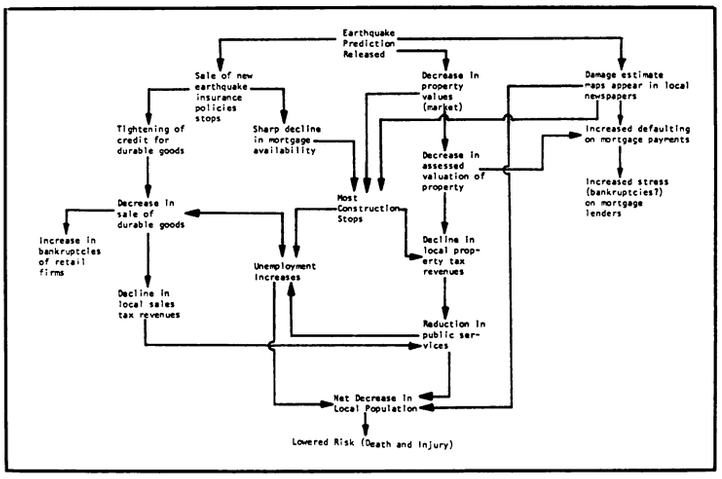
Taking quake prediction seriously

A severe tremor—magnitude 5.5 to 6.5 on the Richter scale—has been predicted for southern California's San Fernando Valley region within the next year (SN: 5/1/76, p. 277). Such a prediction raises questions, and one of the most important has to do with the wisdom of making a prediction in the first place. Foreknowledge of a localized disaster might, for instance, have severe social and economic effects equalling or even outweighing those of the predicted disaster. Now that a prediction has been made (although the seismologist, James H. Whitcomb of the California Institute of Technology, considers it not a prediction but "a test of an as yet unproven theory"), researchers have a chance to evaluate its social and economic effects. So far, the worst has yet to happen.

At the meeting of the American Association for the Advancement of Science in February, sociologist J. Eugene Haas and his colleagues Dennis S. Mileti and Julia Mewes of the University of Colorado outlined the possible consequences of an earthquake prediction for a local community (see chart). One week after the initial press coverage (which was heavy) of the April 20 Whitcomb prediction, Haas went to California to conduct an informal survey. He contacted real estate people, property assessors and insurance agents in an attempt to see if anything unusual had happened. The only clear action Haas found was a sharp increase in both inquiries about and actual purchases of earthquake insurance. Four of the major companies had already stopped selling such insurance. In addition, one major lending institution had suddenly stopped providing mortgage money for one area near San Fernando. But, Haas says, "It was not clear whether this was related to the earthquake prediction or not."



Some identifiable, slow-developing social and economic impacts at the local level from a prediction of a 7.3 earthquake.

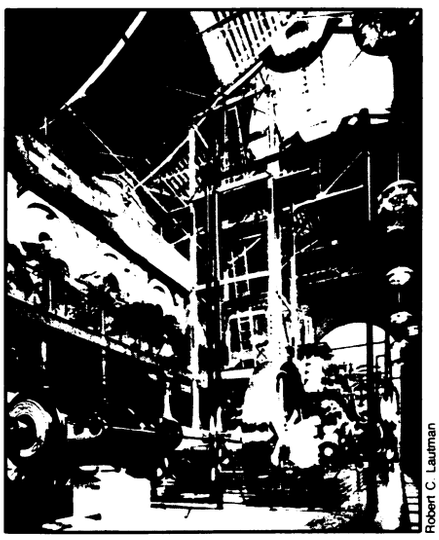
One possible reason for the less than dramatic response to the quake prediction may be that residents held off making any moves until California's Earthquake Prediction Evaluation Council had its say. The council, made up of some of the most prominent and experienced seismologists, has since met to examine Whitcomb's data, method of collection and theory. They found (although not unanimously) that the data were not clear enough to conclude that there is any increased probability of an earthquake. Nevertheless, the data were sufficiently suggestive for the council to decide that the area in question should be designated for intensive study. If such a designation is made, funds, personnel and instruments will be diverted from other areas and concentrated on the San Fernando Valley.

Meanwhile, the White House has responded to the increasing probability of precise prediction by directing the National Science Foundation and the U.S. Geological Survey to come up with an accelerated program in the next three years to examine what ought to be done with earthquake predictions. A task force of special advisers, including Haas, will examine this program.

Obviously the question is no longer: Should predictions be made? "What we need now," says Haas, "is to learn how to use earthquake prediction for the greatest social good." And this area, he says, "is one that is developing very rapidly, or at a very minimum, it is starting to get greatly increased attention and expressions of concern." □

Centennial exhibit marks Bicentennial


Smithsonian Institution


Robert C. Lautman

"1876: A Centennial Exhibition" opened in Washington this month and is brimming with the sights and sounds of Victoriana. The Philadelphia Exposition, left, as recreated, reflects an America deep into the Industrial Revolution and frankly fascinated with its own ingenuity. Housed in the newly restored Arts and Industries Building of the Smithsonian Institution (right) is an acre and a half of century old machinery meticulously brought back to life, furniture, glass and ceramics, tools and inventions of a people that could no longer be kept, ". . . down on the farm." □

Zapping tumors with heat

Slowly but surely the armamentarium of effective cancer therapies is expanding. First there was surgery, then X-rays, followed by chemotherapy and immunotherapy. And now heat is looking promising as a form of treatment. Heat can kill tumors without damaging healthy tissue, Harry H. LeVeen and colleagues of the Veterans Administration Hospital in Brooklyn, N.Y., have found.

