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 aid.

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 aid. 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

(Continued on page 409)

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.

Science Service, Inc. is collaborating with JSTOR to digitize, preserve, and extend access to The Science News-Letter. www.jstor.org

Gene Obsolete Term

(Continued from page 403)

preferentially by the cancer tissue, but that would then block the path by which the cancer tissue receives nutrients. A satisfactory compound of this nature has not yet been perfected.

Reconstituted Viruses

The offspring of viruses that have been taken apart, into their inorganic constituents, and then put back together, into the most primitive form of living matter, breed true.

Announcement of this fact, which clinches the proof that the tobacco mosaic virus is the same after its reanimation as it was before, was made by Drs. H. Fraenkel-Conrat and Robley Williams of the University of California. The California scientists spoke at the McCollum-Pratt Institute's symposium on the chemical basis of heredity, held at the Johns Hopkins University, Baltimore.

These scientists succeeded in March, 1955, in recombining the protein and nucleic acid of the tobacco mosaic virus to reconstitute the living organism. They reported this achievement to the National Academy of Sciences in October, 1955. (See SNL, Nov. 5, 1955, p. 292.)

Not enough time has passed to allow Dr. Fraenkel-Conrat and Dr. Williams to determine whether the virus offspring of the reconstituted colony will differ from the parent stock in the number and kind of mutant strains produced.

Plant viruses are noted for maintaining the function of reproducing their kind, a fundamental criterion of living matter, without having a supply of the life chemical known as DNA in their makeup.

DNA is the abbreviation for the chemical name desoxyribonucleic acid. This chemical is found in the reproductive cells of plants and animals, and is believed associated in a fundamental way with the mechanism of heredity.

In plant viruses, a similar chemical compound, RNA, ribonucleic acid, is the main life chemical. The two compounds differ in the simplest form of their chemical constitution by only one atom of oxygen.

Duplication of this simplest form of structure into polymerized molecules of large size is, however, a characteristic of living matter.

Experiments in building up nucleic acids in the laboratory by means of an enzyme extracted from bacteria were described to the symposium by Dr. S. Ochoa of New York University. This enzyme has the ability of linking together the component parts of nucleic acids through the phosphorus and the ribose sugar they contain

Through this reaction Dr. Ochoa is able to study the differences in nucleic acids, which are due to the orders of sequence of the nucleotides of which they are built. He can also vary the chemical groups in such life chemicals to include similar compounds not found in nature.

The fact that living tissues can take up substitute chemicals in place of nucleic acids but cannot use them as food gives hope of making immunizing chemicals in this way to protect against communicable diseases or possibly find use in combatting cancer.

Science News Letter, June 30, 1956

GENERAL SCIENCE

Vault to Carry Present Into Next Century

➤ A VAULT that is scheduled to be opened a hundred years from now has been placed beneath a walkway in front of the George Washington University's new Tompkins Hall of Engineering to contain objects, publications and other records that will bridge one century with the next.

Dedicated to the donor of the new engineering building, Charles H. Tompkins, a Washington builder, the vault includes in its contents an issue of SCIENCE NEWS LETTER and several units of experimental Things of Science kits.

Science News Letter, June 30, 1956

Wrist Radio Weighs 2.5 oz.

All-transistor wrist radio receiver

A broadcast band all-transistor wrist radio has been designed with r-f reflex circuit to provide good selectivity and sensitivity. Three transistors are used which require 4.5 ma total battery current and five button-size mercury cells last up to 100 hours. The receiver features a 2-stage transformer-coupled audio amplifier and a no-whistle regenerative circuit. A high quality hearing aid receiver allows for private listening. Printed circuitry is used throughout. Band coverage is 550 to 1600 kc. Its small size (2¾ in. long, 1¾ in. wide and ¾ in. thick) and weight (2.5 oz. with batteries) make it well suited for wearing on the wrist or in a shirt pocket. Completely assembled with all batteries.

ONLY
$29.95
POSTPAID

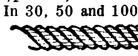
OLIVER GARFIELD CO.
DEPT. SL-35 126 LEXINGTON AVENUE NEW YORK 16, N. Y.

