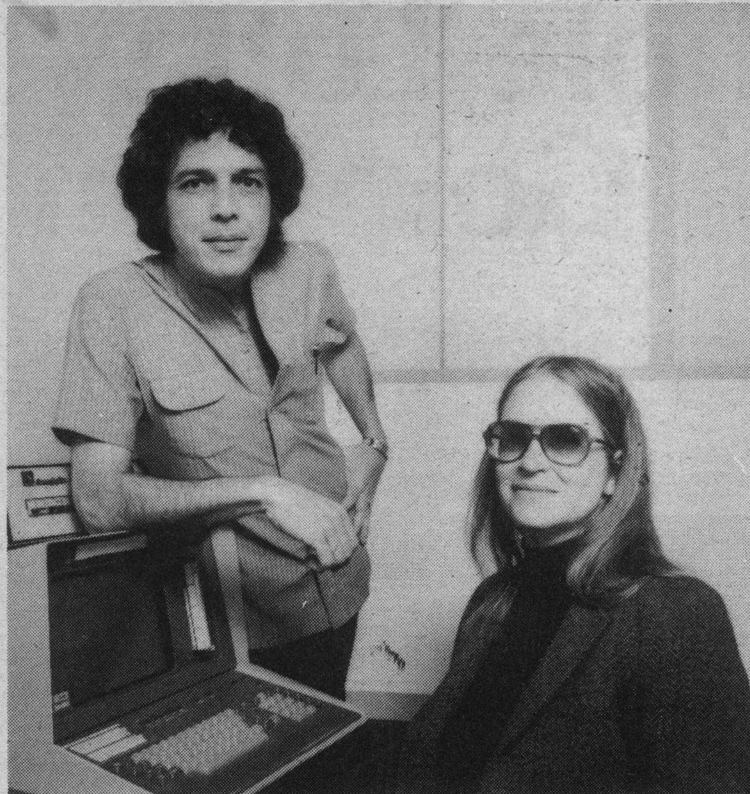
Where are the seismologists? Many of the best are in California. They're working out of the laboratories of Cal Tech, USC, UCLA, UC Berkeley, UC San Diego and, most recently, UC Santa Cruz. They're working in conjunction with the US Geological Survey's Research Center in Menlo Park. They're here, in their element.

The reason is simple. Ninety percent of the world's earthquakes occur at the division of continental plates and three-quarters of any given year's quakes take place somewhere along the so-called pan-Pacific "ring of fire," a belt of intense seismic and volcanic activity that loops around the Pacific Ocean all the way from Australia to the southern tip of Chile. California, in short, is one of the most appropriate places around to become intimate with the earth's ceaseless stirring and shoving.

As pure recreation, seismograph-perusing ranks only slightly above watching the grass grow. The recording drum rolls over ever so steadily and the razor-sharp pen etches its fine, tense lines with infuriating precision. There's always that chance, of course, that any second now the pen will begin to scribble wildly in response to a genuine, newsworthy seismic event. Don't hold your breath, though.

But if sport isn't what you're after, seismographs are not without fascination. As a solution to the problem of how to accurately gauge the earth's rocking while simultaneously being subject to that rocking, the standard version is an ingenious instrument: the old pendulum principle turned on its head. Rather than moving relative to the earth at rest, the seismographic pendulum is suspended and fixed so that it will respond only to the motion of seismic waves. From seismographs come seismograms — scrollfuls of tremulous lines which are both the daily grind and the grail for seismologists.

PHOTO: DON FUKUDA



Jose Rial and Karen McNally of UCSC's Charles Richter Seismic Laboratory.

The Richter Lab's seismographs are stationed under glass in the first floor hallway of UCSC's Applied Sciences Building. They are calibrated to differing time intervals or "periods." The two intermediate period seismographs respond to seismic waves from as far away as Costa Rica and New Guinea, while the pair of short period models record tremors of closer geographical proximity. A fifth seismograph, the consummately delicate Wood-Anderson long period variation, sits dormant beneath a photograph of a jovial Dr. Richter. This is the one from which those famous and familiar Richter numbers are culled, but an adequate site for it has not yet been found.

