

PHYSICS

Powerful Atom Smasher

Plans for 15-billion-electron-volt accelerator, a "colossatron," are now being circulated. The proposed machine will develop five times as much energy as now available.

► THE WORLD'S most powerful atom smasher, a 15-billion-electron-volt "colossatron," can be built in about three years for \$6,000,000 to \$8,000,000.

Plans for the new giant atomic accelerator, which will mimic under man's control some of the power unleashed by cosmic rays, are being circulated among scientists for criticism by the design group headed by Dr. M. S. Livingston of Massachusetts Institute of Technology.

The proposed instrument, which the Atomic Energy Commission is being asked to build, uses the new, strong focusing principle worked out last year by a group of U. S. scientists. This will allow the "colossatron" to develop five times as much energy as the present world's largest atom smasher, the cosmotron at Brookhaven National Laboratory on Long Island, with an outside diameter of 75 feet.

The strong focus is developed by using many small magnet sections, rather than the larger ones now common, to focus the whirling atomic particles. The 15-billion range was chosen by the Cambridge Design Study Group, composed of scientists at Harvard University and MIT, because unleashing such energies would enable scientists to delve deeper into the heart of matter under conditions controlled by man.

The powerful cosmic rays bombarding earth from outer space have energies ranging from about two billion to several thousand billion electron volts. Where and when they strike, however, is not predictable, and their tracks are caught on photographic plates sent 20 miles or so above the earth only by chance. So to get a better picture of the atom, man is building more and more powerful atom smashers.

The cosmotron has operated at 2.3 billion electron volts, and is expected some day to reach 3 billion, at the very lowest level of cosmic ray energies.

Officially, the proposed 15-billion-electron-volt machine is known as an "alternating gradient focusing synchrotron." The strong focusing idea was worked out last year by Drs. Livingston, Ernest D. Courant, Harland S. Snyder and John P. Blewett of Brookhaven, and was first suggested by N. Christophilos, a Greek citizen. By this method, the size of the magnet to accelerate to a given energy can be reduced very considerably, thus saving considerable metal, time and money.

The machine will speed up protons, the hearts of hydrogen atoms and one of the building blocks of all matter. They will circle in a thin-walled metal tube, oval-

shaped and only two by four inches in diameter. Diameter of the doughnut ring around which the cluster of protons is whirled would be 320 feet.

The ring consists of 48 sections of magnet, each 16 feet long, separated by gaps of five feet. Each magnet section has equal lengths of diverging and converging focusing fields. These magnetic fields act on the protons in much the same way that convex and concave mirrors, used alternately, act to focus light waves.

As the protons whirl around the circular path, electrodes, spaced 12 times around the ring, will kick the cluster to higher and higher velocities. Finally, as in all atom smashers, the protons will crash into the target under study.

The greater the energy of the bombarding particles, the more revealing such a smash-up is. By studying the disintegration products, scientists can learn new facts about the mysterious forces that hold atomic hearts together.

The U. S. scientists are cooperating closely with a European group known as

the Council for European Research, Nuclear, or CERN, which is making plans for a 30-billion-electron-volt accelerator, using the same principle, to be built in Geneva on a site already donated.

Science News Letter, September 12, 1953

AERONAUTICS

Stratojet Bomber Acts As Flying Filling Station

► THE U. S. Air Force has a "convertible" jet bomber. It can rain bombs upon the enemy, or it can deliver fuel to its fellow bombers while they are streaking to or from enemy territory.

Boeing's B-47 medium bomber has been successfully converted for aerial tanker duty, Air Force Air Research and Development Command headquarters in Baltimore report. The B-47 Stratojet can be converted under field conditions into an aerial tanker and can be switched back for bombing duty easily.

Using an adaptation of the probe-and-drogue in-flight refueling system, the bomber lowers a flexible hose with a funnel-like device called a "drogue" on its end. To refuel while flying, another Stratojet slips a probe-like tube into the dangling funnel. Then fuel is pumped from the tanker into the receiving bomber.

