CHEMISTRY

Energy Measured Directly

A new kind of atomic "accelerator" was devised to make the first direct measurement of the minimum energy needed to produce a chemical reaction

➤ THE FIRST direct measurement has been made of the minimum amount of energy necessary to produce a simple chemical reaction.

This achievement by scientists at California Institute of Technology, opens the way to a clearer understanding of chemical reactions and to solutions to some chemical problems.

To carry out the study, which is supported by the Atomic Energy Commission, a new kind of atomic "accelerator" was devised. Precise measurements using the Institute's technique should show whether bimolecular chemical reactions are described by the laws of classical mechanics or of quantum mechanics, an unsolved puzzle.

The accurate figures that will be obtained in the future for the probabilities of simple reactions can be used to develop sound theories of more complex chemical reactions.

The key measurement was made by graduate student John Michael White under the direction of Dr. Aron Kupperman, professor of chemical physics. Mr. White showed that 0.33 electron volts of energy are required to initiate the simple chemical reaction of splitting a hydrogen molecule, which consists of two hydrogen atoms, and linking a deuterium atom with one of the hydrogens. If less than one-third of an electron volt of energy is applied, the reaction will not occur.

The measured reaction was energized by light from a 200-watt mercury bulb. The light waves were passed through a diffraction grating to make them all one wavelength.

By changing the angular orientation of the grating, the wavelength could be varied as desired.

The source of monochromatic light is an atomic accelerator in that it forms and accelerates deuterium atoms to predetermined energies in a gas mixture of hydrogen and helium iodide.

The photons of light kicked apart the deuterium and iodine atoms but did not affect the linked hydrogens. The iodines, being heavy, moved sluggishly. The deuteriums moved much more quickly, the energy imparted to them being dependent upon the wavelength.

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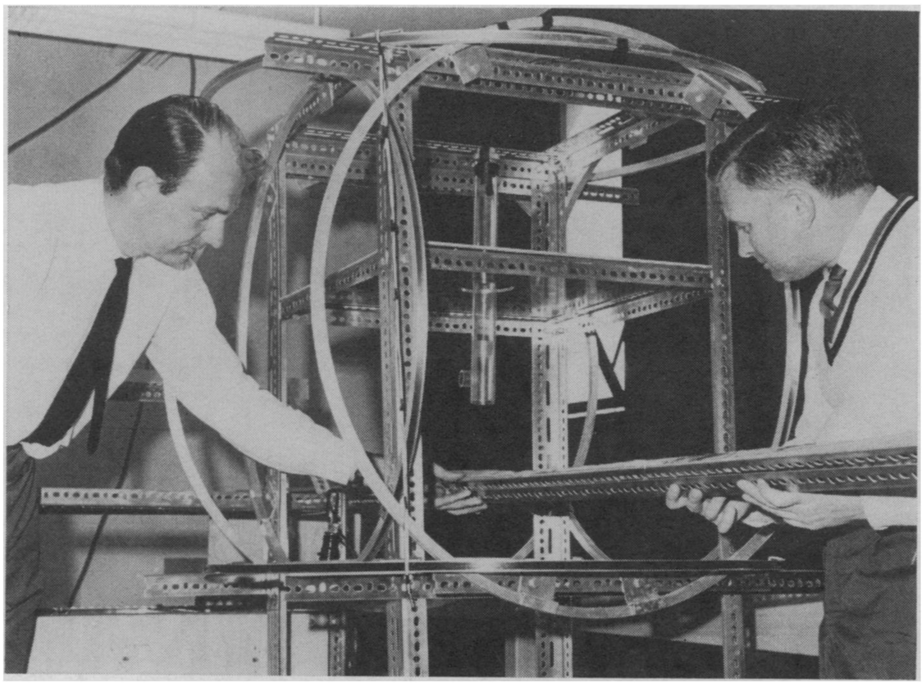

FSU

MAGNETIC DATING—Norman D. Watkins (left), a geophysicist from Florida State University, will use the magnetometer being assembled here to search for the age of the Antarctic ocean sediments in some 400 cores being stored at FSU. With Dr. Watkins is geology professor Grant Goodell who directs a research project bringing back sediments from the Antarctic ocean bottom taken on cruises on the National Science Foundation research vessel Eltanin.

PHYSICS

Superconducting Magnet In Full-Scale Test

➤ A SUPERCONDUCTING magnet —one that requires no added electrical current to maintain a magnetic field once it has been established—has been used for the first time in a full-scale high-energy physics experiment in Argonne, Ill.

The doughnut-shaped magnet is 24 inches in diameter and has a center hole 11 inches in diameter. Although it is relatively small compared to the big magnets now in use, it can maintain a magnetic field stronger than that available with most conventional magnets of much larger size.

The Argonne experiment was conducted jointly by scientists from the Atomic Energy Commission's Argonne National Laboratory and Carnegie Institute of Technology. The superconducting magnet replaced the conventional magnet surrounding a bubble chamber, a device used by physicists to track charged nuclear particles after they have been accelerated to high energies in atom smashers.

The supermagnet produced a field of 44,000 gauss, 88,000 times the strength of earth's magnetic field. Experiments heretofore impossible in high-energy physics are foreseen using the supermagnet.

Superconducting materials lose all apparent resistance to the passage of electricity at temperatures near absolute zero, which is 459.7 degrees below zero F.

The effort at Argonne to develop and use superconducting magnets is part of the Laboratory's high-energy physics program, which is supported by the U.S. Atomic Energy Commission.

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GEOLOGY

Magnetic Poles Were Once Reversed

➤ IF A PREHISTORIC man living more than 850,000 years ago had had a compass, it would have pointed south instead of north. The magnetic polarity of the earth became reversed. A geophysicist hopes traces indicating this change will help him find the age of the Antarctic ocean floor.

When the poles switched, the original polarity remained "frozen" in hardening lava that now forms the sea bottom. By measuring the depth at which the polarity change appears in some 400 bottom core examples, Dr. Norman D. Watkins of Florida State University, Tallahassee, hopes to find a geological "base line" for dating sediment deposited since that time.

The earlier changes might also show up in the samples, Dr. Watkins said.

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