As pure recreation, seismograph-perusing ranks only slightly above watching the grass grow

It's when the rolls come off the drums that the real work of seismology begins. "Processing data," smiles UCSC research seismologist Jose Rial. "That's what it's all about. All those little wiggles need to be entered somewhere and preserved." event at Coalinga, excitement in the Richter Lab had revolved around subsequently pooled and contrasted with their ilk from other stations throughout the state, country and world. If that sounds like a Herculean task, that's only because it is. But this exhaustive networking of data is imperative to any serious seismological research, given the erratic behavior of seismic events. It's one thing if you're a botanist — the leaves and grasses are right outside your door. Earthquakes aren't so obliging.

It is of no small consequence that the dawn of seismology's modern era coincided with the comprehensive standardization of seismological instruments throughout the world. Seismologists now could speak the same language. Their findings finally had international scope and relevancy. A magnitude of 6.3 meant the same in the Turkish steppes as it did in Coalinga.

Surely it would be pleasant to report that this sweeping, transformation was engineered purely in the good name of scientific curiosity. But no, these were the days when Sputniks and bays and pigs were still fresh in everyone's minds. When the Worldwide Standardized Seismographical Network was forged in 1963, one of its fundamental — yet officially undeclared — purposes was to keep a sharp eye (or stylus, as the case may be) on the underground nuclear testing of the Soviets. That is one of the reasons why the 150 stations in 65 countries enjoy a startling fluidity of communication and that is why there isn't a single station to be found in all of Russia or China.

Is there any conflict between the seriousness seismicity demands and the sideshows it inspires?

So much for the debt seismology owes to political dirty laundry. The leaps and bounds with which the science has grown in the last 20 years also has a vast amount to do with the increased technical sophistication of its instruments, a greater dependency on field research and the advanced methodology of seismologists who know more and more what they are looking for — and where to look.

One facet of Rial's research, for instance, has been the study of ground strata composition under major cities such as Los Angeles. Because the shape and content of substrata determines its susceptibility to seismic wave action, it is possible to suggest which bridges, streets and shopping malls are least likely to successfully resist a significant quake. Geologic evidence of this sort is infinitely useful to seismologists, not to mention architects, city planners and insurance companies with quake policy clients.

Overall, California's seismic profile is in sharper focus than ever before. But it's not as if the clues come thick and fast. Although seismologists can safely discuss how the San Andreas has been pulling apart since 1979 rather than squeezing together, or how the increased activity along the Hayward Calaveras fault portends the completion of a century-old seismic cycle, hard facts about earthquakes continue to be dwarfed by their enigmas.

"Ask any seismologist," says Rial, "and they'll tell you they need more data. There'll never be enough data. That's the truth of the matter."

Even when the evidence is served up in the emphatic manner of a Coalinga, clear conclusions don't necessarily follow. There is still some heated debate among seismologists as to the causes of the May 4 quake. The US Geological Survey claims that crustal thrusting was responsible for the 6.5 event. Robert Uhrhammer of the UC Berkeley Seismographic Station contends that Coalinga was a classic "slip-stike" incident. UCSC's Karen McNally, meanwhile, has ventured that perhaps both forces were brought into play that Monday afternoon.

Ironically enough, it's sometimes easier for seismologists to say what *isn't* happening among the faultlines than what is. Take Coalinga. "That quake isn't going to alleviate any of the San Andreas' strain," says McNally. "It occurred on an entirely different fault. We're still in line for something big from the San Andreas."

The question has never been whether the San Andreas will cut loose again, but when. Geophysical forces take their own sweet time: a large-scale quake could occur tomorrow or a century from now and the fault ould still be true to form. Since a uake of a magnitude 7 or 8 could ke some 50,000 lives in high-rise an Francisco alone, and knock out atewide communications systems r days, it wouldn't hurt to have a w general notions of what kind of hedule the faults are keeping. hat's where certain seismologists e Karen McNally come in.

McNally's research resides rgely in the tenuous field of earthuake prediction. It would be a nistake, she asserts, to believe that seismologists are invested with any sort of shamanistic powers of prognostication, but neither would it be accurate to portray them as utterly in the dark where seismic variability is concerned. Geology isn't sorcery. There are patterns to become acquainted with, postulates to put on trial.

Efforts along these lines have ranged from intensive monitoring of radon gas emanations in fault zones to charting the pre-quake behavioral quirks of crickets and cockroaches. Not all of them have been fruitless. Back in 1975 Chinese seismologists were sufficiently convinced of their interpretive analysis to ask for the evacuation of the moderate-sized city of Haicheng. Mere hours later, a quake ripped through the province that would have killed thousands had the city been occupied.

