

NUCLEAR PHYSICS

Water Drop-Atom Analog

Calculations of forces acting when a water drop splits in a pattern like that occurring in atomic fission may help to interpret the nature of the atomic nucleus.

► HOW the nucleus of an atom of uranium or plutonium splits in two with release of immense energies may be more easily understood as a result of 12,000,000 calculating operations just completed on forces which act when a drop of water splits.

The research, advancing the validity of a liquid drop as interpreting the nature of an atomic nucleus, was planned and directed by John A. Wheeler, professor of physics at Princeton, who played a major role in the development of the atomic bomb, and David L. Hill, assistant professor of physics at Vanderbilt University.

In 1935, the renowned Danish physicist, Neils Bohr, suggested that scientists could simplify their thinking if they likened the nucleus of an atom to a simple drop of liquid. Based on this analogy it became possible to predict the fission of plutonium long before that element was known to exist.

Using the water drop analog, Prof. Wheeler and Mr. Hill calculated the forces, moments and velocities which would act on 11 points around the periphery of the drop. These were coded and fed in the form of a perforated tape to the selective sequence electronic calculator of the International Business Machines Corporation.

Six month's work was required to establish the codes. From then on the 12,500 electron tubes with their 23,000 relays, installed at a cost of \$750,000, operated the numerical printers reeling out figures readily related to the drop as it changes

its shape, constricts near the middle and finally splits, somewhat like the familiar mitotic cell division one sees in biology texts.

A hundred different shapes as outlined by the 11 points gave an equivalent of a slow-motion moving picture.

The results of the research show that when a drop of liquid splits the masses are unequal, substantially in the same ratio as occurs in atomic fission, that is a 3-to-2 mass ratio that occurs 500 times as often as a 1-to-1 mass ratio.

The nucleus of the isotope of uranium, U-235, the stuff from which the atom bomb was made, is held to be dumbbell shape. It takes more energy to split this nucleus, Mr. Hill said, than it would to split a perfectly spherical nucleus such as one might find in a hypothetical element, cosmium, entirely unknown, but which would have a theoretical atomic number of around 125 or 126.

The electronic calculator on which the work was done is said to be the only one capable of solving this sort of problem in atomic physics. The solution required 103 hours with an expenditure of 15,000 kilowatt hours of current, about as much as would be required to operate 150 household electric irons for 100 hours. The same calculations would have taken a high speed operator working with the best office type machines 150 years to complete, provided he made no mistakes. The calculator double checks on itself all along the line and stops dead if the figures do not tally.

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ENTOMOLOGY

Locust Swarms Predicted

► "THEY will come out of nowhere, without warning, by the billions, by the trillions. In the air there will be swarms of them 50 miles long, five to 10 miles wide and a mile or two deep."

This prediction of locust plagues to come, rivalling those of the biblical past, is from Dr. Clearhos Logothetis, FAO locust expert, reporting back from specially called locust control conferences in Pakistan and Lebanon.

He called the locust the "most important insect pest in the world today." It eats up millions of tons of food, consuming whole harvests at one feeding. He estimates the worldwide cost at "a bare minimum of \$40,000,000 a year, which does not take into account the severe economic disloca-

tions that result when an entire harvest is wiped out."

In the Near and Far East, and in Africa, Australia and South America locusts appear in unpredictable cycles, disappearing almost completely for a couple of years and then suddenly reappearing to do terrible damage.

He warned that the locusts will come again for a certainty until countries jointly ferret out and destroy the breeding grounds out of which they come sweeping.

It is now believed that locusts have relatively few points of origin, where they rest and build up their numbers between outbreaks. One such area is thought to be the Arabian desert. For reasons that are little understood, Dr. Logothetis explained, the

Arabian locusts will suddenly start to breed prolifically, to change color, to become restless.

Their numbers grow enormously, until, as at a signal, the huge horde rises into the air, heading east. These migratory locusts eat their way from Iran, through Pakistan, into India. These three countries are now joining forces in an attempt to prevent the airborne attack from getting under way in the first place.

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AERONAUTICS

JATO and Parachute Brake Are Features of Jet Plane

► ROCKETS may be used to give rapid take-off to the new three-engine jet XB-51 plane built by the Glenn L. Martin Company for the U. S. Air Force, and a unique ribbon-type parachute braking technique will cut speed rapidly on the landing runway, it was revealed in Baltimore, Md.

Bringing a speedy jet plane to a stop on any but long runways is one of the problems encountered in promoting the use of turbo-jet power for planes. Airliners with conventional reciprocal engines and the familiar bladed propellers can be brought to a stop by the use of reversible propellers to assist the brakes on the wheels of the landing gear.

Considerable experimentation has been carried on during the past few years to find a way to cut the speed of a jet-propelled plane after it hits the landing strip. The trailing parachute is one. Another suggested is the use of rockets attached to the plane and pointed to the rear.

Rocket assisted take-off, JATO for short, is being used with considerable success with many new types of planes. The rocket power enables heavily loaded planes to get into the air which might not be able to do so otherwise. Rocket-assist enables other planes to take off after a shorter run than would be required without their help.

A new Junior Jato, stovepipe size and 18 inches long, develops 250 pounds thrust for 12 seconds duration. It is a product of Aerojet Engineering Corporation, Azusa, Calif. A Ryan Navion, equipped with Junior Jato, in a recent test reached a 50-foot altitude in only 300 feet from its starting point.

The 80-foot Martin XB-51, now undergoing testing, was designed for use in destroying surface installations in cooperation with ground troop. It is a speedy plane with three General Electric J-47 jet engines. It has wings and tail of the swept-back type, both at angles of 35 degrees. This new bomber has a parachute stowed aft which may be released at the pilot's discretion for more rapid deceleration of speed, in the air or on the runway. Neither Jato nor parachute are intended for use except in unusual situations.

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