

## BIOLOGY

# Sees Hereditary Material

►THE FIRST scientist to see a gene express itself in a test tube believes his work may enable biologists to explore more closely the chemical intimacy of heredity and has definite plans for doing some exploring of his own.

In describing his recent accomplishment to SCIENCE SERVICE before his address to the National Academy of Sciences spring meeting in Washington, D. C., Dr. G. David Novelli, biochemist at the Oak Ridge National Laboratory in Tennessee, said:

"We weren't the first to synthesize protein outside the cell, but we were the first to achieve specific gene action in a test tube."

Biologists generally agree that the transfer of genetic information is the work of deoxyribonucleic acid (DNA), the compound that makes up the chromosomes that carry genes. Genes, the heredity units that control traits as varied as finger length and disease resistance, are thought to exert their influence by dictating the synthesis of enzymes.

Dr. Novelli was able to duplicate the synthesis of such an enzyme, beta-galactosidase, in the test tube and to directly implicate a specific kind of DNA in the protein forming process. The organism used was the intestinal bacterium, *Escherichia coli*.

Only a small part of the DNA molecule controls the formation of beta-galactosidase; the other parts do other things. Dr. Novelli and his group broke open *E. coli* cells and separated the protein making machinery. They found that only the DNA isolated from the organism caused the formation of the enzyme—and only that enzyme—out of the metabolic soup.

Destroying the DNA with ultraviolet rays, X-rays and a DNA-splitting enzyme called DNase completely jammed the beta-galactosidase making machinery. None was formed.

Further—and this was a crucial experiment—when he added the DNA taken

from mutants of *E. coli* which did not have the ability to make the enzyme, again none was formed.

"The new development in our work is that we now know that DNA has to come from cells that have the specific gene to form the specific protein," Dr. Novelli said.

Where does he go from here? In several directions, the New England-bred biochemist said.

"For one thing, nobody knows how big a gene is. Now we can begin to chop up DNA to see how small a particle will work. Then we will determine the base composition."

The bases—four in all—are believed to be the portions of the DNA molecule which determine the character of genetic information the DNA molecule transmits. They are scattered repeatedly but systematically along the molecule. Biologists would like to relate the pattern—the code—of these bases to the kind of traits they dictate.

"Another big job is to determine the character of a substance called messenger RNA, the template on which protein is probably built," said Dr. Novelli.

RNA is first cousin of DNA. It is the abbreviation of ribonucleic acid. The two nucleic acids somehow work together as a team in protein synthesis. DNA gives the information to messenger RNA in the form of molecular code—probably by arranging the bases—then the RNA travels to the site of protein synthesis where some 20 different components of the protein molecule, the amino acids, begin arranging themselves on the template.

Then, when the protein is made, it strips itself off the RNA, which is then ready to resume the cyclic process.

"So another job would be to isolate the messenger RNA and see if we can get the process to work without DNA," Dr. Novelli said.

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## INVENTIONS

## Patents of the Week

►"INVENTIONS for the home of tomorrow" were the theme of several inventions just patented.

Two improved methods for rocking the cradle electrically have been invented. The main advantage of the "motor driven cradle" devised by David Saint of Rockledge, Pa., and Calvin L. Reed of Jenkintown, Pa., and assigned to Graco Metal Products, Inc., is that it can be made inexpensively.

It also has a timer and an adjustment that lets the cradle rock through a wide arc or a small one. Patent No. 2,979,734 was awarded this invention.

Norman Donald Helmer of Long Beach,

Calif., won patent No. 2,979,735 for a similar idea. His invention, a rocking platform for a bassinet, is lower in height, in order to cut down the likelihood that the device will tip over.

The latest thing for the bathroom is a bar of soap with brush bristles embedded. The scrubbing bar, invented by Guy M. Beatty of Bakersfield, Calif., and awarded patent No. 2,979,748 contains bristles that are scored at short intervals. As the soap wears down, the bristles break off bit by bit along the score marks and a scrubbing surface is maintained.

For the child in the family, Homer C. McNeil of San Antonio, Tex., has devised a

hand-powered swing. It is actually a small airplane suspended by wooden or metal bars.

The child sits in the cockpit of the plane with the stick of the airplane between his knees. Pushing and pulling on the stick, which is connected to the leverage arrangement, makes the plane swing back and forth. This device was awarded patent No. 2,980,164 with rights partially assigned to Edgar A. Gittinger Jr., also of San Antonio.

The family cat or dog gets an added bit of sleeping comfort, in the form of a cot with an electrically heated pad, patent No. 2,980,058. The structure, invented by Roy D. Hoffman of Bedford, Pa., provides pipe-like supports for a standard cot arrangement. The cloth part is actually a heating pad equipped with a washable cover.

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