SCIENCE NEWS of the week

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 construction 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But even these papers may soon be outdated.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 reseach 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

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