In the late '70s, McNally found that all micro-earthquake activity along a 200-kilomoter portion of the southern San Andreas near Palmdale had ceased. Was this an ominous silence before the onslaught? Seismologists couldn't agree. Some believed that this new revelation had everything to do with an earlier discovery of the "Palmdale Bulge," a massive desert uplift that the USGS believed was hearlding a quake of front page proportions.

For a while the Palmdale Bulge basked in the media spotlight. It was said that the Bulge was a perfect opportunity to test the current caliber of earthquake prediction methodology. A phalanx of Cal Tech's finest descended on the site. Congress chipped in $1.8 million in special funding. Claims and denials among the seismic cognoscenti raged.

Then, in 1981, a National Geodetic Survey examination led to the discovery that the original calculation of the Bulge's bulging had been marred by an optical illusion. The assumed measurement of the uplift itself was called into serious question. There was still plenty of valuable seismological findings to be gleaned from the Palmdale sands, but a supreme Judgment Day for seismic forecasting it was not.

Current research has been bolstered by something called the "seismic gap" theory, which states that the regions to observe the closest for pre-quake signs are those where seismic activity has been most conspicuously absent.

Two inches a year. That's the approximate pace at which a town like Santa Cruz is making a beeline for Alaska's Aleutian Islands

PHOTO: DON FUKUDA

Rial studies the flow of aftershocks that plagued Coalinga in early May.

Such studies have led to successful predictions in Mexico and Japan. In California, says McNally, most seismological eyes are turned towards Los Angeles and the south. It's there that the San Andreas is very literally stuck — its last shudder of any sort was a momentous magnitude of 8 in 1857.

"We know that the timetable for 8-plus events is every 150 years, give or take another 50," she says. "It's been 126 years since the San Andreas did anything down south."

From the shaken oil-fields of Coalinga, McNally's research itinerary is next taking her to Costa Rica, where a magnitude 7 quake struck early this April. But a seismologist's life is not all epicenter-hopping. Much of the work takes place in the strictly unglamorous confines of laboratories, with the emphasis on the routine, the daily, the arithmetic.

Before the pulse-quickening event at Coalinga, excitement in the Richter Lab had revolved around the impending arrival of its new DEC VAX-11/750 computer. Now installed, it has emancipated the lab from the limitations of the overtaxed University computer and has multiplied the applicable uses of the lab's reams of data.

The next important step for the fledgling lab is locating a site to sequester its gem of a seismograph, the teleseismic Wood-Anderson. Given the delicacy of the instrumentation — the necessity of harboring it quite literally between a rock and a hard place — it can't be rigged up just anywhere.

"We've been looking at places up near Lockheed," says McNally. "There's plenty of hard rock there and it's far enough away from ocean waves. Another excellent location would be inside a rock or quarry mine shaft. We're fielding any suggestions people want to offer us."

McNally is also pushing to get the lab a leased van which could be transformed into a fully rigged mobile unit. Come the next big quake, Richter Lab personnel could then respond with all of the desirable promptness and none of the extraneous frenzy.

"Our Coalinga operations were somewhat hampered by transportation and equipment problems," she confesses. "And since here in Santa Cruz we're stationed right at mid-state, the ability of our team to be mobile could be one of our strongest suits."

Earthquakes are California's great truth, our Irish potato, our flooding Nile. Yet more often than not, seismologists here are only granted the marginal credence of casual soothsayers.

At present, Sacramento's attitude towards earthquake preparedness resembles one big whistle past the graveyard. The Jerry Brown-formed Earthquake Task Force is thrown budgetary table scraps. The state's Strong Ground Motion Studies program, which deploys 450 instruments specifically calibrated to anticipate significant events, is facing crippling cutbacks. Of the 1200 freeway overpasses that Caltrans has deemed perilously vulnerable to major tremors, less than half have been re-stabilized. "If we had the ultimate amount of money," says Caltrans director Oris Degenkolb, "we could do something about it."

Seismologists, of course, can't make a similar plea. It's their business to do something about it. And in the absence of money, they won't begrudge an occasional lent hand. "When we find a place for our long-period seismography," says McNally, "we can use all the volunteers we can get. Seriously. There's going to be some he[illegible] labor involved and we're [illegible] going to be able to pay fo[illegible] □