

PHYSICS

Particles Get Greatest Energy From Whirligig Atomic-Gun

Fragments Fly From Explosion With More Energy Than That of Deuteron Bullets Which Tear Atoms Apart

ATOM smashing has revealed new secrets about the hidden energy of the building blocks of matter that may some day serve as power in a super-machine age civilization.

These new advances were disclosed by Dr. Ernest O. Lawrence, an American physicist, at the session of the Solvay International Institute of Physics being held in Brussels. Dr. Lawrence, with Drs. M. Stanley Livingston and Malcolm C. Henderson, his colleagues at the University of California, has also communicated his research results to the American journal, *The Physical Review*, to appear in a forthcoming issue.

The whirligig atom-gun invented by these modern alchemists has fired the most energetic atomic projectiles ever produced by artificial means. Dr. Lawrence and his collaborators forced the hearts or nuclei of heavy or double weight hydrogen, called deuterons, to whirl about in a vacuum. Twice during each circular trip these deuterons are fed more electrical energy. Finally they are stepped up to the almost unbelievable speed of 3,000,000 volts, the most energetic particles ever controlled by man.

Then these atomic bullets bombard targets of platinum, brass, wax and many other chemicals. Atomic disaster is the result of these collisions between the deuteron bullets and the target atom hearts. The fragments of these atomic explosions flying out are caught and measured. These measurements tell the physicists the story of the atomic disaster.

Fragments of one kind fly out with a speed of 5,400,000 volts. As this is 2,400,000 volts more than the deuteron bullet speed, small amounts of highly concentrated energy must have been released. These fragments, called protons, are the hearts of ordinary hydrogen atoms.

The companion fragment to the proton is called the neutron and has the same weight but no electrical charge.

This particle also flies out with an energy of 2,400,000 volts.

The California scientists have interpreted the results of the collisions from the disintegration fragments. They conclude that the deuteron bullet itself has been broken up and 4,800,000 volts of energy have been released as a result of this disaster. The deuteron has to be very close to the target atom's heart before this disintegration will occur.

Very seldom do the right conditions exist for the release of this enormous amount of energy. So seldom, in fact, that Dr. Lawrence states that the best targets gave only two disintegration protons for every 10,000,000 deuteron bullets bombarding the target. The process is so inefficient that it is only detected by very delicate scientific instruments and as yet cannot be thought of as a commercial source of power.

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ASTRONOMY

Second American Planetarium Opens in Philadelphia

AMERICA'S second planetarium, the first in the East, opened in Philadelphia on Wednesday afternoon, Nov. 1, as part of the astronomical section of the Benjamin Franklin Memorial and the Franklin Institute.

This device, a gift to the Franklin Institute by Samuel S. Fels, was made by the Carl Zeiss optical works, in Jena, Germany. It is an elaborate projection device, equipped with 119 lenses, by means of which images of all the naked-eye stars and planets are projected upon a sheet metal dome 65 feet in diameter.

For the audience seated below a realistic effect of the night sky is obtained, and the lecturer can change it at will. He may show the skies visible from any part of the earth at any time, and with



GENTLE HEADHUNTER

Not an Indian maiden, as you might think! This photograph taken by Matthew W. Stirling, chief of the Bureau of American Ethnology, shows a headhunter—a man—in thoughtful pose. This is one of the famous Jivaro headhunters of the Amazon jungle. He takes an enemy's head right off the shoulders and makes a trophy of it. But in everyday life, these warriors wear skirts and long hair, paint their faces like girls and speak softly. Yet, they are not "sissy." It is just Jivaro custom. Mr. Stirling made friends with the headhunters and learned much about them to replace the mystery and scariness that the public associate with that dread name Jivaro.

the motions speeded so that a year goes by in as little as seven seconds.

There are 18 planetaria in operation in Europe. The first in America opened in 1930 in Chicago, and during the past summer has been a popular feature of the World's Fair.

At the formal opening of the Fels Planetarium the inventor of the device, Dr. Walter Bauersfield, was presented with the Elliott Cresson Medal of the Franklin Institute. The award was made in absentia, the recipient being represented by Franz Fieseler, an official of the Zeiss firm. Dr. Heber D. Curtis, director of the University of Michigan Observatory, was the principal speaker, and a brief demonstration of the instrument concluded the exercises.

Beginning Monday, Nov. 6, the Fels

Planetarium will be open to visitors, a total of 28 demonstrations a week being scheduled. Some of these will be especially for schools and colleges, but the public will be admitted daily from Monday to Friday, inclusive, at 11 a. m., 3:30 and 8 p. m., on Saturday at 11 a. m., 2:30, 4 and 8 p. m., and on Sunday at 2:30, 4, and 8 p. m.

