PHYSICS

New Cornell Atom Smasher to Find Uses in Cancer Study

Biological Research Including Possible Changes In Chromosomes and Genes Caused by Piercing Neutrons

BIOLOGICAL research, including the study of cancer, as well as physical science should benefit in the experimental program to be undertaken with the newest of all atom accelerators, just put in operation at Cornell University by Dr. M. Stanley Livingston, instructor in physics. Particles with 2,000,000 electron volts energy can be generated with the device.

Eastern leadership in the field of the conquest of matter is assumed by Cornell, states the University announcement, with the new device which is patterned after the famous 85-ton cyclotron equipment of Prof. E. O. Lawrence of the University of California.

Dr. Livingston was a co-worker of Prof. Lawrence in the design and construction of the West Coast apparatus, which has done so much for increasing knowledge of artificial radioactivity, the production of penetrating neutrons and studies on the transmutation of the chemical elements.

Besides investigations into the structure of the nuclei of atoms, it is planned to use Dr. Livingston's Cornell apparatus to test on mouse cancers the effects of neutrons which it will generate. This research will be conducted in cooperation with the New York State Institute of Malignant Diseases at Buffalo, N. Y.

Study Plants Too

In cooperation with other departments of the University, research is planned also on the effects of neutrons on plants, particularly fern spores, and on the eggs of some of the lower forms of animal life. A comparison will then be possible between the neutron's effects and those of X-rays and the gamma rays from radium.

Biologists too would like to see if the high-velocity neutrons from the apparatus can cause visible changes in the chromosomes which carry the pattern of animal makeup within them.

Also scheduled for investigation are the possibilities of mutations or gene changes caused by the piercing neutrons.

The biological applications of the research hold promise because of all the elements bombarded by other investigators with neutrons, hydrogen appears to have nearly the greatest stopping power. And the animal body contains large amounts of hydrogen in its makeup, both in the form of water and other more complicated chemical compounds. Neutrons therefore are expected to have striking and appreciable effects on such tissues.

Weighing 6,500 pounds, Dr. Livingston's apparatus takes charged cores of hydrogen atoms and accelerates them within a pancake-shaped vacuum chamber lying flat between the pole pieces of a powerful electromagnet. Issuing near the center of the pole pieces, the particles travel in an ever-widening spiral parallel to the faces of the magnet's pole pieces. Twice during each trip around the particles receive a boost of electrical voltage which drives them faster and faster. The cumulative effect finally ends when the particles reach the periphery of the apparatus and they have been given energies of 2,000,000 electron volts by the series of electrical kicks.

When at their greatest velocity and energy they are picked off and directed against targets, which undergo a variety of effects, including transmutation and artificial radioactivity. In the process of impact, particles torn from the nuclei of the targets' atoms come off, and among them are the neutrons.

Action Described

Describing the action of the apparatus, Dr. Livingston states:

"The action may be compared with that of a swing which, starting from a period of rest, increases its arc with each to-and-fro movement. In both instances —whether swing or vibrating "bullet" —perfect rhythm is at once established.

CORNELL'S NEW ATOM SMASHER

Dr. M. Stanley Livingston, young Cornell University instructor, stands beside the newest tool of science for smashing atoms and learning secrets of the nucleus in high velocity impact experiments. The device, which generates high energy atomic "bullets" with energies equivalent to 2,000,000 electron volts, is of the familiar cyclotron type. In it particles are whirled in a spiral path through a magnetic field and are accelerated in small voltage steps at each revolution to the ultimate 2,000,000 volts peak energy of the apparatus.

Regardless of the arc which the swing describes, the time interval required for it to pass through its starting point is the same. So it is with the semi-circles described by the atomic "bullet." In each excursion, regardless of an ever-increasing radius, the oscillating "bullet" reaches the gap separating the two disks in a period of time which is constant. It is this physical principle which gives to the apparatus its resonance feature."

