Quake prediction 'on verge of reality;' geophysicists seek other links

"Earthquake prediction, an old and elusive goal of seismologists and astrologers alike, appears to be on the verge of practical reality." This was the report of three researchers from Columbia University's Lamont-Doherty Geological Observatory, and at the multitudinous annual meeting of the American Geophysical Union in Washington this week, predictions and correlations are, in large measure, the name of the game.

New understanding of the convoluted relationships that link the physical characteristics of the earth (and other worlds) is the goal of the AGU's members, who run the professional gamut from meteorology to volcanology, from oceanography to astrophysics.

Often the connections they find are strange indeed, as in the case of two University of Hawaii scientists who have found that the upper atmosphere may offer advance warnings about tidal waves, or tsunami. The tremors that can produce tsunami also generate vertically polarized waves in the earth called Rayleigh waves. These vibrations pass on to the air and move upward through the ionosphere, where, according to Kazutoshi Najita and Paul Yuen, they can be detected by the ionosphere's corresponding effect on radio waves.

Another investigator theorizes a connection, in the eastern United States at least, between quake-prone areas and low surface elevations. "Either the crust is weaker and breaks more easily where it is thinner," says Benjamin F. Howell Jr. of Pennsylvania State University, "or it erodes more easily where it has been broken in the past, and the low places mark these weaknesses."

The Lamont-Doherty team—Christopher H. Scholz, Lynn R. Sykes and Yash Pal Aggarwal—believe that quake conditions can begin when subterranean rocks crack, releasing the pressure which has been delaying the quake by holding the region stable. As water from adjacent regions seeps in, the pressure rises again until it triggers a quake within the now-fragmented rock. The build-up to a quake has detectable symptoms, however, which could be the key to prediction: small uplifts on the surface, changes in electrical conductivity as the water flows in, increased emission of radioactive radon gas and a decrease in small tremors as the water lubricates the rocks while the pressure is building. All these symptoms have been observed preceding at least 30 quakes in Japan, the Soviet Union and the United States.

Several AGU attendees also discussed the work of a colleague, not reporting at the meeting, who reportedly found such a strong correlation between local increases in the earth's magnetic field and subsequent tremors around California's San Andreas Fault that he took several months for additional observations to make sure.

Not all such connections, of course, are studied with natural disasters in mind, although those links, too, may be present. Perhaps the broadest theory was one presented by Moody L. Coffman of Central State University in Oklahoma, relating changes in the earth's main magnetic field not only to earthquakes, but to volcanic eruptions, tidal motions and continental drift.

Practical or theoretical, the work of the predictors and correlators points to a unified picture of earth.

such a move was being considered, NIH officials avoided any possible controversy and made a final decision. At a demonstration by Roman Catholic schoolgirls an NIH spokesman stated: "We know of no circumstances at present or in the forseeable future which would justify NIH support of research on live aborted human fetuses." The unofficial statement is expected to become policy. This position will not affect private research but because of the pervasiveness of NIH funding, it is expected that all such experimentation in the United States will be discontinued.

Those who favor research on live human fetuses argue that an aborted fetus is like a removed organ. The mother's decision or whatever caused the abortion, they say, has already doomed the undeveloped child. In such instances it seems more acceptable to these researchers to use the fetus for valid research than to dispose of it. During the few hours the fetus might live, for instance, the effects of drugs and other environmental agents can be seen in the entire organism rather than in cell cultures or single organs. Such work, researchers hope, will eventually clarify the dangers or benefits to the fetus of drugs taken by the mother during various stages of pregnancy. With the new NIH position, however, such research will have to be done out of the country and without NIH funds. □

Don't go near the (drinking) water

If air pollutants don't suffocate you or food additives poison you, drinking water laced with a little arsenic or cadmium may well do the trick. This was some of the less encouraging news to emerge from last week's meeting of the American Chemical Society in Dallas.

Various investigators have noted strong correlations between soft water and heart disease (SN: 2/10/73, p. 89). There is fairly strong evidence that lithium, and perhaps also vanadium, barium and strontium in soft water are the hazardous chemicals, Julian B. Andelman of the University of Pittsburgh reports. Harold W. Wolf of the Water Reclamation Research Center in Dallas has found that deaths from heart disease increased when salt water, high in sodium, was processed into drinking water. Sodium has long been implicated in heart disease. Walter J. Weber of the University of Michigan has found that soft water is more apt to contain cadmium than is hard water. Because cadmium accumulates in biological tissues and may replace zinc in certain proteins, its presence in the human body is probably undesirable. But there is no specific evidence that cadmium is implicated in heart disease.

Clinical and epidemiological studies in several locations throughout the world have shown adverse health effects from arsenic in drinking water, Gordon Robeck of the Environmental Protection Agency in Cincinnati points out. In Taiwan people who use well water rich in arsenic develop hyperpigmentation and eventually skin cancer. Well water on a Nevada ranch that was high in arsenic content caused skin conditions in one child and possibly in another. Wolf has noted a "striking" correlation between the presence of heavy chemicals in water basins throughout the United States and the incidence of bladder cancer. This is one kind of cancer scientists are sure is triggered by environmental chemicals.

On the whole, investigators are far from certain what effects chemicals in drinking water have on health. The health effects themselves are difficult to determine, and the chemicals in drinking water are ever-changing. As Andelman stresses, chemicals put into drinking water at the time of treatment, such as chlorine and aluminum, often dissipate by the time they reach the tap. On the other hand, water may pick up new chemicals, such as cadmium, copper, nickel and lead, after it leaves the treatment plant. Water from treatment systems near each other may differ in chemical content. Water processed from the Allegheny and Mo-