Signs of superconductivity at a 'warm' 60 degrees K.

The search for high-temperature superconductivity continues despite repeated failure and the pessimistic attitude of certain experts in the field. Superconductivity is the total loss of electrical resistance that occurs in some metals and alloys at very low temperatures. Flow of electricity without resistance would be (and in some cases already is) technologically useful, but the phenomenon has not yet been observed in any substance at temperatures above 21 degrees K.

Now there is a glimmer of a hope for temperatures substantially above that. It appears in the work of a group at the University of Pennsylvania, Alan J. Heeger, Anthony F. Garito and associates, and was reported at last week's meeting of the American Physical Society in San Diego.

The Pennsylvania group has found superconducting fluctuations, changes in conductivity that are usually precursors of a stable superconducting state in an organic salt with the jawbreaking name dimethyltetrathiofulvalene-tetracyanoquinodimethan or (ATTF)(TCNQ). Fluctuations tend to occur in known superconductors at temperatures slightly above the point at which superconductivity sets in. In (ATTF)(TCNQ) the fluctuations appear at 60 degrees K.

So far, however, the experimenters have not been able to induce a stable superconducting state. At the temperature where one would expect the onset of stable superconductivity, 50 degrees K., (ATTF)(TCNQ) undergoes a crystalline phase change that renders it an insulator.

This does not mean the loss of all hope. The Pennsylvania group hopes to achieve stable superconductivity by "fine tuning" the structure of the material, a process that Heeger calls "creative organic chemistry." This consists of altering the structure by replacing certain atoms or groups of atoms with other atoms or groups.

If it works, it could open a new field for the interplay of solid-state physics and organic chemistry. It could enable scientists to build into synthetic organic molecules the features required for stable superconductivity, just as the features necessary for certain desirable properties are now built into synthetic fibers such as nylon.

If it works at 50 degrees or in that neighborhood, it could open up new superconducting technology since the engineering requirements for refrigeration are far easier in that range than they are below 20 degrees. □

Government scientists venture a quake prediction

On March 22, Earl Holt, the mayor of tiny (8,500 pop.) Hollister, Calif., issued a unique warning to his constituents, advising "those that have a good bourbon to put it in a safe place." Despite his composure, the mayor was reacting to a historic announcement—the first official Government earthquake prediction. Scientists of the U.S. Geological Survey had predicted that a "moderate" quake of magnitude 4.5 (Richter) would hit the region, a hundred miles southeast of San Francisco, within the next several months.

Hollister lies near a particularly active region of the San Andreas Fault, where four moderate quakes, ranging from 4.0 to 5.0 on the Richter scale, have occurred within the last 15 months, so that citizens of the primarily agricultural region were hardly surprised at the prospect of another quake soon. Still, the USGS announcement represents an important further step in understanding the fundamental processes that lead to quakes.

In making the announcement, while preparing for formal presentation of their data before the April meeting of the American Geophysical Union, geologists Robert Wesson and William Ellsworth cite a swarm of "microquakes" now occurring near Hollister as the tip-off for the predicted quake. Microquakes are imperceptible tremors, with magnitudes as small as 0.5, that may occur by the thousands just before a moderate quake. Wesson and Ellsworth also found that the four preceding quakes had released tension at both ends of a 12-mile section of the fault, leaving the center portion still under some strain, which led them to predict this as the site of the next quake.

The announcement also represents something of a "trial balloon," Wesson told SCIENCE NEWS. Since previous predictions have usually come from a variety of "seers," Wesson says the USGS hopes to establish a rapport with the media and the public concerning scientific earthquake predictions. If their openness on work in progress can help establish credibility, Wesson says, "the public may be more receptive to more important predictions in the future."

Robert Stevens, regional director of the Office of Emergency Preparedness (OEP), agrees. "We will be very interested to see what the public's reaction is," he says. OEP was given an advance copy of Wesson and Ellsworth's papers in order to decide what action should be taken. Because of the relatively low intensity of the predicted quake, the remoteness of Hollister and developing state of the art, Stevens said, OEP decided to take no overt action, but to study the effects of the prediction and the quake on people involved.

The California Governor's Earthquake Council has also discussed the prediction.

Understanding the mechanism by which different segments of a fault release energy and the reactions of people to earthquake predictions is vitally important in preparing for great quakes that are sure to come. Donald Tocher, director of the Earthquake Mechanism Laboratory of the National Oceanic and Atmospheric Administration, has noted that a period of moderate quakes on the San Andreas Fault appears to precede a great quake and, he says, "It is clear to me that we're well into a period of this moderate activity." Moderate quakes south of San Francisco, such as the one predicted at Hollister, he says, probably build up strain in the "locked" portions of the fault farther north. Such locked segments are the origin of major quakes like that of 1906.

A surprising ban for St. George's seals

About 300 miles southwest of the Alaskan mainland are the Pribilof Islands, controlled by the United States since 1867 and noted for their thriving rookeries of valuable fur seals. Japan has long maintained—and still does—that the seals are a major detriment to its commercial fishing grounds, reducing the catches by eating the fish and damaging the nets. In 1911, a treaty was signed by the United States, Japan, Canada and the Soviet Union abolishing sealing from the open ocean above 30 degrees north latitude and reaffirming U.S. control of sealing on the Pribilofs, but providing Japan and Canada with 15 percent each of the islands' harvests. (The same percentages go to Japan and Canada from Russia's Komandorskiye Islands.)

In 1941, with the coming of World War II, Japan effectively dissolved the treaty by withdrawing from it, citing the effects on fishing as the reason, and the pact was not reformed until the four nations signed an interim agreement in 1957. Japan, however, has continued to be a reluctant member.

For this reason, U.S. officials were less than optimistic early this month when they set out for two weeks of negotiations in Japan about a proposal