Opening of other sections of the building is planned for Dec. 5. Among these will be the observatory, containing two telescopes for the use of the public, the section of railroad engineering, containing five full-size locomotives, the earliest built in 1837, the newest in 1927, and the sections of physics, chemistry and graphic arts.

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PSYCHOLOGY

Psychodietetics Suggested For Mind-Dietary Science

POPULAR tradition has for many pages recognized the close relation between what man put into his stomach and what he has in his mind.

No stenographer would think of asking her boss for a raise when he is hungry for lunch or when he is suffering from the effects of an unwise last-night's supper. Any bride knows that "the way to a man's heart is through his stomach." Any mother knows that children's quarrels are forgotten as soon as the cake is in sight.

In the hospital for mental diseases, this ancient knowledge assumes an increased importance. Diet has been found to have an extremely important effect in the treatment of mental disease. And, on the other side of the picture, certain dietary defects or deficiencies and the resulting diseases produce definite mental or nervous symptoms, which can, in turn, be corrected by dietary measures. Pernicious anemia, pellagra, sprue, nightblindness and beriberi are diseases in this category.

Dr. Martin F. Fritz of Iowa State College suggests the term "Psychodietetics," a self-explanatory name, to apply to studies of this nature.

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The quick freezing method is being applied by government scientists to ducks, chickens and other poultry, and these birds held in cold storage six months or more are said to be scarcely distinguishable from fresh-killed birds in taste and appearance.

BACTERIOLOGY

Germs' Conquests Aided By Strange Spreading Factor

Substance Isolated at Rockefeller Institute Makes Weak Germs More Damaging Than Strongly Poisonous Microbes

GERMS invading living tissue succeed in adding new territory to their conquests if they can bring about the production of a "spreading factor," and fail if this factor is not produced. Highly virulent germs fail to spread if they are not thus aided, while relatively mild-mannered disease organisms will take in a lot of territory and raise much trouble if they have the backing of the "spreading factor." The virulence, or inherent poisonousness, of a germ has no necessary connection with its ability to spread its infection.

These are among the new facts about infection and its spread that have been discovered lately at the Rockefeller Institute in New York City. What this "spreading factor" is that makes it easier for germs to invade new territory in the tissues, nobody knows as yet, though a clue to its possible chemical nature has already been turned up. But something of the way it acts has been worked out, notably by Dr. F. Duran-Reynals.

Found First in Animals

The "spreading factor" was first found in extracts of animal tissues, notably the male sex glands. Such tissue extracts, injected into the bodies of rabbits along with small quantities of bacteria, enabled the latter to spread rapidly, while inoculations with the same bacteria without the backing of the "spreading factor" extracts spread much more slowly or not at all.

Then Dr. Duran-Reynals succeeded in making extracts of germs that were able to spread rapidly without such help, and found that these extracts also were rich in the "spreading factor." They aided germs that were backward about spreading to penetrate the tissues, and even brought about the spread of infections elsewhere on the body. Furthermore, these "spreading factor" extracts obtained from germ cultures aided the spread of other germ species: they were non-specific in their action. They also aided the spread of vaccine virus, which

is made of what might be called harmless germs.

One practical significance of this "spreading factor" is pointed out by Dr. Duran-Reynals. It is possible that a germ relatively harmless in itself but richly endowed with the factor might make possible the rapid spread of another germ of much more dangerous nature which would otherwise be unable to gain a foothold due to its lack of the factor.

Chemical Understanding Sought

Whatever the "spreading factor" is, it does not seem to be closely related to those noxious agents which induce the formation of the antitoxins and other "antibodies" that help to protect us from disease. It differs from them in three ways: it does not cause the generation of "anti-bodies" that act against it, it is non-specific, and it can be heated without being destroyed.

Dr. Albert Claude, also of the Rockefeller Institute, has made the initial steps toward a chemical understanding of what this "spreading factor" is. He has found that substances containing it combine with diazo-compounds, thus giving what is known to chemists as the "diazo reaction." Diazo compounds are a special chemical group characterized, among other things, by the presence of two nitrogen atoms as critical units in their structure.

May Be Diazo Compound

Furthermore, Dr. Claude found that various synthetic compounds having the diazo group in common would give quite similar results and also possessed the peculiar property of increasing tissue permeability and enhancing infection. These observations brought together, it appears possible that the "spreading factor," if not itself a diazo compound, might be similar to the members of that chemical group.

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Halibut liver oil changes greatly in vitamin value with the seasons.