The refueling fixtures are installed in the tanker ship's bomb bay. Certain instruments are added to the cockpit to monitor the fuel transfer.



JET-POWERED TANKER—A Boeing B-47 Stratojet has been modified to make it an aerial refueling station, using a "probe and drogue" system. As shown in the photograph, the tanker airplane (right) trails a long hose, to the end of which is attached a funnel-like "drogue." The receiver airplane approaches the drogue, then engages the spear-like probe in its coupling mechanism, after which the fuel can be pumped.

The convertible B-47 is thought to be the world's first jet-powered aerial tanker. All production Stratojets are being equipped for refueling in flight. A demonstration of the aerial tank filling maneuver was given in Dayton at the National Aircraft Show.

Science News Letter, September 12, 1953

GENERAL SCIENCE

Fundamental Research Pledged to Agriculture

► MORE ADEQUATE support for research in the fundamental sciences upon which all of agriculture rests is advocated in a policy statement issued by Secretary of Agriculture Ezra Benson.

Such basic research has been the foundation of all the really big advances in agriculture, it is stated, and new research will be the source of new principles for the further improvement of our soils, plants and livestock.

The statement called for the strengthening of American agriculture through research and education. The system of co-operation between the U. S. Department of Agriculture and land grant colleges must grow to meet the growing demands of modern agriculture, it is emphasized.

Better organization and a more adequate extension program are contemplated. While improving marketing efficiency and gearing production to markets, it is planned to study more intensely the uses for millions of tons of agricultural products left on the farm and in marketing channels as waste, the statement said.

Science News Letter, September 12, 1953

PUBLIC SAFETY

Auto "Bug" Deflectors

► STATE LEGISLATURES are beginning to rule against the use of "bug" deflectors on automobiles on the grounds that they obstruct vision.

Connecticut motor vehicle authorities have outlawed the hood-mounted devices outright. New Jersey law says they are illegal unless completely transparent. Furthermore, they must not be larger than seven inches long and four inches high. Minnesota legislators enacted a law this year restricting the deflectors to a 50-square-inch-transparent area.

Other states may follow suit on the gadgets which are said to throw insects over the car so they do not splatter on windshields. The American Association of Motor Vehicle Administrators favors restrictions similar to those of New Jersey.

Opaque "bug" deflectors mounted on the hoods of cars create blind spots. This is particularly true at night. Although the devices themselves may not be large, they obstruct vision in an ever-expanding cone as the driver scans the road ahead.

In this "dead" area of vision, a child may

VITAL STATISTICS

Biblical Lifespan Seen

► THE BIBLICAL lifespan of three score years and ten (70 years) will soon be the average lifespan in the United States, statisticians of the Metropolitan Life Insurance Company predict in New York.

They base their prediction on the record high longevity achieved by Americans in 1950 and the 21-year gain in average lifespan during the first half of this century, as shown by records of the National Office of Vital Statistics.

In 1950, the average lifespan of the American people reached 68.4 years. White girl babies born today can expect to live, on the average, 72.4 years. For white boy babies the figure is 66.6 years.

All white women 21 years old or older can expect, on the average, to live to be 75 years old before they die.

Among non-whites, expectation of life at birth is much lower. For males in 1950 it was 59.2 years and for females 63.2 years. Length of life on the average for non-whites in 1950 was practically identical with that for whites in 1937, the statisticians point out.

Further figures showing the improvement in longevity during the past half century are given as follows:

With the mortality conditions of 1900, only 66 out of every 100 newly born babies (without distinction as to sex or color) could expect to live to age 40. Their remaining lifetime then averaged 28.3 years.

Under mortality conditions today, the newborn baby's chances of survival to age

40 are 92 in 100 and expectation of life at that age is 33.1 years. In other words, those that survive to 40 years can expect to live another 33.1 years.

The chances of living from age 40 to age 65 have risen to 74 in 100, and those aged 65 now can expect, on the average, to live another 14.1 years instead of the 11.9 years they would have had ahead of them at the turn of the century.

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