

## First installation of floating personal transit



Otis Elevator Co.

*Artist's conception of automated personal rapid transit system in Nancy, France.*

The world's first installation of a fully automated, floating personal rapid transit (PRT) system has been scheduled for Nancy, France. Riding on a cushion of air and driven by a magnetic induction system containing no moving parts, a fleet of 24-passenger cars will whisk along a 14.4-mile network of guideways, responding to individual calls from 20 stations.

Such "horizontal elevator" concepts have been around for several years, but the \$80 million Nancy project will be the first large-scale, commercial use of PRT's. Transportation Technology, Inc.—an affiliate of the Otis Elevator Co.—will supply the vehicles; a French consortium will construct the guideways, scheduled for completion in four years.

Air suspension and lack of moving engine parts will minimize friction and thus make the system exceptionally swift and energy-efficient. Similar systems, using magnetic fields to suspend, as well as drive the cars, are also under investigation, but the air cushion system appears simpler and easier to install at present. Electricity for the air suspension blowers and driving magnets is brought into the cars from conductors imbedded in the guideway through a sliding power collector with soft low-friction brushes. Cars are suspended on a cushion of air only a fraction of an inch thick and the in-board magnets set up fields in metallic strips of the guideway to push the cars.

A short demonstration model of the system is in operation on the outskirts of Denver, Colo., which also expects to set up a full-scale PRT system. The

air suspension system allows cars to slide out of the guideway laterally into docking areas so that loading and transfer to other modes of urban transportation can take place without impeding traffic on the main guideway. Special-purpose computers route vehicles according to demand in much the same way the latest high-speed automatic elevators are controlled in response to varying patterns of calls. A fleet of 130 cars is scheduled for production for the Nancy installation. □

## Cyclic nucleotides affect cell growth and vision

A naturally occurring cyclic nucleotide was discovered in cells during the late 1950's. It was cyclic AMP. Another naturally occurring nucleotide was discovered close on its heels—cyclic GMP. During the 1960's and to the present, researchers throughout the world have been exploring the actions of these sister chemicals in cells. Sometimes the chemicals cooperate, sometimes they act independently, regulating a variety of functions—transcription of genes; the metabolism of proteins, sugars and fats; even the shapes of cells and the speeds of their movements. There is now increasing evidence that the cyclic nucleotides are important regulators in cell growth and vision.

During the past few years various investigators have found that GMP enhances cell growth. Evidence has also been building that cyclic AMP can turn cell growth off. For instance, Abraham W. Hsie and Theodore T. Puck of the

University of Colorado Medical Center reported in 1971 that if they added cyclic AMP to transformed fiberblast cells (a particular kind of cell made cancerous by cancer viruses), the cells stopped growing wildly and started to have the properties of normal cells. Hsie and Puck measured the levels of cyclic AMP in cancer cells and invariably found that they contained low levels of cyclic AMP. So it looked as if cancer cells were deficient in cyclic AMP. They then found that cancer cells are defective in a cell membrane enzyme called adenylyl cyclase, which is responsible for the synthesis of cyclic AMP in cells.

This work was rapidly confirmed by other investigators, notably by Ira Pastan and his team at the National Cancer Institute. Pastan and his colleagues now report in the latest PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES (December 1973, Part II) that normal cell growth in fiberblast cells also appears to be under the control of cyclic AMP. As these cells reach a stationary phase of growth, there is a dramatic cellular rise in the enzyme adenylyl cyclase, accompanied by an equally dramatic rise in cellular levels of cyclic AMP.

Some other researchers have noted similar cyclic AMP action in the normal growth of kinds of cells other than fiberblasts. So it looks as if rapid proliferation of normal cells is terminated by a rise in cyclic AMP, and that some cancer cells do not have this regulation.

But Wayne B. Anderson, one of Pastan's colleagues suggests caution. "It is hard at this point to say what is a cause and what is an effect relationship. Cyclic AMP may make cells slow their growth, or cyclic AMP levels may rise as a result of cells slowing their growth." Nonetheless, he and his co-workers believe that cyclic AMP probably helps regulate growth because giving cyclic AMP to cancer cells slows their wild growth and giving cyclic AMP to normal cells also slows their growth.

There has been ample evidence that the levels of cyclic AMP in cells are controlled by hormones outside cells (SN: 12/12/70, p. 450). The NCI investigators and others, however, have evidence that this is not so in the case of cyclic AMP's control over cell growth. In this case the regulators of cyclic AMP are probably within cells rather than without.

Increasing evidence is coming out of the laboratory of Mark W. Bitensky at Yale University School of Medicine that cyclic GMP regulates the sensitivity of photoreceptor cells in eyes to light. These cells, also known as rods and cones, capture light (photons) and turn it into vision.

Several years ago Bitensky and his colleagues found an enzyme in both

vertebrate and invertebrate photoreceptor cells whose activity is markedly altered by light. In fact, it appears to be the only enzyme in these cells that is so affected by light. The enzyme is phosphodiesterase. The Yale researchers suspected that the enzyme might be crucial in the regulation of photoreceptor cells.

Bitensky and co-workers Naomasa Miki, James J. Keirns, Frederick R. Marcus and Jenny Freeman now report

in the latest PNAS that when the phosphodiesterase enzyme in a photoreceptor cell is activated by light, cyclic GMP is dramatically destroyed in the cell. So a decrease in cyclic GMP may well be necessary if these cells are going to adapt to light and dark.

