



HURRICANE AS SEEN FROM OUTER SPACE—This picture of Hurricane Beulah was taken by the TIROS VII weather satellite during its 947th orbit of the earth. The picture was the first taken after Beulah reached hurricane strength about 550 miles east of San Juan, Puerto Rico.

BIOLOGY

Definition of Life

Beet slices, fungal parasites and late-flowering buds are among many clues to the secret of life, discussed by more than 3,000 biologists in Amherst, Mass.—By Walter Wingo

► **WHAT IS LIFE?** More than 3,000 biologists, the scientific experts on life, gathered to exchange small clues to the answer of that fundamental question.

The clues came in bits and pieces and were presented in papers at sessions of the American Institute of Biological Sciences meeting at the University of Massachusetts in Amherst. These papers represented work done in hundreds of laboratories throughout the country.

The work itself might seem to laymen far removed from the search for a clear explanation of life.

Scientists from Cornell University, Ithaca, N. Y., for example, reported on the late season development of flower buds in apple trees; Oregon State University, Corvallis, biologists had facts on the metabolic changes in red beet slices during washing; from Iowa State University, Ames, came information on the fine structure of fungal parasites.

These reports were painfully detailed and precisely worded. There was little mention of scientific breakthroughs or new concepts in biology.

Many biologists are amused by reports that scientists, such as those studying large trait-bearing molecules, have nearly unlocked the secret of life. Biology is advancing, they say, but not that fast.

Still, biologists, like most people, have their opinions on what life is—opinions

which often border upon, or even plunge into, the supernatural.

Dr. Frits W. Went, past president of the Institute and director of the Missouri Botanical Gardens, St. Louis, sees life as an organization of energy, a temporary reversal of the "second law" of thermodynamics.

This law implies that all energy in the universe is running down, seeking a common level. But life, Dr. Went said, is an assemblage of energy—an attempt by nature to thrust mountains into the ever-falling energy plain.

Death, he contends, is the disorganization of energy. The deterioration of a living being is a prelude to death. At the moment of death all the being's energy is reclaimed by the "second law" and resumes its downward journey.

Rather than attempt to define life directly, most biologists prefer describing as best they can the attributes of life.

Dr. Arthur W. Galston, Yale University botanist, believes the most distinguishing attribute of a living thing is its ability to reproduce its kind. He concedes, however, that man can build machines that are not alive but still are capable of replicating themselves.

Dr. Hermann J. Muller, Nobel Prize-winning geneticist of Indiana University, Bloomington, believes the basic characteristic of life is its "evolvability." He says

evolvability basically is a unique combination of chemical faculties possessed by living things in the form of microscopic chromosomes.

Other attributes of life mentioned by biologists were: the ability to grow; the ability to adapt to environment; the possession of a characteristic organization of the material of life, called protoplasm; the ability to carry out a complex set of chemical processes called metabolism, and an ability to respond to things in the world outside itself.

A problem is that biologists are turning up many things that seem to exist in a twilight between certain life and certain lack of life.

The word "biology" means "discourse on life." Until biologists are sure what life really is, we can expect them to rest uneasily in their pursuit of this branch of knowledge.

• Science News Letter, 84:147 September 7, 1963

Plant Sprays Safer

► **SPRAYS** designed to kill plants are not as serious to man as insect-killing sprays, the American Institute of Biological Sciences meeting was told.

Dr. Frits W. Went, director of the Missouri Botanical Garden, St. Louis, and a past president of the Institute, said that plants are so different from animals that many materials toxic for plants do not affect animals at all.

On the other hand, he said, the general metabolism of plants is sufficiently close to that of animals that in many cases plants can be killed by sprays designed to stifle the metabolism of insects. Such insecticides include arsenic compounds, fluorides and dinitrophenol.

"Yet, where the toxicity is aimed at a special part of the plants' metabolism, such as growth," he added, "there is a good chance that substances opposing plant growth will not specifically affect animals and man."

He said herbicides like phenylureas and triazines seem to act primarily on photosynthesis, the energy system of plants but not of animals.

"It is very likely that specific inhibitors for photosynthesis are not interfering with animal metabolism, and therefore are unlikely to be very toxic to animals," he said. "Many of the herbicides are quite selective, and this too means that if even many plants are but little affected by them, animals are even more likely to be safe from them."

Dr. Went said he must "shamefacedly" admit that botanists do not yet know how the hormone-herbicides, like 2,4-D, work. This type of herbicide somehow affects the growth of plants. The first symptoms of 2,4-D poisoning are excessive growth and contortions. The growth then stops but the plant becomes still more abnormal.

"If we make up a balance of the advantages and the dangers of herbicides, however, the balance very definitely tips toward the side of the advantages," he said.

• Science News Letter, 84:147 September 7, 1963