

PHYSICS

Earth Surrounded by Banana-Shaped Shells

THE EARTH is surrounded by banana-shaped shells extending some 20,000 miles in space. The shells are regions of higher ionization than the surroundings.

Radio signals being broadcast by the Explorer VI "paddlewheel" satellite launched early in August from Cape Canaveral may confirm existence of these ducts. If so, such strange radio effects as "multiple-path whistlers" would be explained, and future radio explorations of space made easier. (See SNL, Aug. 15, p. 100.)

Prof. Robert A. Helliwell of Stanford University, Stanford, Calif., reported his new theory on the distribution of ionized matter in outer space to the American Physical Society meeting in Honolulu, Hawaii.

A very sensitive receiver in Explorer VI is being used to verify the theory. Signals at the very low frequency of 15.5 kilocycles from the Navy's transmitter at Annapolis, Md., are being received in the satellite, then relayed to the ground by telemeter.

Dr. Helliwell suggested the banana-shaped shells are aligned with the earth's magnetic field. Although their ionization may be only 10% to 20% stronger than the surrounding regions, this is adequate to form a channel that conducts radio signals with efficiency.

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SURGERY

Plastic Tube Restores Hearing in Some Deaf

A TINY TUBE of plastic, smaller than a pencil point, can restore hearing to nine out of ten people who have a certain kind of deafness.

The new development was described by Dr. Alan A. Scheer, New York University College of Medicine, at the International College of Surgeons meeting in Chicago.

The tiny hollow plastic tube is producing dramatic results in patients who have lost their hearing from formation of spongy bone in the middle ear, which scientists call otosclerosis. More than 1,000,000 persons in the U. S. are deaf due to this bony formation and hardening that locks the ear mechanisms so rigidly that they cannot vibrate to transmit sounds. In 270 patients with deafness from the bony deposits, the plastic tube restored hearing, either partially or completely, in nine out of ten, Dr. Scheer said.

With older techniques, only about five out of ten patients could be helped permanently.

The tube is so tiny, he said, the surgeon has to use a microscope while inserting it into the ear. The surgeon makes an incision in the ear canal, folds back half of the ear drum, loosens the hardened internal workings of the ear. He then tucks in the almost invisible plastic tube and leaves it there in the innermost hidden depths of the ear, to carry sound vibrations to the nerves.

The plastic tube replaces the stapes, one

of the ear bones that was not functioning properly, and acts as a vibrating mechanism.

"The very instant we put the eardrum back," Dr. Scheer said, "the patient hears the booming amplification of sound as though he had just entered a huge auditorium."

The new technique restores hearing to many patients who could not be helped before and there are almost no relapses back to deafness, after the operation, as there were with former methods.

Although the plastic tube surgery is an entirely new technique, it will be done routinely by many doctors within a short time, he predicted. The technique can only be used in deafness caused by otosclerosis. It is not effective when the hearing nerves have been damaged.

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ROCKETS AND MISSILES

U. S. Not Yet Able To Intercept Missiles

THE UNITED States is not yet able to intercept guided missiles fired at American targets.

At best, interception of incoming missiles would be extremely difficult but today is "impossible," Lt. Gen. B. A. Schriever of the Air Force's Air Research and Development Command told lawyers attending the American Bar Association meeting in Miami, Fla.

Because ballistic missiles can travel 5,000 miles in 30 minutes, the U. S. needs an early warning system that can spot the missile attack when launched.

Such a system might use satellite vehicles, he suggested.

A second much-needed link in the warning chain is a way for transmitting needed information to military headquarters when a missile attack is launched. Development of such systems now carries a high-priority military rating, he said.

He indicated that a "decisive" strategic advantage could go to the first nation to achieve the ability to maneuver, communicate and carry out military missions in and from space.

He described ARDC's Dyna-Soar project in which a manned glider may be boosted out of the earth's atmosphere by intercontinental ballistic missile rocket engines. Dyna-Soar would have a global range and the ability to land where the vehicle's pilot chooses.

"It is fairly obvious that the military advantages of such a vehicle are tremendous," said Gen. Schriever.

"It would provide the crucial element of human discretion, along with an almost infinite choice of flight paths. It could operate at lower altitudes than satellites, and yet would be less vulnerable to enemy tracking and destruction."

