

SPACE

Zero and Lunar Gravity Simulated by Device

See Front Cover

►SOME OF THE MOTION problems experienced in zero and lunar gravity may be solved by a new device undergoing checkout in Manned Spacecraft Center's crew systems division of the National Aeronautics and Space Administration, Houston, Texas.

Called the six-degree-of-operational-freedom simulator, the device consists of two 12-foot booms with ballast buckets, and a personnel cradle. A test subject in the simulator can achieve 360 degrees rotation in roll, pitch and yaw. He can move nine feet vertically and has a horizontal range 24 feet in diameter.

The feeling of weightlessness comes from balancing a man's weight exactly with lead weights in the ballast buckets. Since his body has no "weight", he has full freedom of motion. However, it is a suspended type of weightlessness rather than the free fall weightlessness of outer space. The test subject will have only total body weightlessness.

The simulator will be used for evaluating such items as space tool concepts and spacecraft tethering lines.

Project engineer for the simulator is Earl LaFevers. Jack Slight, seen on this week's front cover, is principal test subject for the device. He is demonstrating the capability of the machine at zero gravity.

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IMMUNOLOGY

Immunology May Hold Clue to Cancer Control

►IMMUNOLOGY, the 70-year-old branch of biology dealing with immunity, is fast becoming an independent field with "exciting possibilities," not least of them the control of cancer, an American medical scientist said in Geneva.

"I think immunology is going to surprise us all," Dr. Howard C. Goodman, chief of the clinical immunology section of the National Institute of Allergy and Infectious Diseases, Bethesda, Md., declared.

If cancer can be shown to be produced through mechanisms similar to chemical or virus carcinogen induction, "we can attack it immunologically," Dr. Goodman told a medical reporter.

The specialist received a year's leave from the National Institutes of Health to set up the World Health Organization's first immunology unit, which is now a year old.

The agency has contracted with laboratories in Australia, Czechoslovakia, France, Italy, Switzerland, Great Britain and the United States, for studies of processes important in immunoprophylaxis and therapy, tissue antigens, transplantation, cancer immunology and immunochemistry.

He is staying on a second year as the new unit's first chief.

Immunologic processes involving anti-

bodies and antigens play key roles in the body's response to a great many diseases, Dr. Goodman said. Diagnostic tests depend more and more on these processes which ultimately may solve the problems of "tissue typing" and body organ transplantation, he added.

Fast-breaking developments in the emerging discipline, according to Dr. Goodman, "will mean that physicians will need better grounding in immunology than medical schools now provide."

As part of his WHO assignment, Dr. Goodman this year helped set up an immunology research center in Ibadan, Nigeria. He said it "will serve as a prototype for all new nations."

Within the next two years, he said, he hoped to see other centers in South America, Southeast Asia and one more in Africa.

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GEOPHYSICS

Nitrogen in Snow Caused By Aurora and Air Glow

►A VERY SMALL part of the nitrogen found in snow at the South Pole is formed in auroras and air glow high in the earth's atmosphere.

The amount deposited each year is about seven-hundredths of an ounce on an acre, two New Zealand scientists reported in *Nature*, 205:793, 1965. The nitrogen is in the form of oxides.

The scientists chose the South Pole for their survey because thunderstorms, the usual source of nitrogen oxides in the atmosphere, are unknown there. Snow collected from relatively shallow depths fell before humans set foot on Antarctica, thus cannot be contaminated from human activities.

A. T. Wilson and D. A. House of Victoria University, Wellington, New Zealand, made the measurements.

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GENERAL SCIENCE

Science Talent Winners Get Sloan Fellowships

►TWO YOUNG SCIENTISTS who won distinction for themselves when seniors in high school have been named Sloan Research Fellows.

Both Dr. Laura Maurer Roth, associate professor of physics at Tufts University, Medford, Mass., and Dr. Alan T. Moffet, a radio astronomer at California Institute of Technology, Pasadena, were once winners in the annual Science Talent Search. Dr. Roth was a winner of a scholarship in 1948 and Dr. Moffet received a scholarship in the competition of 1953.

Dr. Roth is the second woman selected for a Sloan award since the establishment in 1955 of the Program for Basic Research in the Physical Sciences.

Ninety-one young scientists in United States and Canadian universities were named to receive these unrestricted grants for basic research, totaling nearly \$1.4 million, from the Alfred P. Sloan Foundation.

