PHYSICS

Six Hundred Billion Volt Cosmic Rays Predicted

Great Energy Can Not Come From Exploded Atoms, Says Prof. Arthur H. Compton, Now in England

WHERE DO the enormous energies observed in cosmic rays come from? Newest of all problems in atomic science is to figure out how the ray energy is released.

Cosmic rays have been observed, for example, so energetic and piercing that they pass through nearly 2,000 feet (600 meters) of seawater.

Prof. A. H. Compton, American Nobelist now at Oxford University, England, has published an estimate *Nature* (Jan. 12), that some of the most piercing cosmic rays have energies of 600,000,000,000 electron volts.

Such great evidences of energy, Dr. Compton points out, cannot come from the release of the energy equivalent to the mass of most atoms known on earth.

It would require atoms from 100 to 1,000 times as heavy as those of hydrogen to produce such rays by exploding. Heaviest of all atoms on earth are those of uranium, weighing only about 238 times as much as hydrogen.

Dr. Compton pictures such rays as primary ones coming in from outer space and not as secondary ones created in the earth's atmosphere. They cannot, definitely, be photons of radiations.

Photons are the little so-called packets of radiation, of which ordinary light is only one kind, which have been suggested as the cause of cosmic rays. Dr. Compton's 600,000,000,000 volt cosmic rays, by contrast, are thought to be electrified particles.

Those scientists who like to retain the idea of cosmic rays being photonic in nature have speculated on complex chain reactions within matter as cosmic rays pierce it. Such chain mechanisms seek to explain how super-penetrating power of the rays is possible with photons far less energetic than observations would indicate.

Just before Dr. Compton's report, and also in *Nature*, H. J. Bhabha, Indian physicist now at Cambridge, England, described such a hypothetical chain mechanism.

Physicist Bhabha pictures an incoming cosmic ray photon striking atoms of matter and turning into a neutron with little loss of energy. The neutron, like a microscopic billiard ball, flies forward with great energy and with little ionizing power. In traveling through a yard of lead, Mr. Bhabha estimates, some 25 such interchanges between photons and neutrons would occur; the one turning into the other alternately.

This scheme would lower materially the loss of energy as a cosmic ray goes through matter, for about half the time it spent in the material it would be in the form of neutrons and lose little energy. Thus the final power of the ray, as measured by its ionization, would be much more than its real energy if such a mechanism were not acting.

Says Dr. Compton discussing such chain mechanisms, "The apparent absence of any possible mechanism whereby such a chain reaction might be effected seems sufficient to rule out such suggestions."

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GEOGRAPHY

U. S. Largely Unmapped; Completion of Work Urged

AMERICA may not be an unmapped wilderness any longer, but it is still unmapped to a very large extent. So much is indicated by a new report of the National Resources Board on the subject of topographic mapping in the United States.

Only 26 per cent. of the 3,050,000 square miles in the United States proper can be considered adequately mapped, the Board states. An additional 24 per cent. has been mapped, but so long ago and with such unsatisfactory instruments that the work must be considered inadequate. The remaining 50 per cent. of the area, lying mainly in the Northwest, Midwest and South, is wholly without topographic mapping of any kind.

The Board has drawn up a plan for the completion of the national mapping task, which it estimates can be carried out in ten years. Based on the urgency of the need in various parts of the country, zones of first, second and third priority have been laid out. It has been estimated that the cost of this ten-year topographic mapping plan will be $117,531,000, which averages out to about eight cents an acre. Airplane photography is expected to speed the work and reduce its cost.

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BIOLOGY—AVIATION

Spores of Fungi Captured In Arctic Upper Air

HIGH over the arctic wastes, the air is charged with pollen grains, spores or fruiting bodies of fungi, and other microscopic witnesses of plant life, borne from afar on world-sweeping winds. Collections of these, made during the Lindberghs' Arctic flight last summer, have been subjected to long and careful examination, and are now described by Fred C. Meier of the U. S. Department of Agriculture (*Scientific Monthly*, January).

Col. and Mrs. Lindbergh were not the first collectors of living dust in the upper air. Many other scientists, including Mr. Meier himself, have emulated the old woman of the nursery rime who went aloft "to sweep the cobwebs out of the sky," and some of them have captured germs of life at altitudes up to nearly 20,000 feet. The outstanding importance of the Lindbergh flight-collections are that they represent the "farthest north" of high-altitude life.

The collecting began as soon as the Lindberghs left the coast of Maine, and continued as they soared over Labrador and into the Arctic, over Davis Strait and the desolate ice fields of extreme northeastern Greenland, and thence across the northern end of the Atlantic finally to Denmark.

The glass collecting slides, suitably coated with a sticky substance to catch whatever minute particles might be afloat high in the air, were elaborately protected inside a carefully worked-out protecting case termed for convenience the "sky hook." It was so arranged that the slides were kept sterile until the moment for most favorable exposure, then opened for the desired period—usually upwards of an hour—and then

closed and tightly sealed to prevent any other objects from leaking in. The sealed carriers were sent to Washington, where Mr. Meier has examined them.

