BIOLOGY

Chemical Go-Between

The chemical that is the key agent in transforming light energy into the chemical energy necessary for photosynthesis has been identified by scientists at the University of California.

➤ A CHEMICAL go-between that triggers the process of photosynthesis in green plants has been clearly identified.

University of California scientists have identified a single chemical substance, called ferredoxin, as the key agent in transforming light energy into the flow of electrons that "drives" the plant's food-building machinery.

The findings removed much of the mystery from the initial light-energized step in the process by which plants convert sunlight into chemical energy. The new knowledge was reported to the 100th annual meeting of the National Academy of Sciences at Washington, D. C., by Dr. Daniel I. Arnon, professor of cell physiology on the university's Berkeley campus, and Dr. Kunio Tagawa and Harry Y. Tsujimoto, research biochemists.

In effect, the California scientists have assigned to the iron-rich protein substance, ferredoxin, the role of chemical go-between —accepting the initial "kick" from the light energy trapped by chlorophyll and converting this to chemical energy that becomes available for the plant's cellular work.

Light, it appears, boosts the energy potential in ferredoxin. After that, other chemical steps in the complex photosynthetic cycle can take place in the dark.

Last summer the Berkeley group first located ferredoxin in the plant's photosynthetic apparatus and employed it, along with hydrogen gas, to accomplish a type of photosynthesis without light. Ferredoxin had been isolated from bacteria a few months earlier by Du Pont scientists in Delaware.

The present research shows that ferredoxin's light-stimulated activity is essential for all other reactions that precede the conversion of carbon dioxide into plant substance.

The experiments have been performed with isolated spinach chloroplasts, the chlorophyll-containing granules of green plants.

After previous experiments, Dr. Arnon proposed an "electron flow" theory, which views the initial steps in photosynthesis as proceeding from light energy into chemical energy by way of the flow of electrons among several compounds.

This theory is now corroborated in striking fashion.

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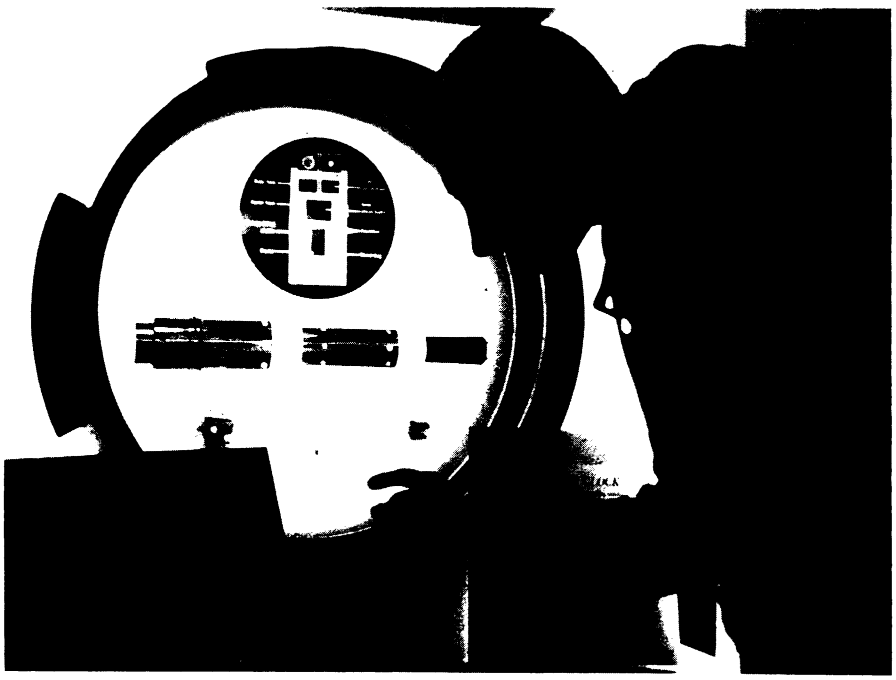

Fremont Davis

ACADEMY EXHIBIT—Stanley J. Kowal of Johns Hopkins University shows the display of parts of the Anna 1-B geodetic satellite. Using Anna, any point on earth can be measured exactly by photographic tracking. It was exhibited at the National Academy of Sciences by the Applied Physics Laboratory of Johns Hopkins and the U. S. Air Force Cambridge Research Laboratories.

Particles Create Energy

➤ NEWLY DISCOVERED microscopic dynamos, termed "elementary particles," keep busy generating energy from food molecules in living body cells.

Detection of these biological particles opens up new approaches to solving the vital problem of how energy is transformed in living systems.

With the powerful aid of electron microscopes, scientists have found that these minute particles have two recognizable parts —a faceted head and a cylindrical stem, both less than ten-millionths of an inch in size.

Special membranes of beef heart cells are studded with rows of these tiny particles, "somewhat like the seeds of a pomegranate," Dr. Humberto Fernandez-Moran of the University of Chicago told the 100th annual meeting of the National Academy of Sciences at Washington, D. C.

These particles play a basic part in the complex work of the cell's mitochondrion, which is a small fluid-filled structure made of delicate double membranes. There are from 50 to 5,000 mitochondrions in almost every living cell.

The mitochondrion releases energy from food molecules in the cell by oxidation, explained Dr. David E. Green who has been doing correlated research with associates at the University of Wisconsin.

The process of chemical transformation involves at least 70 different enzymes and co-enzymes, about 20 of which are found in each "elementary particle."

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Light Awakens Insect

➤ THERE IS a computer inside the brain of a hibernating insect.

This computer "counts" the hours of light and darkness, and tells the sleeping pupa when it is spring and time to awaken, Dr. Carroll M. Williams of Harvard University told the 100th annual meeting of the National Academy of Sciences at Washington, D. C.

As days get longer in the spring, light falls through a tiny transparent "window" onto the brain of a hibernating insect and starts in motion the growth forces that rouse it from winter sleep.

This increasing light acts directly on the insect's brain inside his cocoon, and 26 nerve cells synthesize and secrete hormones that control the end of the diapause, as insect hibernation is called.

With eight hours of light, the insect remains dormant; but with continuous light or continuous darkness, or 16 hours of illumination a day, the neurosecretory cells begin to secrete the "brain hormone" that is a prerequisite for growth and awakening of the insect to the outside world.

In experiments performed on the pupa of the Tussah silkworm, *Antheraea pernyi,* Dr. Williams found that light was able to permeate inside the dense cocoon where it entered the pupa by way of a transparent cuticle zone directly over the brain of the insect.

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