

NUCLEAR PHYSICS

Missing Particle Sought

Theory of the existence of a negative proton is based on the orderliness of nature as shown in the case of positive and negative electrons.

► **WANTED:** A missing atomic particle, the negative proton.

This missing particle look-out was broadcast by Drs. Julius Ashkin, Theodore Auerbach, and Robert E. Marshak, University of Rochester physicists, at the meeting of the National Academy of Sciences in Rochester, N. Y.

Because there are both positive and negative electrons, although only positive protons are known so far, the scientists suggest nature, to be symmetrical, should also have a negative proton. Such a particle might be detected by exposing photographic plates to cosmic rays at very high altitudes reached by balloons.

"Electrons have been known for a long time to exist in two different varieties of the same mass but opposite charge," the report said. "The more abundant electron has a negative charge and is found in atoms in the region close to but primarily outside the central nucleus. The less abundant positively charged electron is not a permanent constituent of the atoms as we know them but is produced in a variety of processes taking place in the nucleus or in the immediate surrounding region.

"When brought into close proximity the two may disappear or be annihilated in a single act, producing simultaneously two quanta of light. Thus a positive electron in the presence of matter containing negative electrons has only a transitory existence and eventually suffers annihilation.

"Protons so far found in nature are all of one variety. These particles, which form one of the fundamental constituents of nuclear matter, are of positive charge and of mass approximately 2,000 times the mass of an electron. They have in common with electrons the feature of possessing an intrinsic spin or angular momentum equal to one half a natural unit. This numerical identity in the spin has long since led to

speculation on possible further analogies between electron and proton. It is of interest to find out if a negative proton exists.

"A negative proton would be a particle of negative charge, of mass equal to that of an ordinary positive proton and capable of undergoing an annihilation process with the more abundant positive proton. For this type of annihilation process one finds by theoretical estimation that the most likely end products are two new charged particles known as mesons.

"The charge on these resulting mesons make their detection possible by the now standard technique of examining nuclear events in very sensitive photographic emulsions. Since the positive proton which is one of the partners in the annihilation event forms a part of the nucleus of an atom in the emulsion there will also be other charged particles emitted as a result of the shock of the annihilation. The mesons, however, will be moving with much greater speed than the emerging nuclear constituents and will leave noticeably different tracks, thinner than usual, in the photographic emulsion. One would therefore expect to find an explosive event in the emulsion which starts with the entry of a very fast charged particle, the negative proton, and results in the production of only two fast moving charged particles, which are mesons, accompanied by some number of slowly moving charges.

"Because of the necessity to conserve momentum in the annihilation event the three fast tracks would all lie in the same plane forming an inverted Y-shaped figure with the angle between the two mesons somewhat greater than 90 degrees on the average. If this characteristic phenomenon were found in photographic plates we would have evidence for the existence of the negative proton."

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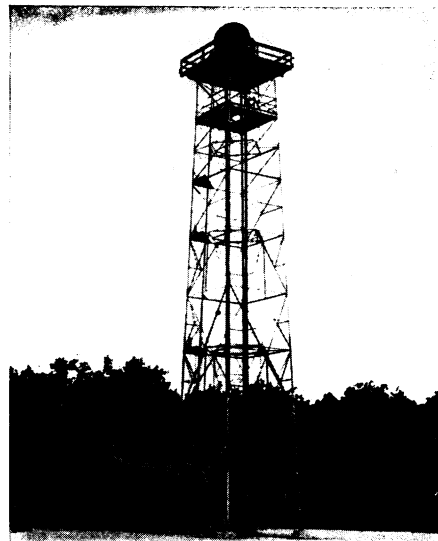
METEOROLOGY

Radar Spots Coming Storm

► **STORM** areas six to eight hours away may be detected by special radar equipment mounted atop a 100-foot tower at the Army Signal Corps engineering laboratories, Fort Monmouth, N. J. This new radar is designed to give weathermen and pilots warning of storms within a 200-mile radius.

The detection of storm clouds far beyond

normal vision by radar is not new. That such clouds will reflect radar pulses back to the transmission antenna of the radar equipment, which also acts as a receiver, was first noticed by observers on radar-equipped B-29s en route from Pacific islands to bomb Japan during the war. Since then radar has been used both by military



RADAR WEATHER TOWER—
Advance storm warning is obtained by this detector at the Signal Corps Engineering Laboratories, Fort Monmouth, N. J.

and civilian weathermen in studies of weather movements and in forecasting.

Tower-mounted, this new installation has a wider range than other ground-based equipment but, more important, the equipment used has been arranged to accentuate the storm signals and to permit their detection at relatively great distances. Earlier radars had a tendency to pick up signals from nearby rainstorms, thereby masking indications from enemy targets on the far side of such storms.

This apparatus consists of a high-power transmitter, a large eight-foot parabolic antenna, and a sensitive radar receiver. The signals received from any storm area within range of the radar can be displayed on several types of oscilloscopes which contain cathode ray tubes similar in appearance to those on television receivers. The signals can "paint" electronically a picture similar to a relief map of the area or give a vertical cross-section of the storm.

In both cases the radar set introduces its own "scale of miles" on the map so that the operator can quickly and simply estimate the distance of the storm from his station. Satisfactory operational tests have already been made with the new installation.

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Electric generators at Grand Coulee Dam in Washington state will have a combined capacity of 2,000,000 kilowatts when all 18 are installed; 10 are already in use.

About 60% more *turkey poult*s were hatched in the United States this year than in 1948, which means that turkeys should be plentiful for the coming holiday markets.