

began a public education campaign about earthquakes themselves as well as about dealing with a possible disaster.

Precursory signs continued to increase. Besides growing crustal deformation and tilt, "a great deal of unusual animal activity was observed," an indicator that receives little attention in the United States although it has been noted for years in many parts of the world. "For example," says Press, "snakes came above ground and froze to death—an unprecedented phenomenon." A number of water wells in the area bubbled, grew muddy and rose in level. ("I only know of one that's being monitored in California for level," Press observes.) With the occurrence of a magnitude 4.8 quake about 40 kilometers north of Haicheng, officials instituted checks of all reservoirs, mine-shafts, industrial plants and possibly unsafe buildings, some of which were strengthened as a result. "Earthquake maneuvers" were widely practiced, including hospital drills and evacuation practice. "Earthquakes were taken out of the realm of mythology and given scientific basis," says Press, "in what must have been thousands of nightly lectures all over the province."

The precursors grew following the shock, including level changes in 70 percent of the 81 wells being monitored. In mid-January, the prediction was narrowed to the first half of the year, with an expected magnitude of 5.5 to 6.0. On Feb. 1, a few small tremors appeared in a previously aseismic region near one of the stations, and by Feb. 3 the number had grown to more than 500.

The big quake was declared imminent. The public was notified to build simple outdoor shelters, to move patients from hospitals and to make suitable arrangements for the old and the weak. Medical teams and rescue brigades were organized, and transport vehicles were removed from their garages to the open air. Outdoor movies were shown to get people out of their houses (despite a temperature of -24°C), with further urging from armed military street patrols. The final evacuation order was given at 2 p.m. on Feb. 4. The quake struck at 7:36.

Chinese society differs from ours, and experience there may not be directly transferable, Press told the recent meeting of the American Geophysical Union, of which he is president. But the message is clear: Planning pays off. □

Forest frogs with ears tuned by sex



Coqui: 'Co' for territory, 'qui' for sex.

One can only guess at such things, of course, but it seems unlikely that many persons would spend hundreds of hours crawling through the undergrowth in a mountain rain forest in pursuit of knowledge. It seems unlikelier still that many would do so in order to play recorded sounds to small Puerto Rican frogs. This, however, is precisely what a Cornell University graduate student did. And his bizarre pursuit paid off: He reported the first known example of a vertebrate with ears "tuned" differently in the two sexes.

Peter M. Narins, a bioengineering doctoral candidate, and Robert R. Capranica, his major professor, report this "sensory sexual dimorphism" in the April 23 *SCIENCE*. They found, both through behavioral testing in the rain forest and electrophysiological tests in the laboratory, that the coqui frog (*Eleutherodactylus coqui*) of Puerto Rico's high-altitude rain forest has a specially tuned auditory system. The males emit a two-note call ("co-qui") for hours every evening. The "co" part of the call, the team found, is heard preferentially by other males, and tells them, in essence, "Male here! Approach my territory at your own risk!" The "qui" part, on the other hand, is heard preferentially by females, and tells them, "Sexually mature and interested male, this way!"

Narins played a series of tape-recorded natural and synthetic sounds (natural "co-qui's" and individual, synthetic "co's" and "qui's") to males in nature. "I was trying to answer a basic question in auditory physiology," Narins told *SCIENCE NEWS*. "Does the ear act as a filter for sequential notes? We know that the frog ear acts as a filter for specific frequencies, but does it also act as a processor for information that comes in a sequence?" Narins chose the shortest series he could find—the coqui's two-note

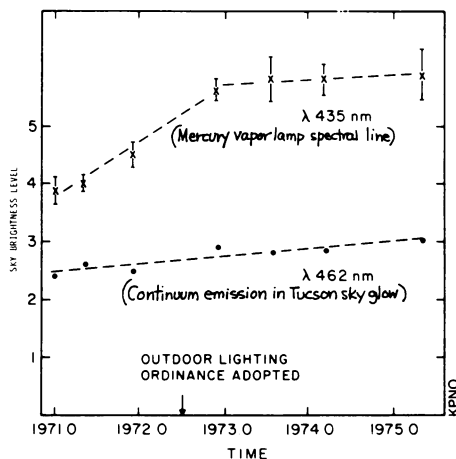
Light pollution: Law cuts sky glare

Back around 1970 the staffs of the many observatories in the southern Arizona mountains were becoming concerned about what astronomers call light pollution. The same urban sprawl that bothers lovers of the fragile desert ecology was bringing city lights closer to their mountains, and the upward glare was beginning to hamper their observations. Before things got really bad, they wanted to see if they could stop the trend.

Monitoring indicated that Tucson's night brightness was increasing by about 10 percent a year. Although seeing conditions at the observatories were still fairly ideal in 1970, if the trend continued, the city's glare would double in 10 years, and that could be purgatory for the astronomers. In 1972 they persuaded the city to adopt an ordinance regulating outdoor lighting.

Monitoring since the adoption of the ordinance shows a significant slowing of the growth of the city's sky brightness. The change is especially dramatic at the wavelength emitted by mercury vapor lamps, one of the chief kinds of outdoor lighting. The lines of mercury vapor wavelengths from street lights can show up in the spectrograms of celestial objects, impairing and sometimes falsifying their interpretation. Kitt Peak National Observatory astronomer A. A. Hoag will report details of the follow-up in a forthcoming issue of *PUBLICATIONS OF THE ASTRONOMICAL SOCIETY OF THE PACIFIC*.

Tucson's ordinance requires that new outdoor lighting must be directed only



Brightness leveling off: Astronomy's gain.

where it is useful and it must be filtered to limit the color output to the range useful to the eye. Use of advertising and recreational lighting is curtailed between midnight and sunrise. Success of the Tucson ordinance has led to adoption of similar ordinances in other observatory centers. They are Pima County (which surrounds Tucson and includes suburbs not within the city's corporate limits), Coconino County, Ariz. (which surrounds Flagstaff), Hawaii County, Hawaii (the big island where observatories are located and being built), and Richland, Wash. If the trend spreads, perhaps not only astronomers but also ordinary citizens will be helped to a clear view of the night sky, which is now almost invisible from urban areas. □