The idea of using heat against cancer has been around for several years. Back in 1967, researchers reported that heated perfused blood led to striking tumor regression in 15 out of 22 patients with sarcomas and melanomas. In 1970, other investigators found that heat could kill leukemia cells. In 1974, still another group reported that heated perfused blood led to

tumor regression in 26 out of 32 patients with bladder cancer, with complete tumor regression in 4 of the patients. That year still another team described how heat led to cancer regression in 25 out of 38 patients with a variety of advanced cancers.

None of these techniques was designed to spare healthy tissues from heat treatments, however. LeVeen and his team set out to do so. Past research had told them that there is a reduced blood flow to tumors compared to that of healthy tissues. They measured blood flow through surgically excised malignant and healthy tissues to try to confirm these results. They were confirmed. Tumor blood flow, they found, was only 2 to 15 percent that of healthy tissues. The larger the tumor, the greater was the reduction of blood flow to it. Blood flow through body tissue acts like a radiator, with greater cooling occurring when the flow is rapid. So they theorized that if heat were applied to tumors in strategic amounts, the slow blood flow to tumors would make them absorb enough heat to self-destruct, whereas healthy tissues would be spared because of their faster blood flow.

They tested their hypothesis, first in animals, then in patients. When they used radio-frequency radiation to raise the temperature of tumors in mice and rabbits 7° to 9°C above that of surrounding tissue, the tumors were rapidly and completely killed, and surrounding tissue was minimally destroyed. When they used radio-frequency radiation to raise the temperature of tumors in 21 patients, 8° to 10°C above surrounding tissues, all of the patients experienced tumor death or at least cancer regression accompanied by symptomatic improvement. So their hypothesis was found to be correct.

"The demonstration of a sizeable reduction in tumor blood flow offers an explanation for the observed success of radio-frequency therapy," they conclude in the May 17 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION. The interplay between the blood supply of the tumor and heat therapy, they say, escaped the attention of past investigators who ascribed the benefits of heat to changes in cell metabolism or to altered sensitivity to drugs.

In an editorial in the same issue of JAMA, Joan M. Bull and Paul B. Chretien, physicians at the National Cancer Institute, call the results "exciting." The Brooklyn researchers' technique, they believe, has a simplicity and selectivity of action that may hold more clinical potential than do heat therapies tried in the past. They caution, however, that the results need to be confirmed by other researchers, especially in controlled clinical trials. The value of using the technique along with X-rays and drugs, they assert, also needs exploration in view of increasing evidence that multimodal therapies are more effective than single ones (SN: 1/11/75, p. 26). □

Beachballs to the space-shuttle rescue

Curling up inside a beachball, zipping it closed over your head and being carried off like a suitcase hardly seems like an exercise in the latest space-age technology, but in fact it is just that: a rescue system for the crews of the space shuttle.

Hard-pressed for elbow room in the shuttle's crew-carrying orbiter section, engineers at the National Aeronautics and Space Administration's Johnson Space Center in Houston have developed the beachball, called the "personal rescue enclosure," as a compact escape system to replace bulky spacesuits in case the orbiter becomes disabled or a crew member is injured. With as many as five shuttle vehicles planned and a mission schedule that NASA hopes will reach 60 flights a year in the 1980s, rescue becomes a matter of sending up a second vehicle, loading most of the crew into the beachballs and letting the two space-suited crew members (the pilot and mission specialist) run the transfer operation.

The beachballs are nothing if not cramped. The user must step through the zippered opening, tuck into a near-fetal position (see cutaway photo, bottom right) and close himself into a sphere only 34 inches in diameter, broken only by a single, tiny, plastic porthole. Someone outside the beach ball plugs the sealed container into the shuttle's oxygen supply while transfer preparations are being completed. When the shuttle supply is disconnected, the beachball occupant has an hour of oxygen left in an oxygen-mask-style respirator that is in the minuscule space with him, presumably plenty of time to be carried across to the waiting rescue craft.

There are three ways of making the trip now being studied by NASA engineers: suitcase, clothesline and claw. As a suitcase, the rescuee is simply carried across by a suited comrade. In the clothesline method, the beachball would be hauled across on a line strung between the two shuttlecraft, like a boatswain's-chair transfer from one seagoing ship to another. The claw is the remote manipulator arm in the cargo bay of each shuttle orbiter; a crewman in the rescue vehicle would use it to reach across the intervening space, pick up the beachball and draw it in to safety. Alternatively, the distressed ship could use its own claw.

The spacesuits, too, will be brand new designs, though only two or three of as many as seven people on board will be wearing them. Instead of the costly, custom-fitted versions worn by previous astronauts, they will come in small, medium and large, suitable for men or women. Elbow, knee and other joints will be made from a fabric called Kevlar instead of the former molded rubber joints with cables. The beachball will be made of a Kevlar-urethane sandwich with an outer layer of thermal insulation. □