PHYSICS

Xenon Bubble Chamber

Physicist finds that gamma rays, invisible and uncharged, can be detected by tracks formed when they collide with atoms of xenon in the new bubble chamber.

➤ SCIENTISTS are using a new device to picture the fleeting tracks of atomic particles.

Just as bubbles formed in beer, root beer or champagne can be photographed, bubbles formed from reactions when high-energy gamma rays penetrate a xenon-filled chamber can be pictured.

Xenon, a rare element that is liquid at room temperature, was chosen because of its high density and atomic number, and because it is not poisonous or corrosive.

Successful operation of a bubble chamber filled with xenon is reported by Drs. Donald A. Glaser, J. L. Brown and M. L. Perl of the University of Michigan.

Xenon's advantage is that it will show the tracks of uncharged gamma rays as well as of charged atomic particles. Gamma rays are the highly dangerous radiation of very short wavelength emitted by the cores, or nuclei, of atoms when they decay radioactively. They are the most feared of atom bomb radiations.

They are also the most elusive of nuclear radiations, but can be detected in the xenon chamber by the electron-positron pairs they create. From the diverging tracks of these particles, one positively and the other negatively charged, energies and paths of the invisible gamma rays can be calculated.

The xenon in a bubble chamber could be mixed with a hydrocarbon so that charged atomic particles might leave their tracks by brief flashing lights as well as by bubbles, the scientists report in the *Physical Review* (April 15).

The new instrument, an improved version of the bubble chamber, will also detect neutrons, one of the basic "building blocks" in the nuclei of atoms; neutral mesons, short-lived particles found in cosmic radiation and created by powerful atoms smashers, and almost all other atomic particles.

In addition, Dr. Glaser hopes the new chamber will reveal nuclear events not yet known, and establish the identity of particles whose existences are only suspected.

Like the bubble chamber, the xenon chamber is placed in a beam of particles while the clear liquid is held on the verge of boiling. Charged particles speeding through the chamber trigger trails of tiny bubbles an instant before the liquid boils. From photographs of these bubbles, physicists can calculate the velocities and masses of the particles.

Most important, when a bombarding particle collides with an atom in the liquid, the paths of the charged "debris" are marked by bubbles, as well.

Dr. Glaser and his associates have tested a small xenon chamber and are planning one 20 inches long. To equal it, a propane-filled bubble chamber would have to be eight feet long and a cloud chamber, famous forerunner of the bubble chamber, 4,000 feet long.

The U-M physicists hope to place the larger xenon chamber next year in a beam of particles produced by the University of California's bevatron, the most powerful

BUBBLE CHAMBER INVENTOR —Dr. Donald A. Glaser, University of Michigan physicist, is shown here with a bubble chamber, a device he developed for observing the paths of speeding atomic particles by the trails of tiny bubbles they leave in the glass-walled chamber which can be seen in the center. An improved version of the bubble chamber, using xenon as the liquid, has been operated successfully.

atom smasher in the world and the machine in which particles called antiprotons were recently discovered.

"It used to be that the bottleneck was in gathering data from atom smashers," Dr. Glaser said. "Now the bottleneck is in processing the great volume of information that the bubble chamber provides."

His group is tackling this problem, as well. They have devised a way to take data rapidly from photographs of nuclear events and feed it into one of the University's electronic computers. The machine will then calculate the velocities, directions, energies and masses of the particles involved.

More than 25 institutions in the United States are adopting the bubble chamber, and the Russians are believed to be developing the device. At the International Conference on High Energy Physics in Geneva in June, a half day will be devoted to discussing recent developments concerning bubble chambers.

Dr. Glaser's work has been supported by the University's Memorial-Phoenix Project and Horace M. Rackham Fund, by the National Science Foundation and by the Atomic Energy Commission.

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METEOROLOGY

See Weather Forecasts Resembling Tip Sheets

➤ DAILY WEATHER FORECASTS may soon show the odds, or probabilities, that a particular weather event will occur.

What the weatherman would add to present forecasts is a numerical estimate of the chances of rain or sunshine or snow.

How best to word this kind of a statement so it would be easily understood by the most people was debated by meteorologists at the American Meteorological Society meeting in Washington.

The weather experts realize a program of education will be needed. For one thing, people familiar with flat statements like "rain" or "clear" will have to learn to interpret probability figures.

People who like decisions made for them will object to having to decide for themselves whether or not to carry an umbrella when the chances of rain are fifty-fifty.

One debate centers around whether it is clearer to say "The probability of rain is 75%," or to state, "The chances of rain are three to one."

Majority opinion is that the best way will be learned only by actual tests using various wordings. It is hoped within a year on a trial basis to add a probability statement to weather forecasts for a Midwestern state.

These weather predictions will be issued using the same terms as at present. For those who are interested or could use the probabilities, a statement showing the odds of a particular weather event occurring will be added.

Because of the difficulties of getting a representative sample of opinions, asking the public for suggestions or conducting a poll to determine the most easily understood wording is considered impractical at the present time.

Both industry and the Government are making more and more use of probability theory as a basis for decision making. Actually, almost everyone uses probabilities daily in decision making, although often unconsciously.

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