PHYSICS

Atoms and Cosmic Rays Yield New Science Knowledge

Annual Report of Bartol Research Foundation Tells Of Many Programs of Research Now in Progress There

LATEST news from the interior of the atom and the depths of space are blended in the annual report of Dr. W. F. G. Swann, director of the Franklin Institute's Bartol Research Foundation laboratories. These laboratories are devoted entirely to the study of the nuclei of atoms and of cosmic radiation.

Perhaps it seems strange that atomic cores and cosmic rays should both be chosen as subjects for a single research program.

Their connection, however, is quite intimate. First, the various kinds of cosmic ray particles are known to be identical with those particles shot out by the nucleii of radioactive atoms. Second, one way to learn about nuclei is to bombard them with high speed particles like cosmic rays; or, by watching what happens when cosmic rays themselves hit the atomic cores.

Some of the researches which Dr. Swann described were:

1. A cyclotron for nuclear investigations is being installed in collaboration with the Franklin Institute's Biochemical Foundation.

2. Dr. L. H. Rumbaugh has succeeded in separating the isotopes of lithium, thereby producing the lightest solid ever found at ordinary temperatures.

3. Dr. G. L. Locher and C. L. Haines are testing the Einstein mass-energy equivalence in the process whereby a gamma ray photon is converted into a pair of oppositely charged electrons. Verification has been established within a few per cent. The remaining discrepancy may furnish vital information about nuclear behavior.

4. Results of the recent stratosphere flight confirm Dr. Swann's theory that most of the observed rays are secondary particles knocked out of atoms of the atmosphere by the primary rays. Data from the balloon also shows that the rays are strongly deflected by the earth's magnetic field.

Data From Balloons

5. Dr. T. H. Johnson will soon send up unmanned balloons for cosmic ray data in the stratosphere. The balloons and their equipment will probably be lost but in the meantime will have automatically radioed back the desired information.

A feature of this equipment is a novel type of power plant for supplying high voltage to the cosmic ray counters. The entire equipment dangles on a string from the balloon. It will be falling slowly, however, during the entire flight, like the weight in a grandfather clock. The energy thus generated is used to drive a compact electrostatic machine.

6. An automatic cosmic ray recording equipment was sent on shipboard to Valparaiso, Chile, and return, by Dr. Johnson. The results reflect local variations in the strength of the earth's magnetic field.

7. Drs. G. L. Locher and L. H. Rumbaugh are examining photographic plates which were carried to the stratosphere on the recent flight. High speed electrical particles produce tracks in the photographic emulsion which can be seen with a microscope. Different kinds of particles can be distinguished by the kinds of tracks which they leave. According to Compton and Bethe most of the rays at high altitudes should be alpha particles, but these plates say that the number of such particles is less than one per cent of the total. At sea level few if any of the rays are protons. The plates also suggest that a certain small percentage of the cosmic ray energy at high altitudes is conveyed by neutrons.

8. Examination of rays which have reached the ends of their paths has shown that very few of them are protons, at sea level. (Dr. Swann, W. E. Ramsey, Dr. C. G. and D. D. Montgomery.)

9. The total amount of ionization produced by a cosmic ray in passing through a gas was studied by Dr. W. F. G. Swann and W. E. Ramsey with a combination of ionization chamber and Geiger counters. Dr. W. E. Danforth is studying the primary ionization (number of atoms shattered per centimeter of path by the original ray, not counting branch tracks) by determining the efficiency of Geiger counters at different pressures.

10. W. E. Ramsey has shown that at least 75 per cent of all nuclear bursts accompanying cosmic radiation are produced by photons, not by charged particles.

11. It has been customary to say that there were two distinct types of cosmic-ray-nuclear bursts, those in which only a few particles are ejected, and those involving a very large number, thousands even, of particles. Dr. and Mrs. Montgomery have shown that no such distinct classification is possible, that any size of burst may occur, and that they probably all arise from the same kind of process.

Science News Letter, April 25, 1936

AVIATION-FORESTRY

Bombing Planes to Fight Fires with Chemicals

BOMBING planes to stop fire and destruction, rather than cause it, are to be experimented with by the U. S. Forest Service. Ordinary explosive bombs of the military type will be tried for their possible usefulness in throwing dirt on fires, retarding their spread until ground crews can arrive. Chemical bombs, particularly those containing the "froth" type of fire extinguisher, are considered promising, at least in the combating of small fires.

Another possible usefulness of bomb-dropping planes is to deliver food and supplies to ground crews of fire-fighters in isolated positions, as planes have been used to drop food and medical supplies to towns cut off by disaster.

Science News Letter, April 25, 1936