

BIOCHEMISTRY

Gene Now Obsolete Term

Although by definition a gene is still the unit of heredity, scientists no longer believe it is a bit of matter that determines a specific characteristic.

► **THE GENE** as the carrier of a unit characteristic in heredity has become a mere ghost of its former self.

Once it was pictured as the unit of chromosome structure, much like an individual bead in a string of beads. It is still, by definition, the unit of heredity.

However, it is no longer believed to be a blob of matter that will confer blue eyes or extra fingers upon the individual who happens to receive one specific section of a chromosome in the lottery of heredity.

As new techniques of scientific observation reveal fine structure of the chromosomes, which are the heredity-bearing parts of the living cell, the mechanism by which plants and animals reproduce their own kind is found to be more and more complex.

The imaginary model that likened genes within the chromosome to a string of beads has had to give way to one more like a piece of rope. Coiled and twisted strands that are shown by the optical microscope, or suggested by structures seen there, can be magnified by the electron microscope.

Here the individual strands are seen to be each composed of many bundles of fibrils. Each fibril has an outside shell around a central core. Whether the living fibril is like an insulated wire or a hollow piece of macaroni has not been found.

Dimensions of these fibrils do not correspond to those calculated by the scientists who elaborated the gene theory a generation ago.

So much has the idea of the gene changed that the word is not used on the program of the symposium on the chemical basis of heredity held at the Johns Hopkins University, Baltimore, by the McCollum-Pratt Institute, with the cooperation of the Atomic Energy Commission. Instead, the physicists and geneticists who joined forces at the symposium to discuss the latest findings on the subject have submitted the term "unit of heredity."

A handicap to scientists trying to identify objects seen through the two kinds of magnifying devices seems to be that some of the key structures in the reproductive cells are too small to be seen clearly through the ordinary microscope, where the distinctness of the image is limited by the size of the waves of light by which the image is seen.

At the same time the electron microscope, which is capable of much greater magnification because it sees by means of the electron, finds the units of heredity in the cell too large to get into the picture. Scientists are now trying to identify objects of intermediate size to bridge the gap satisfactorily between the two classes of structures.

► **LIFE** is still a mystery. In spite of the strides taken in recent years toward understanding in detail the way life processes work, scientists have not been able to create life.

The goal of making living matter in a test tube seems to recede further with each new discovery. New problems appear as each barrier is overcome.

However, scientists do know that life is a chemical reaction. Living cells are kept going by a continuous supply of the familiar food chemicals, proteins, carbohydrates and fats. The cells contain, in addition, nucleic acids.

Analysis of nucleic acids has shown they are made up of four kinds of nuclear fragments, each containing phosphoric acid and a peculiar kind of sugar called ribose. Four nucleotide bases, joined to the sugar and the phosphoric acid, make the distinction between the four constituents of nucleic acid.

The four nucleotide bases are nitrogen-containing compounds known respectively as adenine, guanine, cytosine and uracil,

which are relatively simple compounds for organic chemicals. All have been synthesized from inorganic material, although for experimental work it is more convenient to obtain them by splitting nucleic acid.

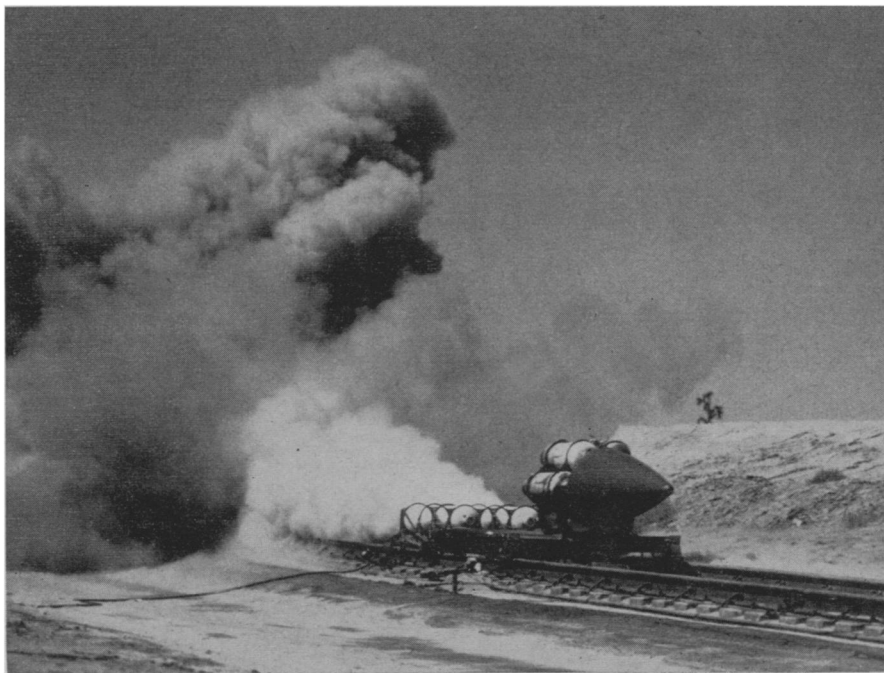
Ribose, the sugar part of the nucleic acid, is chemically a simpler compound than dextrose and levulose, which are the less complex of the sugars used as food. Dextrose and levulose have six carbon atoms to the molecule. Ribose has only five. Its hydrogen and oxygen are in standard carbohydrate proportions, $C_5H_{10}O_5$.

Although the ribose and the phosphorus parts of the nucleic acids are always the same and the same four nucleotide bases are found in equal quantities on analysis, a great variety of ribonucleic acids is found in nature. The differences between these substances are believed to be due to differences in sequence of the nucleotides, in their arrangement within the molecule.

Chemists have tried the effect of introducing other, similar molecular groups into the nucleic acid structure in place of adenine or others of the nucleotide parts of ribonucleic acid. Such a synthesis is chemically practicable but, when the new compound is introduced into a colony of bacteria, growth of the bacteria is hindered.

One school of cancer-fighters hopes to find a way to control such growths by administering abnormal chemicals of this type. The hope is that a compound could be synthesized that would be taken up

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RECORD BREAKING SLED—A world's record, for recoverable sleds, of 1,560 miles per hour was set by this Convair rocket sled on the 10,000-foot high-speed track at Edwards Air Force Base, Calif., one of ten such test centers under the Air Force's Research and Development Command. Tests are being conducted to determine the effect of rain erosion damage on aircraft and missiles at supersonic speeds.