

THE ANTI-PROTON

AT the American Physical Society Convention held in Seattle recently, Dr. Marcel Schien of the Chicago University reported that he observed a peculiar ray track through the pack of photographic plates sent in a balloon up to 10,000 ft. to be exposed to powerful primary cosmic radiation. The track was a bundle of slim V's made by pairs of negative and positive electrons, and there was no trace of larger charged particles (e.g., protons) usually present. His tentative conclusion is that some particles had hit the film pack with energy of the order of 10^{15} electron-volts.

This energy is more than 1,500,000 times the energy of the particles shot out by the University of California's powerful bevatron, and 50 million times the energy of splitting uranium atom in an atomic bomb. What had caused the ray track is most probably an illusive particle called an anti-proton (negative proton), which theoretical physicists have long guessed about, but never observed. Dr. Schien believes that it hit an ordinary proton in the aluminium

wrapping of the film pack and that the two particles annihilated each other, turning all of their mass into energy. The peculiar track was made by the enormously powerful gamma rays thus produced, which created electron-positron pairs as they streaked away from the site of the collision.

Dr. Schien has no theory about the possible origin of the anti-protons. But according to him it is quite possible that remote stars may be made of "reversed matter", whose atoms have negative anti-protons in their nuclei and positrons (positive electrons) revolving around them. The reversed matter would send out the same kind of light as ordinary matter. It would behave itself normally as long as it stayed there. But if particles from an anti-proton star should wander into a region, like the earth's atmosphere, where the other kind of matter abounds, an encounter of the above type is quite probable, resulting in the production of gamma rays.

ATOMIC BATTERIES

A new method which, makes it possible to convert atomic energy directly and simply into small but usable quantities of electrical energy sufficient to operate a transistor has been announced by the Radio Corporation of America.

The new type of battery consists of a radioactive source to which is coupled a wafer of semi-conducting crystal (germanium or silicon). An impurity material has been alloyed into the crystal to form a junction. The junction is similar electrically to those used in a junction transistor, but is considerably larger, with an area of 1/20th of a square inch.

In the battery, 1/300th of a c.c. of radioactive strontium is spread in a thin layer against the junction wafer. The layer of strontium bombards the semi-conducting crystal wafer with several billion electrons per second. As the electrons penetrate the wafer, they release many more electrons, an average of 200,000 for each bombarding electron. These released electrons flow across the wafer's junction producing a voltage which can be applied to an electronic circuit and cause a current to flow.

When connected to the transistor oscillator circuit, the battery's 1/5 volt potential provides a current of 5 microamperes, an output of approximately one millionth of watt. The best efficiency of energy conversion so far obtained exceeds 1 per cent., i.e., the ratio of useful electrical power developed by the battery is at least 1/100th the energy of the beta particles as they leave the radioactive source. The greater part of the original energy is lost as heat in the crystal wafer. As present techniques are refined, an efficiency of 10 per cent. appears to be a reasonable goal for such devices. But greater power can be achieved by increasing the present quantity (50 millicurie) of strontium-90 or by placing a number of such units in a single container.

An aspect of atomic batteries that has yet to be determined accurately is the extent of the effect of the beta radiation on the crystal wafer: for it is well known that the crystal structure of any substances is gradually damaged by bombarding electrons. Further research would seem called for to minimize these effects.