Later versions of the Dyna-Soar vehicle could be made to orbit the earth many times and then re-enter the atmosphere for a specific mission. Such a vehicle, he said, could be used as a satellite interceptor to inspect, board, disable and possibly destroy hostile satellites.

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IN SCIENCE

ENGINEERING

Automation in Infancy Says Head of NBS

AUTOMATION is still in its infancy. Dr. Allen V. Astin, director of the National Bureau of Standards, said, and "we still have a long way to go before we will have a completely integrated and automated industry."

To bring automation closer to maturity, Dr. Astin reported at ceremonies dedicating a new \$2,000,000 research and development center of the Leeds & Northrup Company, in North Wales, Pa., both technology and research must contribute to the advance of automatic instrumentation.

To meet technological demands and competition, all firms should maintain staffs of scientists and provide them with tools for studying business-improving methods, he said.

The technological advancement of business, he said, depends on "a proper state of mind, that of seeking to improve one's product, to develop new ones, and to improve basic production processes." This he considered a prerequisite to a vigorous economy.

Dr. Astin emphasized that instrumentation is the key to all experimental research. It provides the link between research and technology and can be important for business and technological growth as well as to the future of big and little business.

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ENGINEERING

New Jet-Engine Fuels Boost Plane Performance

NEW JET-ENGINE fuels that burn less brightly have been developed at New York to give airplanes more flight per gallon of fuel.

The secret of the new fuels developed by Texaco, Inc., is their high "L.N."—a number expressing luminosity of the combustion flame. Most present jet fuels have low luminometer numbers of 45 to 65. The new fuels are rated upward from 135.

Higher L.N.-rated fuels are expected to extend engine life and sharply reduce exhaust smoke on take-off. In a luminous flame, such as that of kerosene, incandescent molecular fragments are formed that radiate heat. This can seriously increase temperatures inside a jet engine without adding power.

By designing the engine to use high luminometer number fuels and by burning them at higher temperatures, greater thrust can be developed at take-off, said L. C. Kemp Jr., vice-president of Texaco research. In addition, the jet could carry heavier payloads.

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E FIELDS

ASTRONOMY

Detection of Planets Of Other Stars Proposed

DIRECT DETECTION of planets of other stars billions of miles from the sun by a large telescope on the moon is possible, an astronomer from the U. S. National Aeronautics and Space Administration reported.

Dr. Nancy G. Roman has calculated that if the nearest star outside the solar system had an airless planet like the moon, the planets Venus, earth, Jupiter and Saturn would be visible from it using present methods.

Other stars besides Alpha Centauri, which is 4.3 light years from the earth or about 26 million million miles, from which solar system planets would be visible under such conditions include Sirius, Procyon, Altair and Arcturus. All five stars are bright, easily visible to the naked eye. Sirius and Procyon are visual double stars.

Dr. Roman, therefore, concludes that stars such as these five are the "logical" ones to test for the presence of planets. She suggested at the American Astronomical Society meeting in Toronto using a large telescope on the moon, because there no atmosphere interferes with viewing.

The experiment is a time-consuming one and could not be performed at all without a large, accurately guided telescope, Dr. Roman said. A telescope on an artificial earth satellite would probably not allow either the necessary size nor the long periods required for such an experiment.

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ELECTRONICS

Discover Silicon Carbide Is Good Electron Source

BETTER ELECTRONIC TUBES that glow blue when working, instead of red, may result from the discovery that silicon carbide is a good source of electrons.

Drs. W. J. Choyke and Lyle Patrick of Westinghouse Research Laboratories, Pittsburgh, have found that silicon carbide, used as an abrasive in grinding wheels, can emit a heavy stream of electrons when excited.

Dr. Clarence Zener, director of research, speculated that electronic tubes might be built using extremely pure silicon carbide as a replacement for hot cathodes used today. In effect, such a development would be transistorizing the vacuum tube to achieve inherent advantages of both transistor and tube.

Transistors are tiny solid-state devices that can replace vacuum tubes in some jobs. They require little power to operate and hence give off little heat.

In contrast, the ordinary radio tube requires much power for heating its cathode to red hot temperatures so that electrons will boil off and make the tube work. This large amount of power makes the tube less effi-

cient than the transistor. The heat given off becomes a serious handicap in some cases.

