BIOCHEMISTRY

How Plants Use Sunlight

➤ A POSSIBLE EXPLANATION of an age-old mystery—how plants build sunlight into the food compounds that maintain life on earth—was proposed in Washington.

Apparently plants have a mechanism similar to that of the Bell Telephone Laboratories photobattery, which is designed to capture sunlight and convert it into an electrical current.

Evidence for nature's "plant photobattery" is presented in *Science* (March 15) by Drs. Melvin Calvin and Power B. Sogo of the University of California, Berkeley.

They suggest, essentially, that bits of plant cells called chloroplasts act as "photobatteries," capturing sunlight and turning it into a kind of electrical current merging with the chemical reactions taking place in photosynthesis.

Dr. Calvin is credited with having charted, in more than a decade of work with radioactive carbon, the complex chemical steps by which plants convert water, carbon dioxide and sunlight into sugars, proteins, carbohydrates and other energy-bearing materials.

With this chemical phase of photosynthesis well on its way, the mechanism by which packets of energy from sunlight entered into the chemical process apparently has been the last major mystery in the process.

Recent studies by other scientists revealed that the chloroplasts, which contain the light-capturing green plant pigment, chlorophyll, have a well-ordered, quasi-crystalline structure, containing alternate layers of proteins, chlorophyll and fats. This arrangement was strikingly suggestive of the photobattery.

Dr. Calvin theorized that a packet of the sun's energy might strike an electron in the chlorophyll, bouncing an electron out and leaving a hole. The electron would then be conducted through the chloroplast, as in a photobattery, until it became attached to a carbon atom participating in the chemical process. Thus energy would be stored in the process.

Meanwhile, the theory suggested, the hole left in the chlorophyll molecule is filled with an electron stolen from an adjacent water molecule. This eventually splits the water molecule into its hydrogen and oxygen components, the oxygen going into the atmosphere and the hydrogen being used as a building material in the photosynthetic process.

Dr. Calvin suggested an experiment to test the idea, and it was first tried by three Washington University scientists, Drs. Barry Commoner, J. J. Heise and J. Townsend.

Essentially, the scientists send a radio-frequency wave through a chloroplast while a light is shining on it and also in the dark. They find part of the wave is absorbed in the light, indicating the presence of free electrons bounced out of the chlorophyll. This supports the theory.

The version of Dr. Calvin's suggested experiment recently completed in Berkeley seems to be the most conclusive. Earlier experiments were conducted at room temperature, where free electrons might arise from chemical reactions in photosynthetic reactions.

Drs. Calvin and Sogo conducted their experiment at the low temperature of minus 140 degrees centigrade, or about 220 degrees below zero Fahrenheit. Since photosynthetic chemical reactions do not take place at this temperature at a measurable rate, the free electrons found to be present can be attributable only to the action of light flashed on the chloroplasts.

Science News Letter, March 30, 1957

GEOPHYSICS

To Study Earth, Seas and Air at MIT Laboratory

➤ THE EARTH, ITS SEAS AND ATMOSPHERE will be studied at a laboratory of earth sciences established at Massachusetts Institute of Technology in Cambridge.

The laboratory, under the direction of Prof. Henry G. Houghton, head of MIT's department of meteorology, is sponsored jointly by that department and the department of geology and geophysics.

Scientists working at the laboratory will attempt a new approach to such problems as whether it is possible to modify the weather on a large scale, what the earth's interior is really like and why continents are distributed the way they are.

Science News Letter, March 30, 1957

PHYSICS

Temperatures Twice Those Of Sun's Surface Reached

➤ TEMPERATURES twice those of the sun's surface are being reached for several minutes by scientists at the University of Chicago. Previously such intense heat could be sustained only for fractions of a second.

A water-stabilized electric arc is used to create temperatures of approximately 25,660 degrees Fahrenheit. The sun's surface is about 11,000 degrees Fahrenheit.

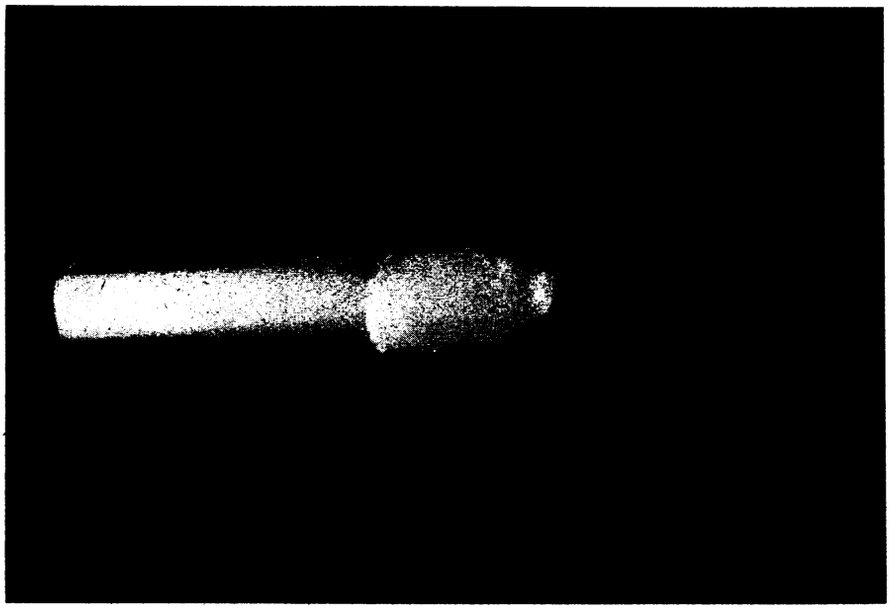
With the high heat, the Chicago scientists are trying to develop new materials for jet engines and hypersonic missiles. They are working on a contract with General Electric Company for the Air Force's Air Research and Development Command.

The arc used differs from a conventional electric arc in that the arc column is controlled by a whirling blanket of water. The water forces the column to stay within prescribed limits. The high temperatures are brought to bear on objects by a plasma stream, flowing at high velocities from the arc through a nozzle in one of the electrodes.

Stabilized arcs were first made in 1904, and the present Chicago set-up is based on designs by R. Weiss, Institute for Experimental Physics of the University of Kiel, Germany.

Dr. T. R. Hogness is director of the Chicago Midway Laboratories where the equipment was developed. Dr. L. Steg is manager of the Aerosciences Laboratory for General Electric.

Science News Letter, March 30, 1957



HEAT TESTS MATERIALS—A plasma stream flowing at high velocities from an arc through a nozzle in one of the electrodes brings the high temperatures to bear on objects.

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