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Changes in Communication

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## PHYSICS

# Changes in Communication

► **RADICALLY** new long-distance communications systems and a great increase in the power of radio telescopes to detect faint objects were foreseen by scientists at the American Physical Society meeting in New York.

These developments and others not yet known will result from applying a new principle, that of the "maser," to solid objects, causing them to oscillate at microwave frequencies.

First successful operation of one such solid-state device at Bell Telephone Laboratories was reported by Dr. Mervin J. Kelly, the president. The idea for this new electronic device was proposed by Dr. N. Bloembergen of Harvard University, who also discussed it at the meeting.

One outstanding characteristic of the device is its very low "noise" level compared to conventional microwave equipment. The device, which might be called a spin oscillator, is also expected to operate as an amplifier.

The "maser" principle it uses was first demonstrated for beams of molecules in gases in 1954 by Prof. C. H. Townes and co-workers at Columbia University. They coined the word "maser," which stands for "microwave amplification by stimulated emission of radiation."

Recently scientists have tried applying this principle to solids. What they do is use microwave power of the proper frequency to cause changes in the energy levels of spinning electrons of paramagnetic materials in a magnetic field.

A number of conditions, however, have to be filled before the device will work, and only certain materials diluted with other special materials can be used to make the crystals. Low temperature operation, equivalent to about 455 degrees below zero Fahrenheit, is advisable and a magnetic field is required.

The experiment demonstrating operation of the device was performed by Drs. Derrick Scovil, George Feher and Harold Seidel of Bell Telephone Laboratories. Using a crystal of gadolinium ethyl sulfate diluted with lanthanum ethyl sulfate, they produced continuous oscillations at 9,000 megacycles with a power output of about 20 microwatts.

A completely new source of microwave power was thus demonstrated. Scientists believe it is only a question of time until microwave amplification can be obtained using these or similar crystalline materials and operating under the same physical principles as the oscillator.

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## GENERAL SCIENCE

# Invitation to Desert

► **THE TOUGHEST** selling job in the world faces Rep. Thomas J. Lane (D-Mass.), who wants to invite Russian scientists to desert their country en masse.

He intends to introduce a bill to encourage Russian scientists to defect to the United States by the thousands each year. Mr. Lane reasons that Red scientists, engineers and technicians would welcome the opportunity of leaving the Soviet Union to find "the freedom necessary for scientific inquiry."

The bill will seek to amend the immigration laws by permitting the entry of 25,000 skilled Russians each year, after they have been screened to make certain that they are opposed to Communism.

From all available evidence, this would be like asking teacher's pet to take the last seat in the last row in the class.

Every study of the Russian scientist since the death of Stalin has shown that the Red scientist is the best-paid and most pampered in the world.

The Russian scientist, particularly in the post-Stalin period, has emerged as a new and powerful class member in present-day Russia. He receives as much as 10 times the earnings of the average factory worker. He has almost equal status with the military and government leaders.

Even in the laboratory the emphasis on Party doctrine has been significantly watered down to permit top-level work in theoretical research without interference. This is the report of Western scientists who have visited Russian laboratories and read Russian scientific papers.

An important factor has been the Russian capability of giving the research scientist not only top money and top billing for himself, but for his equipment and projects. Unlike democratic nations, where a project must be debated and meet the approval of several departments, in Russia, scientists present a project and if the top leaders are satisfied, the scientists come away with a blank check and the right to levy all the men, material and money necessary to complete the job.

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## PHYSICS

# Peanut-Size Quartz Cell Heart of Loudspeaker

► **A SMALL** quartz cell, the size of a peanut shell, is the heart of a device called the Ionovac and can replace the larger vibrating diaphragms of loudspeakers, the

DuKane Corporation reported in St. Charles, Ill.

The small cell is open on one end and narrows down to a tiny hole the size of a pencil lead inside. Air within this small space is bombarded with high frequency, high voltage current which ionizes it into a violet cloud. This cloud is electrically similar to the ionosphere, a layer of air up to 250 miles above the earth's surface.

Changes in the electrical field creating the ionized cloud vary the breadth of vibration of the ionized particles, William Torn, senior developing engineer, reported.

"Each variation causes an expansion of the 'cloud,' followed by a contraction, thereby producing sound waves in any strength, form and frequency needed."

This electronic method of sound production is superior to the presently used vibrating diaphragm because it responds faster to electrical changes and is capable of higher fidelity sound reproduction, he said.

The Ionovac is being offered first to the high fidelity market as a loudspeaker.

Science News Letter, February 16, 1957

## PSYCHOLOGY

# "Learning" in Paramecia Due to Soda Water Gas

► **WHAT** appeared to be learning in the paramecia can be explained as the chemical effect of soda water gas. Experiments indicating that this microscopic one-celled creature which inhabits pond water is not so intelligent as some scientists have thought are reported in *Science* (Feb. 1) by Dr. Donald D. Jensen, Yale University.

The "learning" which had been reported was that the paramecia acquired what the psychologists call an "approach reaction" toward a platinum needle baited with bacterial food supply. After training trials in which they approached the baited needle, the paramecia would later go toward the needle even though it contained no bacteria but was sterilized. The concentration of paramecia around the bare needle was significantly higher after the training trials than when no such "training" was given.

But the psychologist who conducted the original experiments, Mrs. Beatrice Gelber of the University of Chicago, was careful not to call the results she observed learning.

Now Dr. Jensen has found that when bacteria are introduced into one area of a pool of water, they tend to remain concentrated there. Thus, in Dr. Gelber's experiments, the concentration of bacteria would continue to be high when the unbaited needle was replaced in the pool following training.

The reason for the concentration of paramecia where the bacteria are thickest may be in the acid and carbon dioxide produced by the bacteria, Dr. Jensen suggests. The acid and gas are produced by the bacteria in the course of normal metabolism, and weak concentrations of acid are known to affect paramecia in precisely the manner observed in the experiments, he said.

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