The Yale team has not yet been able to find a hormone that regulates cyclic GMP synthesis in photoreceptor cells. Like cyclic AMP, cyclic GMP is usually under control of hormones. □

## A superconducting accelerator planned

Physicists have long wanted to apply superconductivity to particle accelerators. Use of superconductors in the magnets that bend and focus the paths of the accelerated particles or in the radio-frequency waveguides that accelerate them could yield great savings in electric power and significant savings of space. Experiments in this direction have been going on for some time at a number of centers, but difficulties with the metallurgy of superconducting metals and with techniques for refrigerating large volumes to the temperatures near absolute zero where superconductivity occurs have made the work slow.

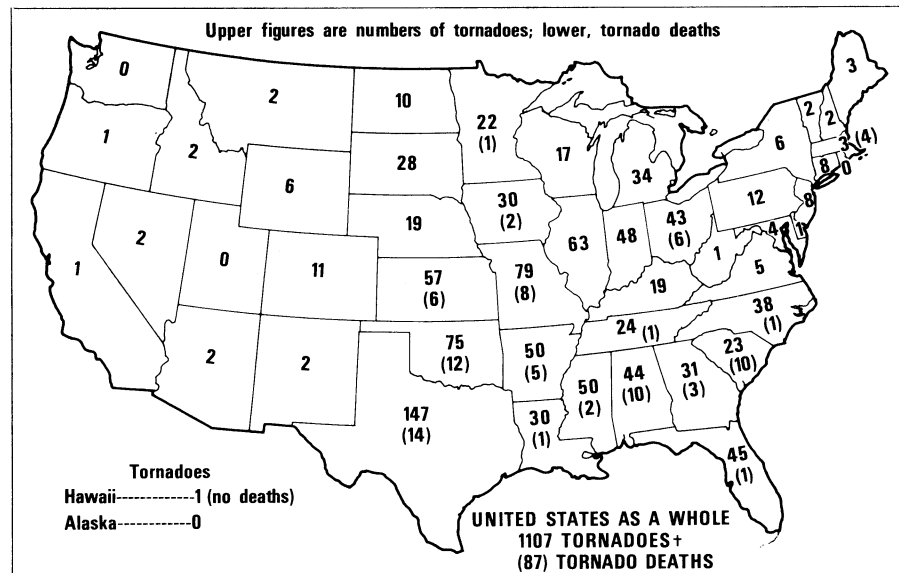
Now the Lawrence Berkeley Laboratory announces plans to build what will be the world's first accelerator with all superconducting magnets—if the laboratory gets the money and builds it in the two or three years contemplated. At the moment the money is promised in the fiscal 1975 Federal budget for the Atomic Energy Commission submitted to Congress this month. It remains to be seen whether Congress will approve.

Called ESCAR (Experimental Superconducting Accelerator Ring), the machine is looked upon as prototype and testing ground for techniques that will be applicable to much larger installations. ESCAR will be a ring 80 feet in diameter. It will have 56 superconducting magnets, each maintained at liquid-helium temperatures (4 degrees K.). It will be able to accelerate protons to energies of five billion electron volts, and will also act as a storage ring for them. In addition it may be used to accelerate heavy ions from the Super-HILAC, LBL's heavy-ion accelerator.

The new ring will be built alongside LBL's existing proton accelerator, the Bevatron, and will take advantage of already existing utilities that serve the Bevatron. The project will be directed by Tom Elioff and Glen Lambertson.

Other national laboratories are expected to collaborate in the venture. Application of superconductivity would greatly cut power costs and enable increases of energy in such contemplated projects as the proton-electron-positron storage ring now being discussed by LBL and the Stanford Linear Accelerator. Substitution of superconducting magnets for conventional ones could also increase energies of existing accelerators. Use of superconducting magnets was contemplated by the builders of the biggest present accelerators but it was decided that the still-experimental status of superconducting magnets made it too risky. □

## A record 1,107 tornadoes twisted across U.S. in '73



Meteorologists suspected even before 1973 was half gone that it would be the Year of the Tornado. By late September they had their record—930 (SN: 11/10/73, p. 294)—and the number kept climbing. The final total: a staggering 1,107 full-scale tornadoes, including record numbers in 11 states.

"The 1973 tornado season," according to the directors of the National Severe Storms Forecast Center, "can only be described by the liberal use of superlatives. It had the most, lasted the longest, involved more states and produced more 'super tornadoes' than any year since tornado records began."

Only four of the 50 states avoided the tumult of twisters completely: Alaska, Rhode Island, Utah and Washington. Others really felt the blitz. North Carolina, for example, which had seen no more than seven tornadoes in any one month for 58 years, had 32 in May. Indiana's twister tally rose more than 200 percent over its long-term average.

The national figures are just as humbling. "While admittedly the reporting networks are superior to those of years past," says the center's director, Allen Pearson, "the total of 94 tornadoes reported from May 26 to 28 equalled the number of tornadoes

reported during the entire year of 1931."

The toppers were a pair of monster storms among the most violent on record. On May 27, a single tornado thrashed its way across 135 miles of central Alabama. Then on Sept. 25, the day that the record was set, another one tore all the way from north-central Kansas into Nebraska, covering almost 160 miles. Property damage for the year is estimated at more than half a billion dollars.

Yet nature is not entirely unforgiving. While the twisters were tearing up the turf, the number of major earthquakes (and deaths therefrom) declined sharply, not just in the United States but around the world.

For years, there had been an average of 18 major earth shocks (those between 7.0 and 7.9 on the Richter scale) and one great shock (over 8.0) every 12 months. 1972 was particularly brutal, with quakes resulting in some 10,000 deaths.

Yet 1973 was almost a year of peace. There was not a single great shock, only 11 major ones, and the death toll dropped by more than 93 percent to 650.

Who knows which way the wind blows? □