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IN SCIEN

AGRICULTURE

Rainwater Found Rich With Nutrients in Africa

►NITROGEN, PHOSPHORUS, potassium and sodium fall from the sky during the first rainstorms after Africa's yearly dry season, reported I. Thornton of the Yundum Experimental Station, The Gambia, Africa.

During the annual drought, the wind blows dust into the atmosphere. This dust is then washed down from the sky when the heavy rains start in June, lasting until mid-October, Mr. Thornton stated in *Nature*, 205:1025, 1965.

The land nearest the coast receives the greatest amount of nutrients, about 42 pounds of nitrogen per acre each year, eight pounds of sodium, five of potassium and four of calcium.

Farther inland, less rain falls, and less nutrients are added to the soil, he pointed out. Much of these substances is washed from the sky at the beginning of the rains. The additions of 10 to 20 pounds of nitrogen during the rainy July and August play an important part in satisfying the nitrogen requirements of the peanut, the main economic crop of the country.

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PHYSIOLOGY

Bigger Brains in Rats Produced by Hormones

►RATS with bigger brains and more nerve cells have been produced by injecting growth hormones into the mother during pregnancy.

Several years ago Dr. Stephen Zamenhof, now a professor of medical microbiology at the University of California at Los Angeles Medical School but then at Columbia University, found that when he injected growth hormones into a pregnant rat the brains of its offspring were larger and the nerve cells more numerous.

Certain tests suggested that the rats might even be smarter, although the tests were not conclusive.

Growth hormone, which is produced by the anterior pituitary gland, stimulates growth by facilitating cell division. Thus, the growth hormone was injected into the mother rat at a time when the fetal brain cells were still dividing. This was found to be during the first 7-21 days of pregnancy.

An English scientist who repeated the experiments said that more sophisticated techniques to measure intelligence, developed since the original experiments, indicate that the hormone-fed rats were more intelligent.

What might this mean in terms of human beings—a means of producing superior intellect?

Not yet, Dr. Zamenhof says.

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CE FIELDS

OCEANOGRAPHY

'Foresters' Look After Underwater 'Trees'

► SCUBA-EQUIPPED "foresters" are tending an underwater grove of giant kelp which flourishes only in deep waters around two islands off the southern California coast.

Dr. Bruce Parker, University of California at Los Angeles botanist, has staked a claim in the submarine forest, which is located just off Catalina Island.

Scuba divers from UCLA's diving board, under the direction of Glen Egstrom, are helping in a scientific study of the kelp.

Two plots have been staked out and marked with tile on which is printed, UCLA botany department.

The species belongs to a group of seaweed known as elk kelp, so-named for the antler-like shape of its branches. This particular species, known as *Pelagophycus giganteus*, is found only off Catalina and San Clemente Islands, and apparently nowhere else in the world.

This variety of kelp is one of the deepest seaweeds, growing at depths of 50 to over 130 feet. The name *Pelagophycus* is from the Latin "pelagic," meaning on the bottom, and "phycus"—seaweed. At these depths there is little light for photosynthesis, but apparently just enough.

One of the unique features of the Catalina species of elk kelp is the large bladder which keeps the giant seaweed off the bottom. It contains the deadly gas, carbon monoxide, which is not a common plant product.

Divers are helping to conduct a year-around study of growth and development of the elk kelp. They return every few weeks to collect data from two plots of kelp located at a 75-foot depth.

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PUBLIC HEALTH

Exhaust Fumes Threaten Driver in Heavy Traffic

► THE CARBON MONOXIDE fumes from cars in heavy, slow-moving traffic can often build up to dangerous proportions for drivers.

Tests in heavy traffic showed that there is often enough carbon monoxide in the air to dull a driver's alertness, smog researcher Dr. Arie J. Haagen-Smit, California Institute of Technology, Pasadena, reported. Because the red corpuscles in the blood prefer carbon monoxide to oxygen, high concentration of it will cause oxygen starvation, making a person sleepy. The gas, of course, can kill by asphyxiation.

Two cars, installed with carbon monoxide analyzers to continuously record the carbon monoxide levels of the drivers' environment, were driven up and down a California freeway. The overall average level of the gas on the test trips was 37 parts per million

(ppm) of air. In heavy traffic moving less than 20 miles an hour, the level rose to an average of 54 ppm, with peaks up to 120 ppm.

