Southern California: Dearth of Quakes?

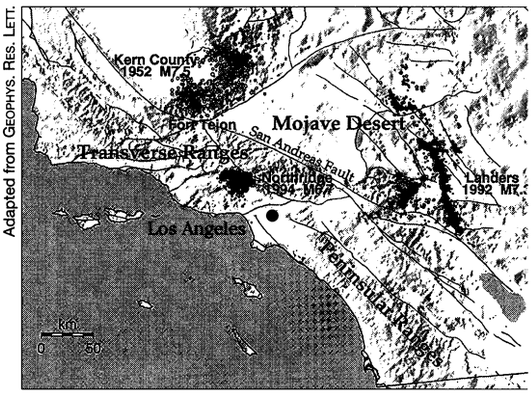
In a reprise of the 1970s, Hollywood is churning out a torrent of disaster movies in which various U.S. cities get shaken, baked, and pummeled by nature gone mad. In real life, Los Angeles and its environs are currently enjoying a welcome respite from their chief nemesis—the strong earthquakes that recently hammered the city. A new analysis of historical seismic trends hints that the peace will persist for another 5 to 10 years.

This controversial prognosis arises out of a study by two California seismologists who examined the frequency of all quakes larger than magnitude 3.0 since 1945. Lucile M. Jones of the U.S. Geological Survey and Egill Hauksson of the California Institute of Technology, both in Pasadena, report their findings in the Feb. 15 GEOPHYSICAL RESEARCH LETTERS.

"Right now, we're in a quiet time. We're having fewer magnitude 3 earthquakes than we did 10 years ago. That means our probability of having a magnitude 6 is down from what it was then," says Jones. She warns, however, that even in a quiet time, major quakes strike, albeit less frequently.

Jones and Hauksson conducted a rigorous statistical analysis of earthquake frequency to test whether quakes follow a clear boom-bust cycle, as many seismologists have hypothesized. According to standard thinking, a region remains quiet for years after a large jolt, while stress slowly accumulates underground. Over time, the number of small and moderate tremors increases, building up to the next big earthquake.

Supporters of this seismic cycle hypothesis point to San Francisco as a prime example. After the catastrophic 1906 earthquake, says seismologist Lynn R. Sykes, "it's just as if you turned off a switch. The moderate-sized earthquakes turned off for 40 years." In the late 1960s, the medium-sized jolts started to strike more frequently, building up to the strong October 1989 quake, says Sykes of the Lamont-Doherty Earth Observatory in Palisades, N.Y.



Adapted from GEOPHYS. RES. LETT.

Large quakes may protect Los Angeles.

Jones and Hauksson found that the quakes of Southern California did not follow the expected pattern. Although the number of tremors did drop off after large ones, the frequency of jolts did not keep rising until the next large shock. Instead, seismic activity stayed at a constant value. For instance, quake frequency declined by 30 percent after the Kern County shock, magnitude 7.5, in 1952. Then in 1969, the number jumped up to its previous rate and remained there until the Landers earthquake, magnitude 7.3, in 1992.

Scientists have often viewed this type of increased activity as a precursor to the next big quake. Jones and Hauksson consider the increase simply a return to normal conditions, not a warning of a catastrophe around the corner.

Nonetheless, the new study can give some clues about the future, the two scientists claim. They note that strong jolts hit less often after the 1952 quake. Judging from the size of the 1992 shock, they estimate that Southern California's quake rate will stay depressed until sometime between 2002 and 2007.

Sykes warns against drawing such a conclusion, however. "The Landers earthquake was far off to the northeast side of the whole active region of Southern California," he says, making it hard to imagine how this one shock in the Mojave Desert could control the rate of earthquakes all over Los Angeles and its surroundings. —*R. Monastersky*

A new breadth to estrogen's bisexuality

Most people have been taught to think of estrogens as female sex hormones and androgens as male sex hormones. "But that's simply not true," notes Donald W. Pfaff.

Indeed, a pair of studies by Pfaff, a neurobiologist at Rockefeller University in New York, and his colleagues has unveiled estrogen's previously unrecognized depth and breadth in establishing gender-specific behaviors in both males and females.

Estrogen and other hormones operate by binding to receptors on or in cells and triggering the production of one or more chemical products. Pfaff's team worked with mutant mice born without the normal receptors for estrogen.

These males, which don't respond to estrogen, had trouble mating in adulthood. Their reproductive organs "looked all right," Pfaff notes. Moreover, the animals tried to mate, he says, "so their motivation was not affected." What had been compromised was their ability to penetrate the female and release sperm, suggesting that their problems trace to some neurobiological defect, Pfaff says.

This wasn't their only behavioral peculiarity, observes coauthor Sonoko Ogawa, a behavioral neuroscientist at Rockefeller. The mutant males proved far less aggressive and exhibited less stereotypical masculine social behavior than their male littermates, which responded normally to the presence of estrogen. The team reports its findings in the Feb. 18 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

In the December 1996 NEUROENDOCRINOLOGY, the same team reported a suite of comparably atypical behaviors in female mice possessing the same genetic inability to respond to estrogen. Not only did they eschew the pup-nurturing behavior characteristic of females—and evident in normal littermates—they also exhibited the territorial aggression toward males usually seen only in males. In fact, Pfaff says, "a donnybrook ensued" whenever one of these mutant females was introduced to a normal male.

Clearly, Pfaff concludes, estrogen appears to be "a basic contributor to normal sexuality in both genders."

The sexual behavior of the estrogen-insensitive males is "very similar to what Earl Gray, in our lab, reported in rats prenatally exposed to dioxin," notes toxicologist Linda S. Birnbaum of the Environmental Protection Agency in Research Triangle Park, N.C. Gray found "that the little boys get just as excited [as normal rats] but then have a heck of a time doing it—and they've got real bad aim," Birnbaum observes (SN: 7/15/95, p. 44).

Pharmacologist Richard E. Peterson of the University of Wisconsin-Madison also has seen similar effects in rats exposed to dioxin (SN: 5/30/92, p. 359). He now predicts that the data from these studies with estrogen-insensitive rodents will open up new areas of research on the behavioral effects of weak estrogen mimics—pollutants that may block the far more potent estrogen's access to its receptor during critical periods of development. —*J. Raloff*