BIOCHEMISTRY

'Puffs' Heredity Clue

The mechanism of heredity is further clarified by evidence that the source of RNA "messenger" molecules is in bulges along cell chromosomes—By Walter Wingo

➤ PROGRESS HAS BEEN MADE in understanding the way the stuff of heredity is created in the cells of living matter.

The mysterious appearances of bulges, called "puffs," along the deeply colored strands of chromosomes in cells have bothered scientists since 1881 when the puffs were first noticed.

Now there is strong evidence that these puffs are zones where the body is actively producing long-string molecules that direct the building of substances needed at that very moment.

These molecules, called messenger RNA, migrate out of the nucleus and trigger the construction of specific proteins.

A study of puffs using modern techniques was reported to the International Congress of Biochemistry, New York, by Dr. Ulrich Clever, who did his work at the Max Planck Institute for Biology, Tubingen, Germany.

Dr. Clever studies chromosomes taken from the salivary glands of fruit fly larvae. These chromosomes are 10,000 times larger than most others.

He first injected the larvae with radioactive uridine, the nucleic acid that blends into RNA but not into proteins or the tightly-coiled master controller of the cell, DNA. Photographs showed that RNA in puffs quickly took up the uridine, indicating rapid production of RNA.

When he injected radioactive amino acids, proteins in the chromosomes did not appear to use them, showing that puffing is not caused by the making of new proteins.

Dr. Clever then attacked the problem of why only at specific times do specific spots along a chromosome unravel and puff up to allow room for the making of RNA.

By injecting a hormone, ecdysone, he noticed he could produce two puffs always at the same spots along the chromosomes of the midge insect.

The more ecdysone he injected into the chromosomes, the larger the puffs became and the more feverish the rate of formation of messenger RNA. When he stopped injecting the hormone, the puffs shrank and disappeared.

Ecdysone, it is known, controls the process of molting in midges. Its precise action on chromosomes is still uncertain, but Dr. Clever's work indicates that ecdysone sets the trait-bearing genes of the cell into motion.

Thus, while the controls for molting are in the DNA, the switch that turns on the proper sections of DNA appears to be a hormone.

Dr. Clever and his associates are moving to Purdue University, Lafayette, Ind., to develop further this highly revealing line of research into the most intricate mechanism of life.

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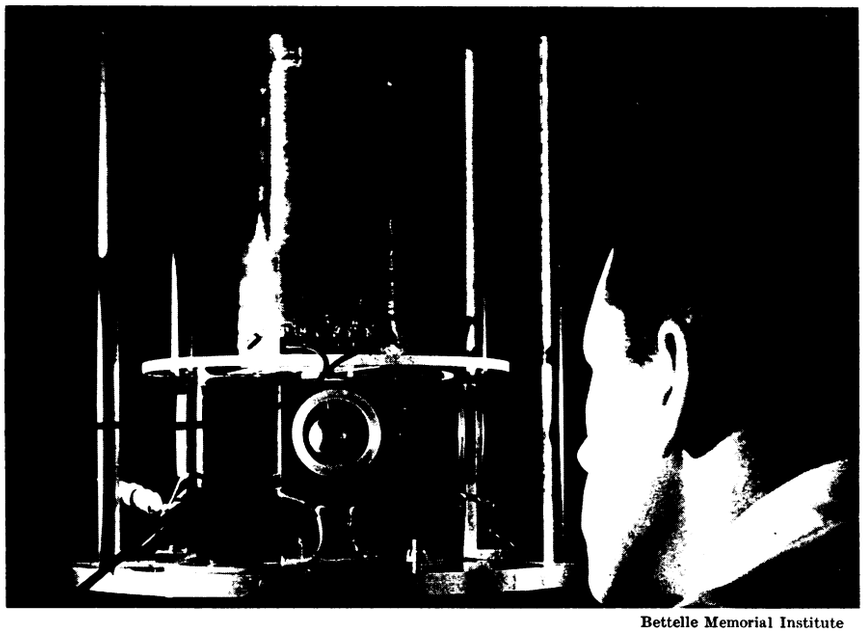

Bettelle Memorial Institute

DEFYING GRAVITY—The one-inch steel ball is spinning in midair faster than the eye can see, due to a delicate balance of magnetic forces in this ultracentrifuge built at Battelle Memorial Institute's Columbus Laboratories for better understanding of the forces that draw molecules together.

Genetic Code Supported

➤ THE BEST EVIDENCE yet that scientists have been right in their interpretation of the "genetic code"—nature's system for relaying such inheritable traits as blue eyes, black skin or red hair—was reported to the Sixth International Congress of Biochemistry in New York.

A team from Stanford University, Stanford, Calif., headed by Dr. Charles Yanofsky, said its latest work deep into tiny cells "conclusively demonstrates" how elements in the trait-specifying genes line up neatly with elements in proteins produced by the body.

Biochemists have held this idea for years, but largely as a matter of faith.

The way was paved for the Stanford experiments in 1962 when scientists first showed that a combination of three chemical bases found in a gene is the "code word" for the cell to make a specific unit on a protein's string of amino acids.

A flurry of attempts to assign triplet base codes to all 20 amino acids followed. Tests revealed that the code, first worked out for the free-living cells *Escherichia coli,* is the same for all living matter. The finding throws more weight behind Charles Darwin's theory that all forms of life are related.

The next step was to use the genetic Rosetta stone to find out the relation between amino acids and mutations, quirks that pop up from time to time in all species of life.

Mutations usually result from exposure to some type of radiation.

Since it appears to be the gene's destiny to make a specific protein, mutations should come about through the replacement of a single base in the code triplet.

It should result in the substitution of one amino acid for another in the protein product.

Using agonizingly delicate methods, the Stanford group studied a vital protein in a mutant strain of *E. coli.* The result, worked out on a full quarter of the protein, was consistent with the accepted code. The positions of quirks in nucleic acids in the genes correspond directly with quirks in the protein structure.

Dr. John T. Edsall, Harvard University professor who is president of the Biochemistry Congress, termed the Stanford work "clear-cut proof."

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Antibiotic Upsets Genes

➤ STREPTOMYCIN, a well-known antibiotic whose mode of action in fighting disease has been unknown up to now, is believed to upset the genetic code, Dr. Luigi Gorini of Harvard University Medical School, Boston, told the Sixth International Congress of Biochemistry in New York. The genetic code is the term given to the chemical means by which hereditary information is passed from cell to cell.

Enzymes and other proteins, which are the essential elements of life, are assembled in the cell's cytoplasm by small "factories" called the ribosomes.

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