

Superconductive Barriers Surpassed

True breakthroughs are rare in science. But if recent work on superconducting materials at the University of Houston and the University of Alabama in Huntsville is confirmed, it may very well join that exclusive "breakthrough" club.

The research team, led by Houston's Paul C. W. Chu, has made a material that becomes superconducting at 98°K, or -283°F. This breaks the group's record of 52.5°K, set with another material just two months ago (SN: 1/10/87, p.23). Since superconductivity, or the loss of all electrical resistance, was discovered at temperatures around absolute zero in 1911, scientists have hoped to increase the temperature at which the phenomenon occurs so that it could be more readily used in practice.

The recent discovery is technologically important because it will enable scientists to use liquid nitrogen to get to

superconducting temperatures. At 77°K, liquid nitrogen is 10 times less expensive and 20 times more effective as a coolant than is the currently used coolant liquid helium, according to the National Science Foundation, which announced the find on Feb. 16.

With the new material, says Chu, a wide range of previously conceived applications becomes practical — including no-loss electric power lines, magnetically levitated trains, and very large magnets for medical magnetic resonance imaging. (Two weeks ago, a prototype "Maglev" train in Japan established a world record when it reached 400 miles per hour, according to the Feb. 12 NATURE.) At the moment, the material is too brittle to be made into wires, but Chu expects this problem to be overcome. If this is done soon, he says, the new material "will also surely have a great impact on the con-

struction of the [recently approved] Superconducting Super Collider" particle accelerator (see p. 119).

Chu's group had set its 52.5°K record by pressurizing a lanthanum copper oxide compound. In their most recent work, the researchers were able to mimic the effects of pressure by manipulating the chemical makeup and structure of the material. Chu says he cannot yet reveal the composition or structure of the new material, which is not lanthanum copper oxide, because a patent is pending. More information will become public, he says, when his group's papers are published in the March 2 PHYSICAL REVIEW LETTERS.

But even these papers may soon be outdated. Chu says his group has had a very preliminary indication that superconductivity may occur at 240°K. That number, says one scientist in the field, "just leaves me speechless." —S. Weisburd

Osteoporosis: Most answers yet to come

About 15 to 20 million people in the United States have osteoporosis, a loss of bone mass that can cause bones to shatter. But despite its prevalence, especially among postmenopausal women, a clear consensus on the causes, treatment and prevention of the bone disease has so far eluded the scientific community.

Some of the top osteoporosis researchers met last week at the National Institutes of Health to consider the current state of affairs. After hearing two days' worth of sometimes conflicting data, the discussion leaders concluded the following:

- Adequate calcium intake throughout life can slow or prevent age-related bone loss. However, the accelerated bone loss that occurs in women during the first decade or so after menopause cannot generally be reversed with calcium supplements alone.

- Postmenopausal women can reduce their bone loss with estrogen pills; calcium supplements used with estrogen can reduce the total amount of estrogen needed.

- The best detection methods — CAT scans and measurements of radiation absorption by bones — work well if performed carefully, but screening asymptomatic women is not cost-effective.

- There is strong evidence, primarily from studies of women, showing that being obese, being black and taking estrogen protect against osteoporosis, while advancing age, steroid use, lack of

exercise and premenopausal removal of ovaries predispose individuals to it. The evidence implicating alcohol, cigarette smoking and low calcium intake in the development of the disease and heavy exercise in its prevention is moderately strong.

While not a consensus conference — a formal gathering organized by NIH to make decisions on controversial medical issues — the meeting last week reflected the most current medical research on osteoporosis. It echoed in part the findings of a 1984 consensus conference (SN: 4/14/84, p.238), though this time the researchers put more emphasis on estrogen as a preventive and less emphasis on calcium as a panacea.

Many questions, the conference participants repeatedly observed, remain unanswered. Conferees agreed that while most adults should and can eat a diet that gives them 1,000 milligrams of calcium a day (200 mg more than the National Academy of Sciences' recommendation), some people will benefit from additional calcium. "The problem is to determine who will and who won't," says conference co-chair William A. Peck of Washington University in St. Louis. Some studies have even shown that extra calcium can't reduce postmenopausal bone loss. The data on exercise are also contradictory. And there is currently no treatment for established osteoporosis, though Peck suggests one may emerge from basic research into bone growth factors.

— J. Silberner

'Major step' on the stairway to orbit

Less than three months after the Jan. 28, 1986, explosion of the space shuttle Challenger, there began a bizarre, six-week period that included the launch failures of three different major types of conventional, unmanned rockets, due to as many different malfunctions. First came an Air Force Titan 34D, most powerful member of the U.S. military space fleet, followed by a NASA Delta rocket and finally by European Ariane. Of the lot, only the Delta is so far back on track.

Last week, however, another member of the grounded group took a partial step toward recovery.

The Titan 34D consists of a two-stage, liquid-fueled main booster with a pair of solid-propellant "strap-ons," similar to those that have been linked with the Challenger disaster. On Aug. 28, 1985, a 34D failed due to problems with the liquid-fuel portion, destroying its classified payload. The next attempt was made last April 18, with the difficulties presumably under control, but that time it was the strap-ons that failed, only seconds after liftoff, with the same costly result. The 34D's liquid-fueled "heart," in other words, had yet to be re-proven.

On Feb. 11, the Air Force did just that, launching a classified payload this time with a less powerful rocket called a Titan 3B — essentially the core of a 34D but without the strap-ons. Secretary of the Air Force Edward C. Aldridge Jr. called the event "the first major step in the recovery of the space program," no doubt joining the Pentagon's collective sigh of

relief at being able to continue launching a variety of photographic and electronic-monitoring reconnaissance satellites.

