

GENERAL SCIENCE

Science Advances Marked as Carnegie Researchers Report

New Breath Thermometer, "Tagged" Atoms for Research, New Cyclotron and Volcano Studies Disclosed in Summary

A BREATH thermometer that spots fever four times as fast as time-tried clinical thermometers and could be used on school children during epidemics; the discovery of diamonds in meteorites which fall to the earth from outer space; plans for a giant atom smashing cyclotron rivalling in size any in the world today; finding of molten lava deep beneath volcanoes, and a gigantic whirling of ourselves and the sun as the Milky Way rotates.

These are the latest research accomplishments of the Carnegie Institution of Washington, one of the world's leading institutions for scientific research with a \$35,000,000 endowment and annual budget of \$1,500,000, reported in its yearbook.

The new temperature-taking instrument works much faster than a thermometer and therefore will be useful during epidemics. With it, scientists of Carnegie's Nutrition Laboratory take the temperature of the air expelled from the lungs in a single breath. The patient refrains from talking and breathing through the mouth for two minutes. Then he draws a moderately deep breath, holds it for about five seconds, and exhales into a mouthpiece. The true body temperature can be told within 0.5 degree Fahrenheit by adding 2.2 degrees to the breath temperature.

Breath temperatures can be taken at the rate of four per minute. The speediest clinical thermometers require one minute to register the temperature and most physicians prefer to take two or three-minute readings.

For Flu Epidemic

During an epidemic of colds or influenza, this new instrument would be useful for taking temperatures of large groups of persons—children in school, or the whole office or factory staff in business—to determine which ones were probably coming down with colds or influenza and should be sent home to bed for protection of themselves and their associates.

New born babies whose mothers had diabetes have been saved by the Nutrition Laboratory incubator which helped them through their first struggles to breathe normally. The insulin and diet requirements of diabetics, especially those who have a high resistance to insulin and require large amounts of it, are being worked out by use of a helmet open-circuit respiration apparatus developed at the laboratory. When the patients breathe into this apparatus, the physician learns how fast they burn oxygen and computes the diet and insulin requirements.

Unsolved mysteries of history may be explained by the Carnegie Nutrition Laboratory studies of the diets of various races, such as one on the Navajo Indians just reported. Such studies may explain why races have survived either in spite of or because of their diets.

Diamonds bombarding the earth from outer space have been found by Carnegie's Geophysical Laboratory studies of small black grains in the Canyon Diablo meteorite in the U. S. National Museum. The diamonds were identified by their X-ray spectrum and optical properties.

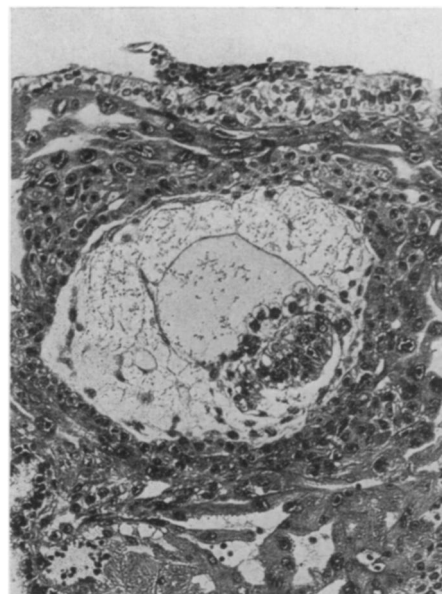
Could Find Depth of Lava

Studies of earth magnetism around the "baby" volcano, Santiaguito, near the extinct volcano Santa Maria in Guatemala, show that it should be possible to locate the outline and depth of the hot and potentially active lava beneath it.

A giant atom-smashing cyclotron weighing 200 tons and as large and powerful as any in the world today, is planned by Carnegie's Department of Terrestrial Magnetism.

The new atom smasher will be modeled after the 200-ton cyclotron now in operation at the University of California. It will be designed to yield alpha particles having energies of at least 32,000,000 electron volts.

By the time it can be placed in operation, within a year and a half or two years from now, advances in cyclotron



IN THE BEGINNING

Packed in the tiny dark area at the right of the lighter circle are all the infinite potentialities of the adult human. This Carnegie Institution photograph is of the Hertig human embryo only 11 days old, youngest ever seen. At the outside of the picture is the shell of the ovum, now eroding and consuming maternal tissues. The area is a primitive cobweb-like tissue which "conditions" the fluid in which the embryo itself is developing.

Life's Beginning

Deeper insight into the wonder of how a baby comes to be is provided by two human embryos in the earliest stages of development thus far known, which are being displayed at the annual exhibit of the Carnegie Institution of Washington.

These minute beginnings of human life were obtained during the past year at the Institution's laboratories of embryology, in Baltimore. They are now in process of sectioning for detailed microscopic study, which will be reported on in due time by Dr. Arthur T. Hertig.

The embryos are both of the eleventh day after conception, when by repeated division the original cell formed by the fusion of the parental elements has produced a hollow mass of cells known as the blastocyst. On the ninth day of development the blastocyst becomes attached to the uterine wall; the new Carnegie specimens therefore represent the second day after attachment.

An important fact already discovered about the new eleven-day embryos is their very close resemblance to those of monkeys and apes at a similar stage of development. It had hitherto been assumed that human embryos, even in the earliest days of growth, were considerably different from the embryos of zoological relatives.