Science News Letter, January 25, 1936

RADIO-AVIATION

New Aviation Radio Receives 2 Signals on Same Frequency

NEW radio aid for commercial aviation is under test in Pittsburgh, Pa., which consists of the transmission of both voice and radio range signals on the same frequency. The two sets of signals are received simultaneously in an airplane—directional signals operating a needle pointer on the instrument panel and the voice signals being received in headphones.

The new development solves the problem, existing for some time, that directional beacon signals and the weather reports went out on the same radio frequency, and thus one had to be interrupted for the other.

The limited number of frequency channels available and the need for the simplest possible receiving equipment required such interrupted service in the past. With both weather and range directions on the same frequency, the pilot did not need to change dial settings on his receiver.

The old system, while simple, had its handicaps. If a pilot was flying blind and attempting to locate an airport, it was disconcerting to have the directional signals interrupted by a weather broadcast which told him it was raining or foggy in his vicinity. He knew that anyway, otherwise he would not be flying blind.

In a minor aspect the weather signals delayed his landing and in a major case might delay him at a time when the ceiling at the airport was lowering to zero-zero conditions.

Before the new development the Bureau of Air Commerce sometimes postponed weather information for a short while and kept the directional signals on the air continuously when requested by pilots.

This system also had its handicaps, for weather reports might be needed by other pilots, and planes with receivers but not transmitting equipment might need continuous directional signals and not to be able to request them.

The new development of receiving two signals on the same frequency solves all these problems.

Science News Letter, January 25, 1936

CHEMISTRY

"Alloy" Oil Promises Changes In Motoring Upkeep Costs

"ALLOY" oil, three times stronger than ordinary petroleum used in motor cars, is the latest answer of oil engineers in Philadelphia to the demands of increased lubrication pressures inside modern automobiles.

Alloy oil consists of 99 per cent. petroleum and one per cent. of a chemical relative of phosphoric acid.

In tests with stock cars driven the equivalent of ten years of average motoring, the new alloy oil markedly prevented wear. Measurement showed less wear than is usual for one-tenth the 100,000 miles traveled, according to Dr. T. G. Delbridge, research director of the Atlantic Refining Co.

Significance is attached to the successful development of an "alloy" oil which obtains strength without sacrifice of any other essential lubricating qualities, for the reason that the sharp reduction in engine wear effected by the new oil may permit important changes in motor design and possibly the use of new metals. This in turn may lead, in the opinion of auto engineers, to a reduction of production costs during the next decade. The wear reduction effected by the high film strength oil is alone estimated to permit a cut in national motor upkeep costs of at least $50,000,000.

"It is proper to ask," Dr. Delbridge remarks, "whether the decrease in wear made possible by this high film strength motor oil may not have effects equal to those in the building and manufacturing industries when steel was created. Any substantial reduction in the costs of operating automobiles increases the number of people who can afford to own and operate cars."

In engineering circles the development of an effective "alloy" oil is considered significant for the reason that a crisis has long been foreseen when the strength of natural petroleum, no matter how well refined, would be inadequate to meet the increasing heat, pressure and speed of moving parts developed by the high compression automobile motor. Search for an effective "alloy" oil has been carried on for some years. The problem has been to find a substance which would increase the film strength of petroleum without reducing its effectiveness in other respects.

The strengthening chemical added to natural petroleum is known technically as the non-chlorinated ester of phosphoric acid.

Science News Letter, January 25, 1936

DENTISTRY

Chemical Test May Lead to Preventing Tooth Decay

DECAY of the teeth with attendant toothaches may be prevented in the future, if a method developed by Dr. E. P. Brady of the Washington University Dental School, St. Louis, is put into successful practice.

A dental examination can determine by a chemical test which of the teeth in one's mouth are liable to decay, says Dr. Brady. Silver nitrate, a common chemical used generally for germ killing purposes, betrays the presence on the tooth enamel of certain faults of formation. It is in these faulty areas that decay is likely to start, because there the acids in the mouth and acid-producing bacteria can penetrate through the enamel to the sensitive dentine beneath.

The decay can be prevented by the use of silver nitrate, Dr. Brady said.

After it has started, its progress can be stopped by use of another chemical