

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.

Science News Letter, January 26, 1935

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 rhyme 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