BIOCHEMISTRY

# How Plants Form Food

**Scientists have found that photosynthesis, the process used by green plants to produce food, is dependent on two photochemical reactions rather than one as previously thought.**

➤ PHOTOSYNTHESIS, the process by which green plants manufacture food, depends on two primary photochemical reactions rather than one as has been previously believed, Dr. Eugene Rabinowitch of the Photosynthesis Laboratory of the University of Illinois reported.

This new knowledge brings scientists a step closer to duplicating this life-giving plant function in the laboratory.

The two photochemical reactions, observed by Dr. Rabinowitch and Dr. and Mrs. Govindjee, who worked with him, involve the conversion of light energy to chemical energy by the formation of certain energy-rich chemical compounds. The process must proceed at balanced rates if efficient photosynthesis is to result.

What is affected is chlorophyll-a, he told the Biophysical Society meeting in St. Louis. His studies show that this main blue-green pigment, known to take up light energy directly from other pigments in green plants, has at least two components with slightly displaced absorption bands.

Activation of only one of these components by light is not enough to produce photosynthesis. But if both are excited at the same time, complete photosynthesis results.

Dr. Stacy French of Stanford University verified these findings in independent studies, Dr. Rabinowitch reported.

Dr. Rabinowitch and his co-workers also found that plant cells contain small amounts of a pigment capable of inhibiting the photosynthetic activity of "inefficient" forms of chlorophyll-a. "Inefficient" forms produce oxygen in the presence of light but do not reduce carbon dioxide necessary for full photosynthesis. The inhibiting pigment, however, does not affect the chlorophyll-a that received absorbed light by transfer from other pigments.

The scientist believes ultimately it will be possible to concentrate and isolate this new pigment.

He also discovered that there are at least five different forms of chlorophyll-a in living plant cells, revealed by spectral light studies. Only three such forms have been suggested by earlier studies, which were limited to the red portion of the light spectrum. Dr. Rabinowitch found the five forms in the blue absorption band.

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## Heredity Mechanism

➤ A DISCOVERY on the mechanics of heredity has resulted from direct examination by electron microscopy of the giant molecules involved, Dr. Liebe F. Cavalieri of the Sloan-Kettering Institute for Cancer Research reported.

The highly magnified look at the DNA deoxyribonucleic acid) molecule, which controls the transmission of inherited characteristics has revealed that a different process may be involved in the self-duplication activity by which living organisms perpetuate their kind. Two classes of DNA molecules, each composed of long chains of nucleotides, arranged respectively in double spirals and pairs of double spirals, have been found, Dr. Cavalieri told scientists at the Biophysical Society meeting in St. Louis.

In studies of pneumococcus DNA, it was found that the two double spirals of the molecule lie side by side rather than intertwined with each other, as previously believed.

It was believed that replication in heredity involved the uncoiling of these strands, but now it appears rather that each double spiral transfers its genetic information by forming an entirely new adjacent double spiral.

"This makes it easier to understand the mechanics of replication at the higher chromosomal level," Dr. Cavalieri said.

Any simplification of the complex process of heredity is important in treating and preventing some diseases, in controlling resistance to drugs, in regulating and promoting growth, in making possible synthesis of proteins and in other fields.

Ultimately, better understanding of heredity can lead to some control where congenital diseases and other inherited malformations may be eliminated.

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BIOPHYSICS

# Irradiated Cells Die Faster

➤ WHEN WHITE BLOOD CELLS are given an overdose of radiation, they die in the same way as normal cells, but much faster.

Dr. Robert Schrek of the Veterans Administration Hospital in Hines, Ill., reported at a New York Academy of Sciences conference in New York that normal and irradiated cells both died from intranuclear vacuolization, the formation of bubbles in the nucleus of the cell.

Normal, healthy white blood cells from humans survived just under ten days outside the body, but cells removed from the blood stream and given ten roentgens of radiation, about one-forthieth the amount required to kill a man, lived only six days. A dose of 4,000 roentgens killed the cells in a few hours and 1,000 killed in 12 to to 24 hours. (Cells and tissues withstand higher doses of radiation when exposed outside the body).

Dr. Schrek also found that human white cells are much more sensitive to radiation than are those from the rat, rabbit and guinea pig.

Normal survival time for healthy rat cells is just under two and a half days. Total body irradiation with 50 roentgens killed white cells in blood samples in about 20 hours.

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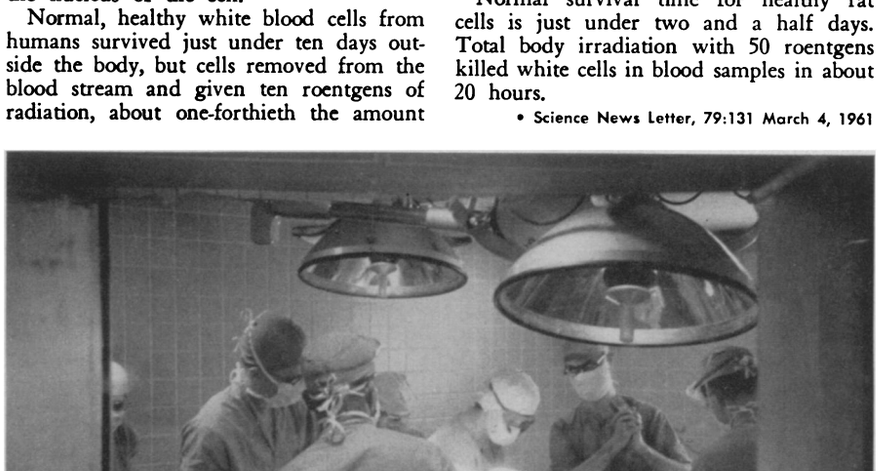

*IRRADIATING BRAIN TUMORS—Patients with malignant brain tumors have the skull opened surgically to expose cancerous tissue to radiation from a beam of neutrons at the Massachusetts Institute of Technology nuclear reactor at Cambridge, Mass. Through the window, consisting of a tank containing zinc bromide solution to absorb radiation, surgeons from Massachusetts General Hospital are seen preparing a patient for treatment.*