

nuclear disintegrations and cosmic radiation, especially in balloon flights and for observations on high mountain peaks where it is with only the greatest of difficulty that the ordinary, heavy type of equipment can be set up.

Dr. Locher expressed the belief that one of the greatest benefits to be derived from cosmic-ray studies will be the eventual correlation of cosmic-ray nuclear disintegrations with those produced

by laboratory means. He showed cloud chamber photographs of some of the 185 cosmic-ray disintegrations he has obtained in paraffin, boron, and lead. Those from paraffin show paths of massive nuclear particles that do not resemble anything produced by radioactivity or by laboratory disintegrations. An explanation of their origin awaits further investigation.

Science News Letter, May 9, 1936

PHYSICS

New Electric Device Detects Distances Less Than Atom Size

Intense Audible Sounds Found to Produce Light, Physicists Are Told; Eruptions in Atoms Described

SCIENCE'S first chance to make measurements directly of individual atoms, which are the smallest particles of the elements, promises to come from a new ultra-precise measuring instrument.

An electric ultramicroscope capable of detecting displacements of less than a billionth of an inch with an accuracy to a few per cent was described at the American Physical Society meeting in Washington by Prof. J. C. Hubbard of The Johns Hopkins University. It is believed the apparatus will be applicable to studies of atoms by direct observation.

The detecting apparatus, said Prof. Hubbard, is an electrical circuit containing a quartz plate resonator roughly similar to those used in broadcast transmitters for controlling the frequency of radio signals.

The quartz plate, in the fashion used by Prof. Hubbard, is extremely sensitive to small frequency changes. "A number of applications of this sensitivity to frequency variation suggest themselves," declared the Johns Hopkins professor, "perhaps the most interesting applying to measurement of small displacements of an ultramicroscope plate in the exciting circuit."

Ten-Billionth of an Inch

Displacements of 10^{-9} cms. (less than a billionth of an inch) have been measured to a few per cent, the accuracy depending upon the absence of mechanical disturbances. By suitable mechanical insulation it is expected that displacements less than one ten-billionth of an inch may be measured.

"Such distances," Prof. Hubbard explained, "being much smaller than the dimensions of individual atoms, it is believed that a number of problems of great interest in atomic and molecular physics will now be open to study by direct observation."

Eruptions In Atoms

A phenomenon corresponding to microscopic volcanic eruptions in bits of tungsten ribbon covered with thorium, and used in vacuum tubes, has been discovered at the Bell Telephone Laboratories, New York City.

In reporting to the American Physical Society, A. J. Ahearn and J. A. Becker described their studies of these thorium eruptions with an electron microscope.

On heating the thoriated tungsten filaments to temperatures as high as 4,000 degrees Fahrenheit, the Bell Laboratory scientists found that the filament surface was covered with little "active" areas which erupted and migrated over the surface of the pockets of thorium.

Two Trillion Atoms

From measurements of the currents in their equipment they estimate that about 50 billion thorium atoms are involved in such eruptions. Each little pocket of thorium, they estimate from calculations, contains from ten billion to two trillion thorium atoms.

The studies were made to determine, if possible, the process whereby the thorium atoms are distributed over the tungsten surface of the filament. This knowledge is basic in the field of filament emission in radio and other vacuum tubes.

Sound Creates Light

Intense audible sounds have been found to produce visible light in fourteen different liquids in the spots where cavitation occurs, said Dr. L. A. Chambers of the University of Pennsylvania Medical School.

Cavitation is the phenomenon occurring in water, for example, at the blades of swift-moving ship's propellers. Holes or empty spaces are created in tiny spots within the fluid. These evacuated spaces collapse suddenly and the liquid comes together with an impact which causes a high, momentary increase in pressure. The resulting effect in the case of propellers is a pitting and erosion of the metal surfaces. Steam turbine blades face the same difficulty.

Dr. Chambers creates the cavitation holes in his experimental liquids by the intense audible sounds with frequency ranging from 1,000 to 9,000 cycles per second.

In the regions where the cavitation was occurring he found that visible light is emitted by the liquid. An adequate explanation is still lacking but it seems probable that the atoms of the fluid are sufficiently excited in the process to emit light.

Science News Letter, May 9, 1936

*New Edition
Completely Revised
Up-to-the-Minute*

**The ROMANCE
of CHEMISTRY**
by WILLIAM FOSTER

This standard manual on chemistry is now thoroughly revised and brought abreast of the latest developments. Ample exposition is given to chemical theory but the volume's chief value is in its emphasis on chemistry's practical applications in all branches of industry, in agriculture, the household, medicine, etc. A new chapter is devoted to archaeology and much new material on the structure of matter, electrons, radium, vitamins, glandular secretions, heavy water, etc., has been added.

Illustrated \$3.00

At All Booksellers

**D. APPLETON-CENTURY
COMPANY**

35 West 32nd Street, New York