

did not become available until 1972, and in 1973 the new NCI Cancer Control Program began its first year of operations designed to speed the application of the latest research results for the benefit of people. The full impact of this . . . program will not be felt for several years because it takes time to get the latest diagnostic and treatment methods into community practice where they may be applied for the benefit of all patients. . . ."

Whether the NCI rebuttals against Greenberg's indictment are sound or not, they still haven't discounted one service that Greenberg has performed for the American public. And that is to remind the NCI, Congress and the President that Americans expect some payoff from the program they've pledged billions of dollars to, and preferably in lives saved. □

## Supercold metals: Theory askew

Relationships in solid-state physics are so complex that their description tends at first to be—and often for a long time to remain—empirical. Experiment determines a connection and gives a rule for extrapolating it. It may be years before theory comes along and explains what brings the connection about.

An example is the relation between superconducting transition temperature and high pressures. Studies of this phenomenon in aluminum by D. U. Gubser and A. W. Webb of the Naval Research Laboratory in Washington (reported in the July 14 *PHYSICAL REVIEW LETTERS*) indicate that it follows an extrapolation rule that theory is yet inadequate to explain.

The transition temperature is the point below which the metal loses all electrical resistance. According to the most widely accepted theory, this superconducting state results from an interaction between the conduction electrons and vibrations of the crystal lattice called phonons that permits the electrons, which would normally repel each other, to form pairs. These pairs are able to constitute currents that proceed without resistance.

The transition temperature varies with pressure and the change in volume induced by pressure. At zero pressure that temperature for aluminum is 1.18 degrees K. By the time the pressure has reached 62 kilobars, the transition temperature has dropped to 0.075 degrees K. Gubser and Webb find that the change proceeds in accordance with an empirical formula suggested from low-pressure data by T. F. Smith and C. W. Chu that simply makes the change in transition temperature proportional to change in volume. But theory does not yield the Smith-Chu formula so this confirmation of the formula at high pressures seems to indicate that something in the theory has to give. □

## Geologists warn officials on resources

When top Administration officials met with several dozen of the country's leading geologists and geophysicists at a special White House seminar earlier this week, the warning they received was uncompromising: Estimates of the nation's petroleum resources keep plunging like the economy, shortages of other materials may prove even more critical, the current data base for making such estimates is woefully inadequate, and basic research to increase the data base is dwindling.

The meeting was organized by the American Geological Institute, representing 18 professional societies of earth scientists, and the AGI used the occasion to take the unusual step of endorsing the latest set of petroleum resource estimates compiled by the U.S. Geological Survey. Past estimates have come under increasing criticism for not taking into account declining discovery rates as new oil fields become harder to find (SN: 4/27/75, p. 277). The latest "best estimate" of total reserves and recoverable resources is 144 billion barrels of oil and 923 trillion cubic feet of gas—both figures down nearly a factor of three from previous estimates and coming very close to those predicted by leading USGS critic M. King Hubbert.

Betty Miller, the primary author of the latest USGS study, told *SCIENCE NEWS* that the revised figures do not represent a shift to the Hubbert view that declining discovery rates should be considered, nor do they take into account possible technological or economic changes that would make presently unrecoverable resources more attractive. The estimates represent "just the geology," she said.

Although the AGI calls the USGS estimates "the most accurate to date," Kenneth Crandall of the American Association of Petroleum Geologists (AAPG) said that "inferred" petroleum deposits may raise the oil resources figure to 209 billion barrels and that technological and economic changes might add another 25 percent. AAPG President John E. Kilkenny said that already higher prices have made profitable some small oil fields that would not have been commercially viable a few years ago.

Pending shortages of various minerals may soon cause "even greater crises for American technology" than the fuel shortages have, two of the earth scientists told the meeting. The main reason these shortages haven't shown up yet is that the current economic slump has temporarily slowed industrial growth, warns James Boyd, former director of the U.S. Bureau of Mines. Ernest Ohle of the Hanna Mining Co. adds that the United States "has no chance of becoming mineral self-sufficient," and he urges a new, concentrated effort in metallurgical research to find substitute materials and improve mining.

But current research efforts may not be keeping pace. Caltech professor Clarence

R. Allen, a past-president of the Geological Society of America, warned the Administration that cuts in graduate student fellowship programs have severely affected the supply of new earth scientists and that the "decreasing research capabilities of the universities as compared to that of the Federal agencies [is] a worrisome trend." Hatten S. Yoder Jr., director of the Carnegie Institution of Washington's Geophysical Laboratory, adds that the fundamental principles of how minerals are concentrated by natural forces into ores are not yet understood, nor are the basic methods of "prospecting for heat." Increased research in these two areas, he says, might open new avenues for locating heat centers for geothermal energy and make possible "chemical mining"—reversing natural processes to extract minerals using liquid chemicals without digging conventional mines.

Among the steps recommended for immediate action was the correlation of possible future costs of fuels and minerals to present expenditures in prospecting and research. If such an analysis were done today, concluded Kenneth Crandall, "we would find ourselves way behind in what we are spending." □

## Chinese predict quake?

Just before noon on Feb. 4, an earthquake measuring 7.4 on the Richter scale shook Liaoning Province, China, strongly enough to be felt 525 miles west in Peking. Ordinarily, this would not be a matter for discussion, since quakes are common in the area, but the Chinese claimed to have accurately predicted it—first a month in advance and then an hour and a half before it occurred. At the White House geologists' conference this week, *SCIENCE NEWS* asked a top expert for an evaluation: Clarence R. Allen, director of Caltech's Seismological Laboratory, who visited China in October.

Allen says evaluation of the Chinese claim is now the "most critical" priority in seismology. Though Chinese scientists do not have techniques more sophisticated than are used elsewhere, the very scale of the country's commitment to quake prediction may have produced a breakthrough. (High school students throughout the country help make measurements.) Four basic techniques are used: measurements of crustal strain, microquake activity, radon content of groundwater and animal hyperactivity.

Although most Western scientists remain skeptical and have so far been unable to obtain hard data on the prediction, Allen says, they take the claim very seriously and are trying to use the new avenues of communication to contact seismologists in China for further information. □