antigen. Because the same class of tumor viruses was implicated in human as well as in animal leukemia, the researchers hoped that the antigen and antiserum might eventually be used to vaccinate and treat people against leukemia (SN: 10/25/75, p. 261).

Since then, this hope has been tempered by two disappointments. One, the investigators have found that they could never harvest enough of the antigen for large-scale clinical vaccination purposes. For another, they are reluctant to try the antiserum on leukemia patients until an antigen cross-reactive with the mouse leukemia virus antigen has been found in such patients. Otherwise, the antiserum might enhance rather than suppress the cancer process. Although a number of scientists have been probing for such a cross-reactive antigen, it has still not been found.

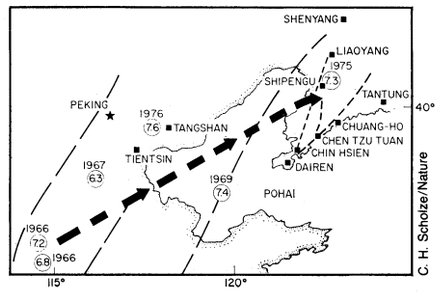
However, leukemia antiserum may yet help leukemia patients and possibly even patients with solid tumors known as sarcomas. Meanwhile, more valuable insights are emerging about viral-caused cancers and how to cope with them.

In a recent set of experiments conducted by Schäfer, Bolognesi, de Noronha and Raymond Baggs of Cornell University, soon to be published, the mouse leukemia antiserum has been found to block leukemia virus infection in cats once it gets started. It may also actually cure (permanently suppress) leukemia in cats—those results are not yet available because feline viral leukemia develops slowly. These findings further suggest that the mouse antiserum is cross-species effective and that if it successfully treats leukemia in cats, it might be able to do so in humans as well. Of course, if an antigen cross-reactive with the mouse leukemia antigen is ever discovered in leukemia patients, antiserum could probably be made just as easily against it for treatment purposes.

The other experiments conducted by Schäfer, Bolognesi, de Noronha and Baggs, just reported in the May 5 NATURE, show that leukemia antiserum can successfully fight not only leukemia but also sarcomas. They injected cat sarcoma virus into 24 kittens. Eleven of the kittens did not receive any viral antiserum; all died. Eight got feline leukemia viral antiserum right after they were infected; none developed cancer. Five of the infected kittens were given mouse leukemia antiserum; three got cancer, two survived.

"It is certainly remarkable," the researchers conclude, "that by simple application of antibody, it is possible to achieve such a striking effect on a solid tumor without any obvious detriment to the host." Also interesting is the modest but nonetheless real effect of mouse antiserum in another species—the cat—in fighting sarcomas. Whether leukemia antiserum, mouse, cat or otherwise, might be able to help human sarcoma victims, of course, is even more on the horizon than its value for leukemia patients. □

Did a moving ripple cause China quake?



Path of the proposed deformation front.

The successfully predicted 1975 Haicheng earthquake in China may have been triggered by a deformation front that propagated 1,000 kilometers through northeastern China at a velocity of about 110 kilometers a year. This proposed deformation front could explain the various phenomena that were used to predict the quake, suggests geophysicist Christopher H. Scholz of the Lamont-Doherty Geological Observatory in the May 12 NATURE.

The magnitude 7.3 event was the first major earthquake to have been successfully predicted. The prediction is considered to have saved thousands of lives, and there has been intense geophysical interest in China earthquake prediction and particularly the events that have ever since surrounded the Haicheng quake.

The Chinese used observations of a variety of different phenonema to make their prediction. Scholz's proposed deformation front supplies a physical interpretation connecting the phenomena used to make the prediction and the occurrence of the earthquake.

Among the most interesting of the phenomena was the observed northeasterly migration of a series of large earthquakes beginning with two in 1966 and culminating with a magnitude 7.4 event in the Pohai Gulf in 1969. That this migration to the northeast occurred is beyond doubt. What is important, says Scholz, is whether there is some causative process responsible for the migration that helped lead to the ability to predict the Haicheng quake. He believes there is—a migrating source of stress of presumably deep-seated origin. If one assumes a deformation front propagated through China along a northeasterly path at 110 kilometers a year (see map) all sorts of observed events used in the prediction can be explained. Among these are the migration of major earthquakes, the increased seismicity in Liaoning Province in 1973, the successive onset of three tilt anomalies at Chin Hsien, Shipengu and Shenyang, the triggering of a swarm of quakes at Liaoyang in mid-December 1974, and then the Haicheng quake.

Scholz calls his deformation front proposal "a plausible hypothesis" for connecting these diverse phenomena, the success of the prediction being the strongest argument for this plausibility. In venturing this hypothesis, "I have proposed the existence of a previously unknown phenomenon, the underlying mechanism of which is not understood."

He suggests that migrations of large earthquakes, commonly at velocities between 80 and 270 kilometers a year, may be caused by propagating deformation fronts. "If this phenomenon is common, it may prove a powerful tool for earthquake prediction." □

Free-flying birds and geomagnetism

Do birds use the earth's magnetic field in navigation? Most of the evidence that birds extract directional information from the geomagnetic field comes primarily from controlled cage experiments and from homing experiments with pigeons.

Now a Clemson University zoologist, Frank R. Moore, reports what he says is, "to my knowledge, the first direct visual evidence that the orientation of free-flying nocturnal migrants is affected by natural fluctuations in the geomagnetic field."

The direct visual observations of migrating birds aloft were carried out by S. A. Gauthreaux Jr. over a six-year period during the spring and fall months in the southeastern United States. The main technique was to record the movement and number of migrants passing through vertically directed beams of light. This information is then compared with data on fluctuations of earth's magnetic field.

Moore finds that in both the spring and fall, the accuracy of migratory birds' orientations deteriorated with increasing disturbance to the earth's magnetic field. The more intense the geomagnetic disturbance, the greater the spread or variation in the birds' paths.

In the spring, the vertical component of the magnetic field was found to be the important variable. In the fall, the horizontal component was the important variable. Fluctuations in the declination of the magnetic field seemed to have no effect regardless of season.

"The evidence lends additional credence to the view that birds respond to magnetic stimuli and suggests that the orientation of free-flying migrants is influenced by fluctuations in the geomagnetic field," Moore concludes in the May 6 SCIENCE. But whether the magnetic disturbances act directly or indirectly on the birds' orientation system—through some other, unidentified, intervening variable perhaps—is not clear. Nevertheless, says Moore, "a strong correlation between the orientation of free-flying birds and geomagnetism has been demonstrated." □