The Carnegie Institution has had for some time one other embryo of nearly the same early age as the two new ones. This has been known as the Miller embryo. Discovery of two additional specimens makes possible comparative studies.

operation may make it possible to achieve particles having 50,000,000 electron volts of energy.

The new cyclotron will be located next to the two giant electrostatic accelerators which already deliver 1,000,000 and 5,000,000 electron volt energy atomic "bullets" for experiments in nuclear physics.

With these instruments, plus a large cyclotron, the department will be one of the best rounded laboratories in America for investigations on atomic structure. Other institutions may have either electrostatic generators or cyclotrons but none, so far, has both.

Moreover, the presence of the newly founded National Cancer Institute of the U. S. Public Health Service in Bethesda, Md., with its large supplies of radium available, means that the nation's Capital area will eventually possess the best research facilities in the country for all types of investigations on radioactivity and atom smashing.

Plans for the new cyclotron call for elaborate facilities for its use in biological and medical investigations using radioactive "tracer" elements to study obscure physiological processes in living plants and animals.

The department also studied the huge and mysterious earth supply current of 1,800 amperes which must continually be supplied to the earth as negative electricity, so that it may balance the 1,800 amperes of positive electricity known to be flowing continually in the atmosphere of the earth.

A "powerhouse" for this supply current may be the regions where electrical storms are prevalent. Continuous observations are being taken to build up a mass of data which will show the changes in supply current of the earth from year to year.

Study Plants

"Tagging" carbon atoms by making them radioactive, and then tracing them in their course through the food-making process of plants, physiologists and biochemists of the Carnegie's Division of Plant Biology are pushing forward into hitherto unexplored regions of plant science.

Radioactive carbon dioxide is manufactured and fed to the plants. Wherever the treated atoms of carbon go, they mark their course by the radioactive particles they throw off, just as a firefly, otherwise invisible in the dark, marks his course with his little lantern. Plant physiologists are thus learning many

things about the way plants make sugars, starches and proteins, which until now could only be guessed at.

Plants are studied while they are whole and alive. Much of the present knowledge of the food-making and food-using processes in plants has been gained by tearing them to pieces and extracting the enzymes with which they work. Now it is becoming evident that this method gets at only part of the facts: "It has been found that some of the components of the cell's photosynthetic apparatus had until recently escaped detection, because of their extreme sensitivity, particularly when in contact with the killed tissue of the plant. Similarly, many of the enzymatic reactions are drastically altered after the death of the cells."

The rotation of the sun about the center of the Milky Way has been explored

by the Mt. Wilson Observatory. The great galaxy system of stars to which our sun belongs is rotating. Latest figures show that the center of this circular movement is so distant that it takes 33,000 years for light (speeding 186,000 miles per second) to reach earth from there. The sun moves 180 miles per second in a circular orbit around this center, requiring 207,000,000 years for one revolution. Since the earth and all of us travel with the sun, we are moving at this rate also.

Discovery of some stars so extremely faint that they give out as little as one fifty-thousandth of the light of the sun emphasizes that our sun is a very average star, roughly midway between these faint bodies and the most luminous stars with 20,000 degrees Centigrade or about 30,000 times that of the sun.

Science News Letter, December 16, 1939

PHYSIOLOGY

Seeks Clue to Human Cancer In Induced Plant Tumors

Tumors Now Induced by Chemicals Are Part of Healing And Unlike Animal Tumors But Cancers May Yet Be Made

CLUES to the mechanism of cancer production in humans and other animals are now being sought in the plant world. Latest efforts to produce cancers in plants by the chemicals in tar which produce cancer in animals or by other chemicals were described by Dr. Michael Levine, Montefiore Hospital Biological Laboratory for Cancer Research, at the meeting of the Torrey Botanical Club in New York. Montefiore Hospital is the only hospital in the world which has a garden devoted to plant cancer studies.

Crown gall, the form of cancer which plants are known to harbor, is not analogous to human or other animal cancer, Dr. Levine said.

Cancer-causing hydrocarbons, which produce cancer in animals, poison plants but fail to produce cancers in them. Certain other irritating chemicals, such as indole acetic acid, indole butyric acid, naphthalene acetic acid and a series of scarlet red dyes, when applied to the injured surface of a plant, produce roots together with small tumors. These tumors, however, are not, in Dr. Levine's opinion, analogous to human or other animal tumors, either. The plant tumor,

he believes, is a part of a reparative and protective mechanism of the plant, analogous to inflammation in animals.

Dr. Levine expressed the hope that plants ultimately will be made to form tumors as a response to chemical substances. He implies that the plant cells will be so modified as to proliferate without limit, endowing them with a property now possessed by animal cancer. The production of malignant plant growths will throw light on the mechanism of cancer production in animals. The absence of blood and lymph streams, and lack of diversity of tissue types make the plant a suitable subject for the study of this important problem.

Science News Letter, December 16, 1939

● Earth Trembles

Information collected by Science Service from seismological observatories resulted in the location by U. S. Coast and Geodetic Survey and Jesuit Seismological Association of the following preliminary epicenter:

Tuesday, December 5, 3:30.1 a.m., EST

On the ocean bottom off the coast of Guatemala. Latitude, 14.5 degrees north. Longitude, 92.5 degrees west. Depth 80 kilometers.

For stations cooperating with Science Service, the Coast and Geodetic Survey, and the Jesuit Seismological Association in reporting earthquakes recorded on their seismographs, see SNL, Oct. 28.