

## PHYSICS

**Water Stretching Study Underway in Scotland**

► WATER is being stretched in Scotland—for reasons of engineering, not parsimony.

The research on water under tension is being undertaken to help design ship propellers, pumps and hydroelectric turbines.

At the British Government's National Engineering Laboratory at East Kilbride near Glasgow, Scotland, one group of researchers, under A. Haward, is learning what happens when water is under tension or stretched. Another team, led by Dr. I. C. Pearsall, is attacking the practical difficulties caused by the fact that water will not stretch under normal circumstances.

A pump designed by Dr. Pearsall's team using a radical new approach to these problems had its first trial.

Under the stresses of a fast pump or propeller, water tears instead of stretching. Bubbles of water vapor form in the low pressure areas behind the blades and quickly collapse. This effect is called cavitation. The endless small shocks caused by the bursting bubbles steadily erode even the best metals.

One solution is to design blades to reduce cavitation. However, Dr. Pearsall and his team are going in the other direction and designing super-cavitating pumps that actually encourage the effect. They have designed turbine blades so that a big permanent bubble forms on the back of the blade. There are no shocks from bursting bubbles so there is no erosion of the blades.

Using super-cavitation, faster, and therefore smaller, lighter and cheaper pumps will be possible, Dr. Pearsall believes. These advantages would be particularly valuable for fuel pumps in aircraft. Liquid fuel rockets need fast, light pumps as well. Super-cavitating turbines would also be useful in some kinds of hydroelectric power stations.

• Science News Letter, 85:376 June 13, 1964

## ASTRONOMY

**Total Eclipse of Moon Likely to Be Dark**

► THE YEAR'S first total eclipse of the moon, on Wednesday, June 24, could be spectacular.

The coppery red color of the eclipsed moon could be much darker than usual. The moon might even be invisible, as it was to many observers during the eclipse of Dec. 30, 1963.

The great eruption of the Indonesian volcano Agung, on Bali, in March 1963 poured huge quantities of fine dust into the earth's atmosphere. This dust caused the virtual disappearance of the moon during totality last December. It has also been responsible for unusually red sunsets reported last fall from the Northern Hemisphere and this spring from the Southern Hemisphere.

The disappearance of the moon during last December's eclipse was a rare event, the first since 1913.

The lunar eclipse of June 24 may be seen

from a part or all of every major land mass in the world except Australia. The middle of totality occurs at 9:06 p.m. EDT. The total eclipse begins at 8:16 p.m. EDT, and ends at 9:57 p.m.

The eclipse will already be in progress when the moon rises in the United States. For the eastern part of the country, the moon will rise during the total phase of the eclipse, although before mid-eclipse for East Coast residents.

From the central portion of the U. S., the rising moon will appear partly shadowed by the earth. It will continue to leave the shadow as it rises.

The total phases of the eclipse will end before moonrise in the western part of the country, although the moon will still be darkened by the outer part of earth's shadow, or penumbra. For persons living in the far Northwest, the eclipse will have ended before moonrise.

A lunar eclipse in progress as the moon rises offers a good opportunity for taking photographs with interesting landscape effects.

The moon is low enough so that the landscape can easily be included in the camera frame and there is still plenty of twilight for illumination. Distant landscape features should be selected so they will be sharp at the infinity focus necessary for lunar pictures.

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## SPACE

**New System Developed For Space Communication**

► LOW-POWER COMMUNICATIONS satellites capable of transmitting information back to earth with nearly the same efficiency as their more electronically complicated cousins may soon be available.

Engineers at International Business Machines Corporation's Federal Systems Division, Rockville, Md., developed the new satellite system, a "quasi-passive" concept termed COMARRAY.

Communications satellites generally are called passive if they merely reflect a radio beam from one part of the world to another, much as a mirror reflects light.

Active satellites, on the other hand, take the incoming beam from earth and give it an electronic boost or amplification before passing the signal back to the planet.

Passive satellites are easier and cheaper to build than active ones, but the quality of the signal received is poorer because of the lack of amplification.

The IBM system uses a special type of transmitting antenna capable of receiving pure radio energy from the ground and transmitting it back to the point of origin.

For example, a signal going from New York to London would be received by the satellite and put on the special transmitter aimed at England. At the same time the English receiving station would send a message-free radio wave to the transmitter.

The transmitter combines the New York signal with the energy-carrying silent wave sent by London into a single package.