The California State Health Department has determined that 30 ppm is an "adverse" level and that 30 ppm for eight hours or 120 ppm for one hour is a "serious level of pollution."

Thirty ppm of the gas will inactivate five percent of a person's hemoglobin, the red coloring matter that carries oxygen in the circulation. Sixty ppm will inactivate ten percent of the hemoglobin.

"If a commuter spends two hours at the higher exposure level found in the study," Dr. Haagen-Smit said, "the carbon monoxide level of his hemoglobin would be approximately that cited by the State Health Department for the 'serious' level."

One way to get high concentration of carbon monoxide is to drive too close to the car ahead. Another is to drive in heavy traffic with much starting and stopping at traffic signals, he said.

Fortunately cars coming out next September will be equipped with devices to reduce carbon monoxide concentration to perhaps one-third its former level, he added.

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SPACE

Space Life Detector Simulates Firefly Light

► AN EXTRACT of firefly light will soon be helping to detect live microorganisms in the upper levels of the earth's atmosphere.

Space probes going to neighboring planets such as Mars must be completely sterile when they reach their destinations, so that they will not "ruin" the planets for biological research. A new instrument called Firefly will be used to measure how much and how far out the traces of life exist in the atmosphere.

The heart of Firefly is a mixture of the same chemicals used by fireflies to create light, luciferin, luciferase and oxygen, except adenosine triphosphate (ATP), a high energy compound essential to all known life on earth.

The Firefly instrument will be launched into space aboard sounding rockets or balloons. If it encounters any microorganisms, the ATP will chemically "complete the circuit," producing light. The light will be electronically amplified, and then radioed back to earth.

Firefly can now detect amounts of ATP as small as one 31-billionth of an ounce. Scientists at the National Aeronautics and Space Administration's Goddard Space Flight Center hope that by the time it is ready to fly, Firefly will be able to detect a single living cell in space. The whole instrument will weigh less than one pound.

An important advantage of Firefly is that it can monitor microorganisms instantly, as soon as they appear. Some detection devices need as long as several hours to register the presence of life. Firefly will not have to be recovered, as would other devices launched in rockets or balloons.

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MEDICINE

New Method Advanced To Treat Shock Cases

► A NEW TREATMENT for shock that contradicts previously accepted techniques has been proposed by two medical scientists.

Dr. Philip Thorek, professor of surgery of the Cook County Graduate School of Medicine in Chicago, and Dr. Kermit Krantz, obstetrics and gynecology department chairman at the University of Kansas Medical School, made the proposal.

Under the new theory, the medical scientists told a clinical symposium in San Diego, the patient is given drugs to dilate the blood vessels.

This contradicts the generally accepted techniques in which the patient is given drugs to cause his blood vessels to contract.

Dr. Thorek said shock occurs when the capillary system breaks down. He said blood vessels contract in the early stage of shock, and that this is presumably a body mechanism to prevent loss of blood in injury.

In the second stage of shock, Dr. Thorek added, the tiny arterial blood vessel muscles relax, but the ones in the veins remain contracted. This causes stagnation, a condition in which vital organs do not get enough blood and which could result in death.

A drug administered under these conditions to further reduce blood flow increases shock effect rather than reducing it, Dr. Thorek said.

He said giving drugs with the opposite effect, called vasodilators, restores blood flow and helps the patient recover. The treatment is given with other medication including cortisone-like drugs.

Dr. Thorek, however, did not recommend the use of vasodilators in cardiac shock when the heart fails to function.

Dr. Krantz said the use of vasodilators had been successful in treating shock caused by poisoning arising from bacterial infections.

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PHYSICS

Princeton Physicist Wins Albert Einstein Medal

► DR. JOHN A. WHEELER, Princeton University physicist, is the 1965 winner of the Albert Einstein Medal and Award.

Dr. Wheeler, who specializes in theories of atomic and nuclear physics as well as Einstein's relativity, took an active and essential part in the development of the first atomic bomb during World War II.

During the early 1950's he worked on Project Matterhorn, aimed at controlling the hydrogen bomb reactions for peaceful purposes. In the last few years Dr. Wheeler has been active in studies on Einstein's unified field theory, an attempt to find one basis for explaining both the virtually infinite world of the cosmos and the unbelievably minute world of the atomic nucleus. It was announced on the 86th anniversary of Albert Einstein's birth by trustees of the Lewis and Rosa Strauss Memorial Fund.

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