PHYSICS

Neutron Must Be Lighter; New Hope For Atomic Energy

"Merry-go-Round" Atom Gun Shows That Particles of Matter Could Break Up Explosively

NEW HOPE of obtaining energy from the atom and convincing proof that the neutron, important although youthful building block of matter, is lighter than its generally accepted mass figure, have resulted from the latest experiments of Prof. E. O. Lawrence and his associates working with the unique magnetic "merry-go-round" atom gun at the University of California.

The University of California scientists, having faith in their own previous experiments, have continued to devise new and conclusive proofs that the mass of the neutron is 1.0003. Heretofore the whole scientific world was rather thoroughly convinced that this most important constant had the value 1.006. This higher value was proposed by the discoverer of the neutron, Prof. J. Chadwick of Cambridge, and subsequent work seemed to verify it.

Less than a year ago Prof. Lawrence and Drs. Stanley Livingston and M. Henderson, working with deutons (nuclei of heavy mass two hydrogen) made by Prof. G. N. Lewis, found that the deutons apparently split up when bumped hard and gave out more energy than was put in. This could be true only if the neutron were lighter than 1.006.

Such a result was so startling that it was not generally accepted. Physicists offered all possible explanations of how it might be wrong. But the Berkeley workers now announce in the *Physical Review* a further experiment which shows they were right all along.

They bombarded two targets with exactly similar protons of about 3,000,000 volts energy accelerated in their atom gun. One target had ordinary hydrogen in it and nothing happened. The other target was just the same except that heavy mass two isotope (deutons) replaced the ordinary hydrogen. From this target great showers of protons and neutrons were emitted. These often had more energy than the impinging protons. Analysis revealed that these results could be explained only if the neutron's mass is less than 1.0003.

The method is so convincing that the conclusions will be accepted everywhere in spite of the jolt they give the preconceived notions about the structure of the nucleus. First, they mean that the beryllium nucleus, the deuton or heavy isotope of hydrogen nucleus, and the proton are all unstable in the sense that they could break up into parts with explosive violence. They do not and scientists have no notion why.

Some day physicists hope to understand the process and then there will be a chance of obtaining energy from the nucleus. For example, the small difference between 1.006 and 1.0003 means that a pound of heavy hydrogen could give off more heat than the burning of five thousand tons of coal.

Science is still far from such a goal but the nearest approach is in these recent experiments of Prof. Lawrence and his co-workers. They have boosted the efficiency of such processes many thousands of times during the past two years. They report that one proton in four thousand is able to disintegrate a deuton into a proton and a neutron and five million volts. The scientific significance of this high yield is much more important than its possible practical application.

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OPTICS

Special Spectacles Permit Clearer Submarine Vision

SPECIAL underwater spectacles that allow lifeguards and divers to see clearly beneath the water's surface have been devised by Robert E. Cornish of the University of California's Institute of Experimental Biology.

The normal human eye, developed for vision in air, is a very poor instrument under water as every swimmer knows. The reason is that the contact of water with the cornea robs the eye of about two-thirds of its refracting power. This trouble is avoided in divers' outfits by keeping water away from the eye and looking through a flat window of glass. If the glass is wet by condensation or splashing it loses its advantages.

Mr. Cornish considered the normal eye under water as an imperfect eye and designed lenses to correct it. He has constructed two such lenses, and finds excellent underwater vision with them, news print being read without difficulty with one of them, while without the lenses it is not even possible to see that the page contains printing.

Such lenses promise to have value in saving life, where it is necessary to dive for a victim of drowning. Lifeguards now must grope for the victim and must depend largely on sense of touch. Precious moments thus lost have often resulted fatally for the victim.

One type of lens has the advantage that one can see tolerably well either in water or in air. A more rugged construction however is good only under water and is perhaps best used on one eye only. In clear lakes the wearer may see many yards.

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ARCHAEOLOGY

New Discoveries Made At Monte Alban

ENTERING a stone tomb in the graveyard of Monte Alban, where a treasure tomb was discovered in 1932, Mexican archaeologists have made their first big find of the present season.

The tomb contains a strange prehistoric Indian burial, guarded by figures of a big-nosed Indian god and enriched by more than eighty objects such as incense burners, plates for food offerings, and other tomb furnishings.

A single human skeleton was stretched the length of the cell-like tomb, when the archaeologists entered. At the man's head lay three heaps of human bones painted red. These bone heaps are pronounced remains of three men re-buried in this manner long after death. The inside walls and the front of the tomb were also painted red.

Five ornate funerary urns of Zapotecan Indian style, all exactly alike, were in the tomb. Each one is in the form of a big-nosed Zapotecan god, wearing a headdress of flowing plumes, and an ear of corn on either side of the brow.

The tomb is the fortieth opened in three seasons of work at Monte Alban, and richest in the number of articles contained since No. 7 was excavated.

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