PHYSICS

21,000 Photographs Help Measure Energy of Atoms

ATOMS SEEM to have within their hard and heavy central cores a large variety of energy stages, two Rice Institute scientists have discovered at Houston, Texas, after taking more than 20,000 photographs in atom-smashing experiments.

In the laboratory of Prof. L. M. Mott-Smith and Dr. T. W. Bonner, atoms were made to shoot off tiny particles called neutrons. From the way these neutrons collided with neighboring gas atoms it appears as if the core, or nucleus, of an atom may be likened to a fortress firing projectiles at the enemy. The scientists with their measuring instruments were the "enemy."

Differ in Energy

The observers in the "range of fire" found that all the atomic projectiles did not strike with the same energy. Some were powerful as if from 16-inch guns; others were more like rifle fire. Within the atom, it is believed, the different strengths of the "guns" correspond to the different states of energy which drive off the atom particles.

Important to science is the discovery, for instance, that the light and comparatively rare element beryllium has within its nuclear core 20 or more different steps of energy; 20 different atomic "guns" of varying caliber. Scientists have been thinking of energy within the atom as having only a few levels. The new discovery is expected to aid the understanding of how matter is put together.

To make the atoms shoot off the various particles and so make possible some estimate of the energy forces producing them, Prof. Mott-Smith and Dr. Bonner bombarded targets of calcium fluoride, boron and beryllium with alpha particles, or helium nuclei, like those given off by radium. When they did this the atoms of the target liberated non-electrical particles called neutrons. These neutrons shoot off into a chamber filled with gas atoms where they could collide with the gas atoms present. This impact was the "battlefront" on which the scientists watched to learn the atomic secrets.

Through the quartz window in their apparatus, called a Wilson cloud chamber after its inventor Prof. C. T. R. Wilson of England, the collisions of the neutrons and the gas atoms were photographed. As the neutrons hit the gas atoms they drove out positive particles that physicists call protons. The range of the proton tracks is a measure of the neutrons' energy; and in turn, a measure of the energy forces within the atoms of the target.

21,000 Obtained

Some 21,000 atomic "battlefront" pictures were obtained, report the Rice Institute scientists. Nine thousand snapshots were made when the calcium fluoride target was giving off the neutrons, 4,000 were taken with boron as the target, and 8,000 more when beryllium was used.

In no case were the neutrons given off in constant energy groups. The range of the recoil particles—the protons—fell, instead, into different groups. Some would bounce back a certain distance; others would travel farther before stopping. The range observed is a measure of the neutron "bullets" just as the penetration of a real bullet into a block of wood is a measure of its energy.

Analyzing thousands of photographs, the scientists found that in fluorine there were five different groups of neutrons emitted. The more energetic was equivalent to 2,500,000 electron volts energy.

For boron eight groups of neutron energies were found. The strongest was equal to 4,160,000 volts energy. For beryllium there were over 20 groups and the maximum energy detected was 11,700,000 volts.

The experiments of Drs. Mott-Smith and Bonner are published in the *Physical Review*.

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VOLCANOLOGY

Stromboli is "Safe" Volcano Because of Its Eruptions

STROMBOLI, island volcano off the coast of Italy which has lately been threatening with lava flows the vineyards on its slopes, is nevertheless rated as one of the "safest" of the world's volcanoes. Paradoxically, it is seldom dangerous because it is almost constantly in eruption, growling and sputtering and roaring away, throwing out incessant small quantities of ash and pumice, and in general expending its energy as fast as it accumulates, instead of storing it up in a long, suppressed geologic grouch, ending in a violent and destructive blowoff, after the manner of its better-known mainland neighbor, Vesuvius.

The action of Stromboli is not, however, incessant and constant, like a well-regulated fountain in a park. It is rather a succession of real explosive volcanic eruptions, but spaced apart by minutes instead of years or centuries.

Before the present outflow of lava there were others: the most recent in 1930; back of that, lava eruptions in 1889, 1891 and 1907. But they were all comparatively mild affairs, confining their mischief generally to the destruction of vineyards. In all recorded history, Stromboli has never been charged with the taking of one human life.

Stromboli has a neighbor-volcano, also an island-former, that bears the distinction of being the "type" specimen of its genus; that is, its name has become the name of all mountains of its kind. It is called Vulcano.

This is the mountain that the ancients believed formed the chimney of Vulcan's under-earth smithy. Here the lame, swarthy artizan-god forged thunder-bolts for Jupiter, while his pretty wife Venus, tired of her marriage-of-convenience, was out flirting with that handsome but dangerous fellow, Field-Marshall Mars.

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