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Light Amplifier Operated

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TECHNOLOGY

Atomic Generator Tested

A COMPACT, LIGHTWEIGHT GENERATOR that can convert heat from a by-product of nuclear reactors into electricity to power advanced satellites and space probes for at least a year is being tested by The Martin Company. The conversion system unit uses no moving parts.

The generator, which is being developed in Baltimore, Md., by Martin's Nuclear Division under contract to the U. S. Atomic Energy Commission, is called SNAP 1-A (System for Nuclear Auxiliary Power). It is similar in principle to SNAP-3, a grapefruit-sized device first demonstrated publicly by President Eisenhower early last year.

SNAP 1-A is roughly egg-shaped, 34 inches long and 24 inches in diameter. Most of its dull metal surface is dotted with screw-headed caps marking the location of 277 thermocouples. The complete generator weighs 175 pounds.

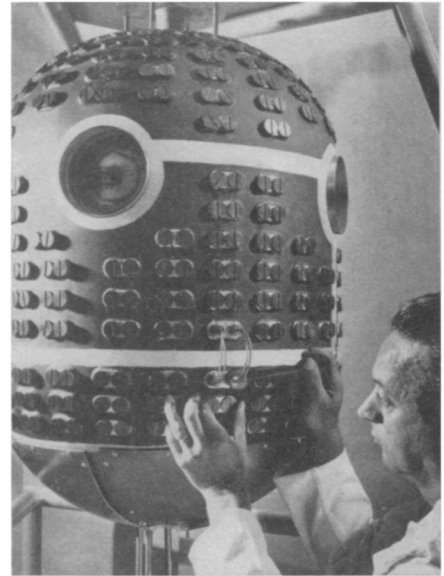
The new system promises more power than any energy unit launched into space so far either by the United States or the Soviet Union. Some systems have combined solar cells with chemical batteries to build up to such wattage levels periodically, but cannot operate continuously at high power.

SNAP 1-A, unlike solar cells, would not be affected by the impact of micrometeorites in space. Operating independently of the sun, the nuclear unit would have the additional advantage of being able to produce power while in the shadow of the earth. The absence of moving parts in the conversion system greatly reduces the chances of any malfunction.

The fuel capsule for SNAP 1-A, which will not be inserted until electrical and environmental tests of the rest of the system are completed, will be located at the very center of the generator, supported by light metal tubing. The capsule will contain tightly sealed pellets of radioactive cerium-144, which decays spontaneously, producing heat in the metal around it.

As the inner ends of the thermoelectric elements are heated, the outside ends always remain somewhat cooler, so that the difference in temperature produces a small electric current in each pair. These thermocouples are connected in series to add up to 125 watts at 28 volts. Tests being conducted now use an electrical heater to simulate the fuel.

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SNAP 1-A—A generator capable of converting heat from atomic waste to electricity is tested by The Martin Company, Baltimore, Md.

Research showed that magnetic influence on plant growth is greatest when seedlings are in the embryo stages, and when these embryos are oriented along an imaginary line drawn from pole to pole, rather than crosswise of the magnetic field.

When a seedling has its roots directed toward a natural or artificial south pole, both the roots and stem swell up and grow faster than usual. When turned with roots toward a north pole, the seedlings grow slower.

The work is reported by Drs. A. V. Krylov and G. A. Tarakanova of the Institute of Plant Physiology (Timiryazev Institute) of the USSR Academy of Sciences in the *Journal Fiziologiya Rasteniy*, 7:191, 1960. Translation was released by the Office of Technical Services, Commerce Department.

The physiologists say physicists have established that all substances possess magnetic properties that change as environment varies. The basis for these properties is the fundamental polarity, such as that found in the plants.

From this they conclude that magnetotropism is the key to the study of such problems as photosynthesis, the nature of heredity, the onset of malignant growth and the harmful effect of ionizing radiations.

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PHYSICS

Light Amplifier Operated

See Front Cover

SUCCESSFUL OPERATION of an optical maser, a new device for greatly amplifying light beams, has been reported. Maser is an acronym for Microwave Amplification by Stimulated Emission of Radiation.

It is expected to have important applications in sending and receiving signals from satellites and other objects in space, in projecting television pictures, in photographing astronomical bodies and in medical diagnosis by X-rays or fluoroscopy. It will give a super-sharp picture heretofore unobtainable.

The optical maser, which produces a very sharply defined light beam using atomic methods, will also provide scientists with a new method for establishing standards of wavelength, for performing basic experiments in physics and for true amplification of light.

Dr. Theodore H. Maiman of Hughes Aircraft Company, Culver City, Calif., plans to report details of the optical maser in the *Journal of Applied Physics*, a publication of the American Institute of Physics.

The new atomic method for amplifying light beams was suggested early in 1959 by Dr. C. H. Townes of Columbia University and Dr. A. L. Schawlow of Bell Telephone Laboratories, Murray Hill, N. J., who this year received a patent for it.

In the Hughes device, a light source, such as a powerful flash tube lamp, irradiates a synthetic ruby crystal, shown on the

cover of this week's SCIENCE NEWS LETTER. This optical energy excites the atoms to a higher energy state, from which the energy is reradiated in a narrow band of frequencies. The excited atoms are coupled to an atomic resonator and stimulated to emit the radiation together.

In ordinary light sources, the atoms radiate individually at random and the light from such sources is therefore incoherent. The light from an optical maser is coherent.

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BOTANY

Magnetism Affects Plants, Russian Scientists Say

ALL LIVING THINGS have north and south poles of sorts, two Russian plant physiologists have asserted.

They have discovered that the earth's magnetic field exerts a definite effect on growth processes in plants. Establishing the existence of this phenomenon—magnetotropism—leads the Russians to believe that polarity is a fundamental property of all living material and that magnetotropism may influence cancer and radiation effects.

Magnetotropism in this case consists of the oriented growth of a root in the direction of the earth's south magnetic pole or an artificial south magnetic pole. It is similar in effect to phototropism, the attraction that makes a houseplant grow toward a sunny window.

PHYSICS

Zero Energy Breeder Reactor to Be Built

THE UNITED KINGDOM Atomic Energy Authority will build a zero energy fast reactor at Winfrith, England. It is called ZEBRA (Zero Energy Breeder Reactor Assembly). The reactor will permit the study of the neutron physics of a wide variety of fuel assemblies containing uranium and plutonium, which have been built up by loading fuel elements into a steel matrix.

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