The solid-fuel strap-ons, meanwhile, are undergoing an extensive testing program to confirm that the cause of last year's mishap — the peeling of insulation inside the rockets, different from the leaky seals (still being redesigned) cited in the shuttle's case — is under control before the 34D goes back into service.

— J. Eberhart

DOD is asked to aid semiconductor firms

Historically, the United States has been the world technological leader in advanced semiconductors. In recent years, however, U.S. semiconductor manufacturers have been losing that lead. Their slowed growth and loss of sales, principally to the Japanese, have hurt not only their financial health, but also the vitality of their research enterprise — a trend that poses a large and growing threat to national security, according to a new Department of Defense (DOD) study.

Says Charles A. Fowler, chairman of the Defense Science Board, which prepared the report, the waning U.S. leadership in semiconductor technology is so serious "that at some time in the future [it] may be looked upon in retrospect as a turning point in the history of our nation."

To help U.S. semiconductor manufacturers regain leadership in chip manufacturing and maintain leadership in chip design, the Defense Science Board recommends that DOD pump hundreds of millions of dollars more into semiconductor research, development and especially manufacturing.

The United States' ability to field technologically superior weapons has become increasingly "dependent upon superior electronics," says the report. DOD has relied upon this technological superiority in its weapons to counter the numerical advantage — in weapons and troops — of its adversaries. At this point, however, the most advanced defense systems — those about to be deployed — may contain "up to several tens of percent" of computer chips that were made, packaged or tested in foreign countries, the Defense Science Board finds.

As a result, the report concludes that "if steps are not now taken to assure the availability of domestic sources or stockpiles, or both, the United States could be denied timely access to these militarily critical devices in wartime or [be] forced to rely upon technologically and operationally inferior alternatives." Moreover, the report notes, when the source of superior chips is overseas, the United States has little ultimate control in preventing their acquisition by the Soviets. That acquisition could directly threaten

Deadly aftermath for Vietnam veterans

Vietnam combat veterans had a much higher death rate in the first five years out of the service than veterans who had served elsewhere in the same period, according to a study by scientists at the Centers for Disease Control (CDC) in Atlanta. Violent deaths, including automobile accidents, suicides, homicides and drug overdoses, accounted for most of the difference.

This pattern is similar to that found in World War II and Korean War combat veterans, say the investigators in the Feb. 13 *JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION*. Unlike veterans of the two prior wars, however, Vietnam combat survivors had a persistent elevation of drug-related deaths that continued through the end of the study in December 1983.

The researchers conclude that "the postservice excess of traumatic deaths among Vietnam veterans is probably due to unusual stresses endured while stationed in a hostile fire zone." But the data do not clarify whether specific factors, such as exposure to the herbicide Agent Orange, contracting infectious diseases in Vietnam, lack of support on returning home or suffering post-traumatic stress disorder, led to the increase in violent deaths.

The study compared postservice mortality rates of 9,324 Vietnam veterans with those of 8,989 veterans who served at the same time in Korea, West Germany and the United States. The Vietnam veterans had enlisted in infantry, armor, artillery or combat engineering units.

The researchers found a 45 percent higher death rate among Vietnam veterans in the five years after discharge. In addition, the Vietnam group had 72 percent more suicides, 93 percent more automobile fatalities and 69 percent more poisoning deaths, mostly from drug overdoses. By 1983, deaths among

Vietnam veterans remained 17 percent higher than deaths among the other veterans.

For the entire study period, Vietnam veterans had a markedly lower number of deaths due to heart or blood vessel diseases. The reason for this surprising finding, say the researchers, is unclear. Another recent study found a similarly elevated death rate from external causes among Australian Vietnam veterans in comparison with non-Vietnam veterans, but mortality from cardiovascular diseases was also much greater among the Vietnam group.

While the CDC study points to important mortality trends for Vietnam combat veterans, the reasons for the trends remain unclear, says psychologist Terence Keane of the Boston Veterans Administration Medical Center. "[The CDC researchers] would like to conclude that excess stress experienced during combat leads to excess mortality after the war, but they can't really do that," he asserts. "Did a peculiar virus in Vietnam or exposure to Agent Orange lead to behavior problems later on? Your guess is as good as mine."

Another possible factor in the elevated death rates, notes Keane, is post-traumatic stress disorder, a severe stress response that afflicts a substantial number of Vietnam veterans with heavy combat duty or participation in abusive violence (SN: 4/28/84, p.261). Only a prospective study could uncover links between this disorder and eventual death rates.

The Veterans Administration is conducting a nationwide study of Vietnam veterans' postwar adjustment, says Keane, including a close look at post-traumatic stress disorder and substance abuse. The project, which involves interviews and psychological testing of about 3,000 veterans, will be completed in October. — B. Bower

U.S. technological superiority in weaponry.

The board recommends that DOD establish a cooperative industry-DOD Semiconductor Manufacturing Technology Institute (Semitech). It would not only develop, demonstrate and advance the technology needed for efficient, high-production output of state-of-the-art devices, but also provide facilities to actually produce selected devices that DOD most needs. The board estimates that Semitech could be launched with about \$250 million from the industry and with DOD support of about \$200 million per year for five years.

The board also suggests that DOD spend \$50 million annually to set up eight centers of excellence in semiconductor

science and engineering at universities; increase its other investments in semiconductors by \$300 million a year, within four years; and set up a government-industry-university forum to assess how each sector might cooperate in meeting DOD's developing needs.

Both the Cupertino, Calif.-based Semiconductor Industries Association and the Semiconductor Research Corp., a 35-company research consortium headquartered in Research Triangle Park, N.C., have come out in favor of the report's general findings and recommendations. DOD's only reaction has been to say it "is currently reviewing the [report's] conclusions and its recommendations and investigating technical as well as funding alternatives." — J. Raloff