By replacing the hot cathode structure with a cool unit of pure silicon carbide, little power would be required for the tube and little heat would be given off. Through this idea, a better and less complex TV picture tube might be developed.

When enough voltage is applied at a junction point on the pure silicon carbide, the material's normal electrical resistance breaks down. Small blue spots of light suddenly appear near the junction. Electrons escape from these bright, light-emitting spots, which are only 50-millionths of an inch in diameter. The spots have yielded currents up to one-millionth of an ampere. This density is "quite comparable" to that from the cathode of a typical electronic tube, Dr. Zener said.

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MEDICINE

Heredity Appears Cause Of Drooping Eyelids

DROOPING eyelids appear to be hereditary, a Baltimore plastic surgeon suggested.

Ptosis, drooping lids, can be congenital or the result of an illness, Dr. Edward A. Kitlowski, University of Maryland School of Medicine, reported to the International College of Surgeons meeting in Chicago.

The congenital type is the most common and usually affects both eyes, he added. The acquired type may come about overnight as the result of the loss of power to elevate the eyelids. The paralysis of the levator muscle, which controls the movement of the lids, may be a temporary one, and clear up in a week or ten days.

Dr. Kitlowski explained that eyelids in the unborn start to develop as folds of skin in about the seventh week of pregnancy and completely cover the eyes in about the ninth week. The lids are fused until the sixth or seventh month when they begin to open. When they fail to function properly at birth, it is usually due to a mass contraction of the muscles supplied by the so-called third nerve.

"The correction of the deformity resolves itself in using muscles to replace the function of the levators and by voluntary action of the patient to permit the eyelids to elevate when desired," he said.

The muscle of the scalp, which in its normal function is an accessory muscle of lid elevation, is used to provide the power. Fascia, a sheet of tissue which invests and connects muscle, is taken from the patient's hip, threaded beneath the folds of the forehead, and tightened to elevate the lids to the desired level. The lids will not close completely for a few weeks after the operation.

"The operative procedure is most desirable to offer the patient the best cosmetic results to improve vision," Dr. Kitlowski said. Surgery should not be contemplated until it is reasonably sure that there will be no improvement in the acquired type of ptosis, he concluded.

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CHEMISTRY

Chemical as Effective As Pruning Shears

SCIENTISTS have developed a chemical that may be as effective as pruning shears in keeping ornamental plants and hedges well-trimmed.

Chandler P. North, Drs. George F. Ryan and Arthur Wallace, horticulturists at the University of California, Los Angeles, have been experimenting with the chemical which is known as maleic hydrazide (MH).

They have found that MH solution sprayed on such plants as pyracantha, eugenia and ivies, honeysuckle, star jasmine, and fuchsia will effectively control their growth for periods up to six weeks.

Best results have been obtained when plants are trimmed and new growth is allowed to re-cover the trimmed areas before the spray is applied. When new normal growth appears, spraying should be repeated at four- to six-week intervals.

Effective MH concentrations in the solution have been worked out for a number of plants. These range from one to seven teaspoonsful per gallon. However, effective concentrations may vary with climatic regions, and since excessive concentrations cause excessive leaf and fruit drop, the following procedure is recommended:

Spray a small part of a plant with low concentration solution (0.005 percent solution for herbaceous plants and 0.15 percent for woody ones). Wait a week, if spray has stopped growth without excessive leaf drop, then spray the whole plant. If growth is not controlled, the MH concentration may be slightly increased.

Limited trials have indicated that MH may be used in conjunction with insecticides.

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PHARMACOLOGY

Pills Coated While Suspended in Air

A PILL COATING MACHINE that may replace the present pan coating method has been invented by Prof. Dale E. Wurster of the University of Wisconsin School of Pharmacy.

The machine suspends pills in the air forced into it by a blower, while atomizers inject a carefully controlled stream of coating material. The blast of air causes the coatings to dry immediately.

Better vitamins may also result from the new invention, because the machine can coat small vitamin granules with a protective film that prevents destruction of the chemical by air.

Present pill coating methods involve pouring coating material on pills revolving in a turning drum and a separate drying process is required.

Prof. Wurster's work was supported by the Wisconsin Alumni Research Foundation, which holds patents on the machine. The foundation plans to make the coating process available to industry at a low royalty.

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