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**IN SCIEN**

## PUBLIC HEALTH

**Air in Coal-Burning Areas Purified by New Method**

► RESIDENTS IN AREAS where soft coal is burned for fuel now can breathe pure air.

The pungent odor of burning sulfur and the presence of ash solids in the atmosphere of coal-burning areas is virtually removed with a new method announced at the 26th annual American Power Conference in Chicago.

The sulfur dioxide fumes normally dissipated into the air are instead converted into sulfuric acid as a marketable by-product, Ralph F. Bovier, vice president of Pennsylvania Electric Company, Johnstown, said.

The sulfuric acid produced at Pennsylvania Electric's coal-burning generating station in Seward, Pa., is a low-grade acid of 70% to 75% concentration.

This new process can be incorporated economically into the design of larger, new generating stations which use sulfur-bearing fuels, Mr. Bovier said. However, it would not be economical to adapt the process to existing generating stations because of the expensive major plant changes required.

In the process, more than 99% of the ash solid first is removed by a specially developed instrument known as a mechanical-electrostatic precipitator, built to withstand the high gas temperature and volume.

The cleaned gas is then passed over a special catalyst at temperatures ranging from 800 degrees to 900 degrees Fahrenheit, converting a major portion of the sulfur dioxide to sulfur trioxide. The flue gas then passes through an air preheater. Water vapor present combines with the sulfur trioxide and condenses as sulfuric acid. The sulfuric acid mist that remains is removed by an electrostatic mist collector.

The purified flue gas is then emitted by the stack with most of the sulfur fumes and all the solids removed.

By using the process, future electric power generating stations can be located virtually on top of vast coal reserves, making possible low-cost electricity which can be transmitted to large eastern markets.

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## GENERAL SCIENCE

**Belgium Nature Camp Invites U.S. Student**

► AN AMERICAN STUDENT will be welcomed by an international science camp devoted largely to biology and geology to be held July 6 to 16 at Han-sur-Lesse in the Ardennes as part of the Belgium science youth program. Expenses not available. French knowledge preferred. Cable application to Jeunesses Scientifiques de Belgique, 147 Chausee de Haecht, Brussels.

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# CE FIELDS

## GENERAL SCIENCE

### Presidential Scholars Include STS Winners

➤ A FIFTH of the young scientists among the nation's outstanding high school graduates named in the first year's Presidential Scholars by President Johnson won honors in the national Science Talent Search earlier this year, compilation shows.

Of the 121 Scholars named, 51 are listed by the White House in the fields of mathematics, physics and chemistry. Of these, the Science Talent Search, conducted by SCIENCE SERVICE, picked for honors three mathematicians, three physicists, two chemists, and two others who are listed in the Presidential selection with interests as undecided or non-science.

Three of the Presidential Scholars were among the 40 top winners of the Science Talent Search for the Westinghouse Science Scholarships and Awards and visited Washington this spring. Of these, Lee R. Girton Snyder, Huron, S. Dak., won the third award of a \$5,000 Westinghouse Scholarship. The other two who came to Washington in the winner group are Stephen Lawrence Coy, Lincoln, Nebr., and Amory Bloch Lovins, Amherst, Mass.

The other Presidential Scholars who won honors in the Science Talent Search are Leona Margaret Dryden, Hyattsville, Md.; Howard Owen Hunter III, Brunswick, Ga.; Nathan Gerald Isgur, South Houston, Texas; Mehrene Emma Larudee, Ann Arbor, Mich.; Clinton Graydon McCrory, Columbia, S. C.; Kenneth Mark Minkoff, Laurelton, N. Y., and Trudy Ann Porter, Hickam A.F.B., Hawaii.

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## ORNITHOLOGY

### Evolution of Sparrows In North America

➤ THAT NOISY, quarrelsome bird, the house sparrow, has changed his size and color since he arrived in North America from Europe about a century ago.

His wing and body have changed size, and his color tends to be a darker or lighter brown, according to the section of country in which he lives, Dr. Richard F. Johnston, University of Kansas, Lawrence, and Robert K. Selander, University of Texas, Austin, reported.

Sparrows from the northern and Pacific coastal areas and from the Valley of Mexico are darkly pigmented, the scientists said in Science, 144:548, 1964. Yet those birds collected in the arid southwestern regions from southern California east to southern and central Texas are relatively pale in color.

