PHYSICS

New Atomic Accelerator

See Front Cover

➤ A NEW ATOM SMASHER for probing the inner cores of atoms, one of the three largest of its type in the world, is now in full operation at Argonne National Laboratory, Argonne, Ill.

The atomic accelerator, called the ZGS for Zero Gradient Synchrotron, will accelerate protons to 12.5 billion electron volts, then hurl them at target atoms in an extremely intense beam.

An aerial view of the central portion of the facility, dedicated Dec. 4, is seen on this week's front cover. A mound of earth, approximately 50 feet high, covers the doughnut-shaped magnet ring building, which is 212 feet in diameter. Inside this building is a 200-foot ring of steel magnets weighing a total of 4,800 tons.

The protons and beams of "secondary" particles are shot into equipment in the experimental buildings at the right. At the left, behind the road leading to the top of the mound, are buildings that house the beam injector and control systems of the ZGS. At right foreground is the magnet power supply building.

Protons are the nuclei, or cores, of hydrogen atoms. At 12.5 billion volts, the protons have a speed very close to that of light, which is 186,000 miles a second.

The speeding protons are being used to learn more about the structure of protons themselves and other nuclear particles. Atom smashers are to nuclear scientists what telescopes are to astronomers. The largest yield increased knowledge of the sub-microscopic pieces of matter of which the universe is made, much as the largest telescopes help show the structure of the cosmos.

Atomic accelerators are used by experimental physicists to check the predictions about nuclear structure made by theoretical physicists.

One of the first experiments to be conducted with the ZGS will deal with neutrinos, long suspected of coming in two forms, which was confirmed experimentally last year. Neutrinos are elusive bits of nearly massless matter and are extremely difficult to detect because they have no electrical charge.

The ZGS, using a so-called "horn of plenty" and new spark chamber equipment, is expected to produce from two to 12 interactions of neutrinos with matter every hour. This will make the nuclear machine the world's most prolific producer of neutrino information.

The neutrino experiments are possible because the ZGS will accelerate a more intense beam of protons than any other high energy proton machine, although very closely rivaled by the Princeton-Pennsylvania accelerator, which also went into operation this year.

The ZGS, built for the Atomic Energy Commission, is being used for nuclear research by scientists from a group of midwestern universities as well as from the Argonne staff.

• Science News Letter, 84:372 Dec. 14, 1963

TECHNOLOGY

Army Order: 'Sound On!'

➤ EVERY AMERICAN infantryman soon will wear on his helmet a new radio device putting him in constant contact with his master sergeant's voice.

While the troops are not expected to embrace such an arrangement enthusiastically, it will eliminate one of the greatest hazards to a rifleman in combat.

It may also lead to sweeping changes in the tactics of small groups of infantrymen.

Combat radio sets are not new. The walkie-talkie of World War II fame and the special radio helmet introduced six years ago, however, are so heavy and awkward that only a few key men, such as platoon leaders, used them regularly.

The new set, shown publicly for the first time at the Association of the U.S. Army's annual meeting in Washington, D. C., combines the latest in transistors, printed circuits and new materials. The result is a nine-ounce receiver and a 15-ounce transmitter.

Leaders of platoons and squads, the smallest infantry units, will carry the transmitters as well as the receivers. The regular foot soldier will have just the receiver, which is the size of a pint flask and can be clipped on the helmet or stuck in a pocket.

Thus all members of a squad no longer need remain within sight of their leader to get commands. In the past a single enemy shell could wipe out an entire bunched-up squad.

And squad leaders no longer need to stand up and wave their arms to signal their troops.

The sets were designed by the Army Electronics Research and Development Laboratories, Fort Monmouth, N. J., and are being built by Delco Radio Division of General Motors Corporation.

The receiver has 13 transistors and seven diodes mounted on printed wiring. Dry cell batteries, smaller than those used in pen-sized flashlights, can power it continuously for 24 hours without replacement.

The hand-held transmitter also can be stowed in the pocket. It is powered from a small pack-type battery.

The transmitter has two power settings to conserve batteries and cut down possible interference with other radios operating in the area. The lower setting provides a range of 500 yards and will be used for communications within the squad.

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Questions

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MEDICINE—What hormone may soon be used to prevent new tumors from forming? p. 376.

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