As was expected, the spores, pollen grains, bits of fungal thread and scraps of non-living material were most numerous at the two ends of the long flight, and scarcest over the high-Arctic middle of the horseshoe-shaped coarse. But nowhere did the slides fail to show up some hundreds of scientific trophies.

Some of the fungus spores are recognizable as familiar genera, a part of which are of fungi that cause plant diseases. Others are as yet unrecognized, but botanical specialists are at work on them, as well as on the pollen grains, in an endeavor to identify as many as possible of the plants that launched their propagating bodies on such a long air voyage.

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PHYSIOLOGY

Sleeps Three Days at Time; Woman Puzzles Doctors

STRANGE sleeping habits of Miss Eleanor Coburn, 93-year-old American-born resident of Wimbledon, have puzzled physicians.

For approximately three days Miss Coburn sleeps almost continuously. For another three-day period she remains awake almost continuously, although lately she has had a little sleep during her waking periods also. Interviewed in London just after she had awakened from fifty-four hours of sleep, she seemed extremely alert, intelligent and vivacious.

This pink-cheeked old lady, who will be 93 next March 12, is a picturesque figure in the bonnet and mittens of grandmother's or great-grandmother's time. She was a brilliant amateur pianist and now conducts an extensive correspondence with friends in many parts of the world, including America. She formerly lived in Boston, Mass., but left the United States finally over fifty years ago.

She started her strange method of sleeping and waking in alternate three-day shifts about four years ago, soon after becoming an invalid. Her sleeping habits are a mystery to her physician, as she apparently suffers from no mental or physical disease, although she shows a gradually increasing physical weakness.

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PHYSICS

"Shadow" of Earth Explains Cosmic Ray Variation

CONFIRMATION for the idea that cosmic rays consist, in a large measure, of charged particles streaming down on the earth from outer space was presented before the Franklin Institute in Philadelphia by Dr. Thomas H. Johnson, assistant director of the Bartol Research Foundation, Swarthmore, Pa.

Dr. Johnson recently returned from a cosmic ray expedition to Mexico, where his party climbed the 14,000-foot peak of Nevado de Toluca, fourth highest mountain in the country.

Using heavy and elaborate apparatus which measures the intensity of cosmic radiation as it varies from zenith down to horizon, Dr. Johnson detected a greater intensity from the south than from northern directions. These results tie in with his previous discovery that cosmic ray intensity also is greater from the west than the east. Both results are explainable by previously developed cosmic ray theories of Prof. Carl Stoermer, Dr. P. S. Epstein and Abbé Lemaître (developer of the expanding universe concept) and Dr. M. S. Vallarta.

To explain the north and south difference of cosmic rays is the concept that the earth casts a magnetic shadow. Says Dr. Johnson, "Due to the magnetic field and to the fact that the rays are electrically charged, the orbits are curved, and, if the earth were transparent to cosmic rays, much of the intensity which would be observed at the earth's surface would be due to rays which had previously been inside the earth. From inside the earth they would be turned back by the magnetic field into the region above the earth where they would again be turned down to the observer.

"Rays traveling such orbits as these are, of course, stopped at their first entry into the earth's surface and their absence on the remainder of their hypothetical path, appears as a complete shadow from the directions below the horizon and as a partial shadow from directions above the horizon," he added.

"The partial shadow is the more dense, according to experiment and theory, from northerly directions than southerly directions in the northern hemisphere."

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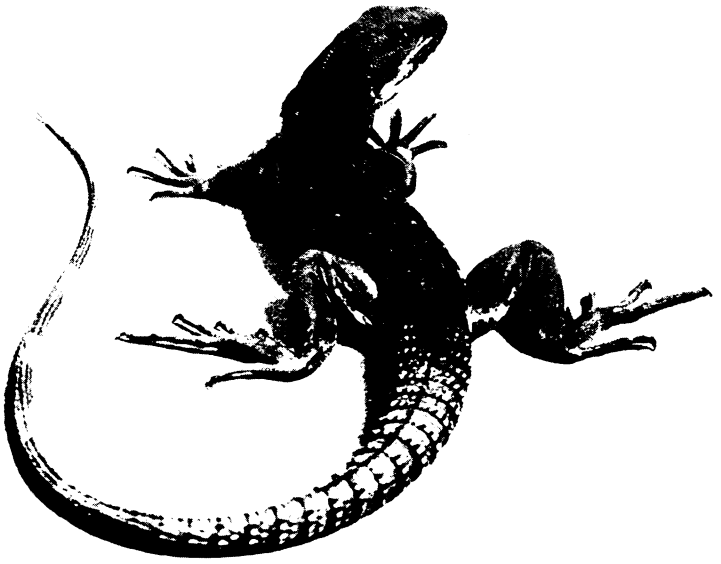

STOWAWAY *Cornelia Clarke Photo.*

A grocer in Grinnell, Iowa, was unpacking a bunch of bananas. He heard a slight rustling, and jumped back, expecting the conventional monstrous hairy spider; but what came out was this bright-eyed, harmless, vegetarian young iguana. From blunt nose to tip of tapering tail, "Iggy" is just an inch under two feet long.