Sparrows have evolved and changed their size dimensions also. The largest specimens of the perky bird come from the more northerly sections of the United States and

Canada; while the smallest are found in the desert southwest.

In order to study the rapid evolutionary changes in color and size, the scientists collected series of 100 to 250 specimens of the house sparrows at various localities throughout North America and in the Hawaiian Islands, Bermuda, England and Germany.

The house sparrow, *Passer domesticus*, also called the English sparrow, was introduced from England and Germany into North America in 1852. Since that time it has spread across the country, reaching Vancouver about 1900, Death Valley in 1914, and Mexico City about 1933.

Much of the rapid evolution and change in the sparrow may have happened in the present century, the scientists stated.

Racial differentiation of populations in the sparrow may require no more than 50 years, they said, even though current estimates of the shortest time normally required for the evolution of races in birds range more than about 4,000 years.

"Clearly, our thinking must not exclude the possibility of animals attaining to extremely rapid rates of evolution at the racial level," they said.

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## MEDICINE

### Heart Defects Caused By Diminished Oxygen

➤ WORKING WITH MICE, scientists have established a definite relationship between diminished oxygen supply during pregnancy and heart defects at birth.

The work involved years of experimentation in the rare atmosphere high on a California peak.

Dr. Bernard Baird of the University of California, Los Angeles, Medical School has found that among laboratory mice conceived and born in such an atmosphere about one-third exhibit congenital heart defects similar to those seen in man. These include defects in the walls between heart chambers and misplacement of major heart blood vessels.

The research was carried out in the University of California's Barcroft Laboratory at the 12,500-foot level on White Mountain Peak. Dr. Baird found a similar incidence of such defects in wild mice living at that altitude.

A small number of other defects such as cleft palates and club feet occurred in the laboratory animals. A large number were never born, dying and being absorbed in the uterus.

Careful evaluation has ruled out genetic factors, virus infections and faulty sperm or ova as major contributors to the defects. Dr. Baird points out that the mother mouse, living where oxygen is precious, has extreme difficulty providing oxygen for her own needs and that of a typical fetal litter of eight or nine.

As was emphasized by Dr. Joseph Barcroft, noted English pioneer in the field of hypoxia for whom the laboratory was named, a fetus lives a precarious existence. He likened the normal fetal environment to that of Mount Everest.

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## PUBLIC HEALTH

### Germ Warfare on Insects By Biological Control

➤ A KIND of germ warfare on insect pests is slowly taking its place in the insecticide battlefield.

Scientists call it biological control, and only selected insects are harmed. Birds, fish and mammals, including man, are untouched.

Specific weapons are being found that will not leave residues or injure food and crops.

The late Rachel Carson had been scheduled to take part in a symposium on some of these new weapons, called microbial insecticides, at the meeting of the American Society for Microbiology in Washington, D. C.

"We would be foolish to offer a change-over from chemical insecticides and we do not offer a panacea for insect control," Dr. Arthur M. Heimpel of the entomological research division, U.S. Department of Agriculture said. "We are working side by side in an integrated program with the chemical insecticide producers. We are greatly indebted to DDT and numerous other useful insecticides."

More than 1,000 species of bacteria, fungi, nematodes, rickettsia and protozoa are known infest insects.

The use of these microorganisms for large-scale control of insect pests had been studied long before Rachel Carson wrote "Silent Spring."

Three species of bacteria, one fungus and one virus are now being produced commercially to control insects.

Dr. Edward A. Steinhaus of the University of California, Irvine, said that 20 years ago in California, when alfalfa was the most important as well as the biggest crop, which it still is, scientists learned that caterpillars destroying the crop could be killed, using diseased ground-up caterpillars.

Dr. Steinhaus said the biological control program has meaning for human medicine because it provides scientists with a system applicable to higher as well as lower animals.

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## ENGINEERING

### First Atomic Lighthouse Could Shine for Decade

➤ ONE OF THE OLDEST navigation aids in the New World, the Baltimore Light, has become the world's first atomic-powered lighthouse.

The powerplant is a generator called SNAP-7B, developed by the nuclear division of the Martin Company, Baltimore. It is powered by heat from radioactive strontium-90.

Output is 60 watts, and the generator is designed to operate continuously for 10 years without refueling, although it will remain in the Baltimore lighthouse for only about a year. Then it will be moved to another lighthouse in a remote location, where it will replace batteries or diesel engines.

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