GOVT. SURPLUS DUPONT NYLON CORDS
Below Mfrs. Cost
Outwears Ordinary Cord 10 to 1

Light, strong, durable, quick-drying. Will not rot or mildew. Ideal for indoor or outdoor use. Camping, boating, hunting, clothesline and venetian blinds. Perfect for tent ropes, light anchors, deer cord, trot lines, crabbing, etc.

NYLON BRAIDED CORD
1/16" dia., 100 lb. test, white, per ft. ...... 1½¢
1/8" dia., 375 lb. test, white, per ft. .... 2¢
3/16" dia., 550 lb. test, olive drab, per ft. .. 2½¢
In 50, 100, 200, 300, 400, 500 ft. and over lengths.

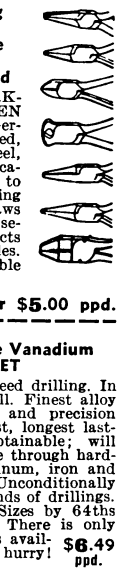
NYLON BRAIDED LINE
¼" dia., 1000 lb. test, olive drab, per ft. .... 3¢
In 30, 50 and 100 ft. lengths.


NYLON ROPE
⅜" dia., 2,700 lb. test. Any length to 600 ft., per ft. .... 17¢
7/16" dia., 3,800 b. test. Any length to 600 ft., per ft. .... 20¢

NYLON FISH LINE Proven best by experienced fishermen. Heat stretched. Will not kink, twist or unravel. 25 lb. test. 300 ft. reg. $1-per spool. NOW .... 50¢


NYLON WEB STRAPS
with sturdy steel buckle
Perfect for passenger safety belts, luggage straps, car tow-lines, car carrying straps, boat trailer straps, etc. Tie heavy equipment and machinery with greater ease and safety . . . at far less cost. Just the thing for the garage or workshop.
1" wide, 3,000 lb. test, per foot .... 10¢
1¾" wide, 6,000 lb. test, per foot .... 16¢
In 5, 6, 8, 10, 12 foot lengths.

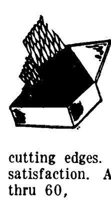
75¢ ea. for Finest Quality
Imported PRECISION PLIERS

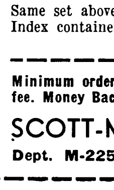


- Flat Nose
- Combination
- Diagonal Cutter
- End Cutting Nippers
- Round Nose
- Snipe
- One Side Flat—One Side Round

FOR JEWELERS, OPTICAL WORKERS, HOBBYISTS, CRAFTSMEN OF ALL KINDS! These superb German instruments are of deep-forged, heat-treated high quality tool steel, fabricated to most exacting specifications. All-over ground and polished to smooth hard surfaces. Smooth working joints with just the right tension. Jaws meet perfectly to hold safely and securely even the most delicate objects in the hard-to-reach corners and angles. Each plier is 4" long and a veritable gem of precision and strength.

75¢ each all 7 for $5.00 ppd.


29-Piece Chrome Vanadium
DRILL SET
Specially made for speed drilling. In sturdy plastic tool roll. Finest alloy steel drills hardened and precision ground to the sharpest, longest lasting cutting edge obtainable; will easily and cleanly bite through hardwoods, plastics, aluminum, iron and the toughest steels. Unconditionally guaranteed for thousands of drillings. Full jobber length. Sizes by 64ths from 1/16" to ½". There is only a limited quantity of sets available at this low price, so hurry! $6.49 ppd.
Also available with Turned Down Shanks to fit all ¼" drills. In individual pocket roll. $8.95 ppd.


60 Pc. Set CHROME VANADIUM Wire Gauge DRILLS
Top quality high test Chrome Vanadium Drills designed for speed drilling through toughest steels, woods, plastic, iron and aluminum. Precision ground long-lasting cutting edges. Guaranteed to give years of satisfaction. A full 60 pc. set. Nos. 1 thru 60, A $14.95 Value Now Only $5.40 plus 35¢ pp. and hdlg.
Same set above available with Huot Metal Index container —— Only $6.65 plus 35¢ pp. and hdlg.

Minimum order $1.00. Send Check or M.O. C.O.D. plus fee. Money Back Guarantee.

SCOTT-MITCHELL HOUSE, INC.
Dept. M-225, 611 Broadway, N. Y. 12, N. Y.