

La Jolla, Calif., promptly dubbed this explanation the Colgate Effect, and agreed that it should be considered along with three or four other theories of Seyfert radiation at wavelengths from radio to ultraviolet, including electron synchrotron emission and proton synchrotron emission.

If Seyferts and quasars are related, what astronomers may be seeing could be likened to a bomb explosion on earth, with the galaxies looking so very different because they are caught at various stages: a time-stopped photo-

graph of galactic evolution with most of the pictures missing.

One additional explanation for the variations of radiation in very short times in both Seyferts and quasars is that some unknown force is at work. Just as there are phenomena, not all understood, that effect earth in a few seconds or less (microseisms) and the sun in a few minutes or hours (surges or flares), there may be equally mysterious forces at work in galaxies with time scales of a few months or years, such as those observed in Seyferts. <

## CHROMOSOMAL RNA

### Key to cell specialization described

Every cell that possesses a nucleus also has a complete set of genes for the organism of which it is part. This interesting state of affairs, somehow, does not result in biological anarchy.

Yet if every function controlled by the genes was performed by every cell, there truly would be anarchy. That liver cells function as liver cells and not as leukocytes is a fundamental of life.

The fundamental is not necessarily simple. Much effort has gone toward uncovering the mechanism whereby each cell performs as a specialist. Dr. Mark Ptashne of Harvard University, speaking at last week's Biophysical Society meeting in Pittsburgh, reported on a tide of research into gene function repression at the bacterial level.

Genetic experiments some time ago showed that there are groups of genes controlled by the products of other genes called regulators. The latter produce substances called repressors, which neutralize the protein-forming activities of the genes under their control. Dr. Ptashne reports that the action of repressors, which are medium-to-large-sized proteins, is due to tight binding of these proteins to the strand of deoxyribonucleic acid (DNA) bearing the genes they control. For each group of genes the bacterium synthesizes a unique repressor protein.

This system works well in a bacterium, which has relatively only a few genes. But it would be unwieldy in higher organisms; in fact, their reliance on the system may explain why bacteria have risen no higher on the evolutionary scale. At the same time, Dr. James Bonner of California Institute of Technology reported a substance in the chromosomes of higher organisms which apparently performs the same function as the cumbersome bacterial system of repression. Dr. Bonner calls the substance chromosomal ribonucleic acid (RNA). This form of RNA, he says, is responsible for the specificity of the repressant action of certain proteins.

DNA is found in the nucleus and consists of long strands of sub-units, called nucleotides, hooked together. In nearly every instance the DNA occurs as a double strand wound into a helix. Genes are defined as sites along these strands which are capable of initiating a process leading to the biosynthesis of proteins. Each gene can start the ball rolling for one specific protein. It does so by acting as a template for the formation of messenger RNA.

The messenger RNA, a kind of mold of the gene site on the DNA strand, migrates into the cell's cytoplasm and becomes attached to an organelle called a ribosome.

At the surface of the ribosome synthesis of protein takes place. There the messenger RNA is deciphered by the ribosome as a record of the genetic information.

Dr. Bonner notes that only 5 to 15 percent of the DNA of a cell is available for transcription, however. The rest seems to have been switched off and does not form messenger RNA. Responsible for this repressed state are the histones, a group of proteins found in the nucleus associated with DNA. These histones are capable of bonding firmly to the gene sites, thereby occupying the space that otherwise would have been occupied by the messenger RNA as it was being synthesized.

The problem that researchers ran into was the lack of specificity of the small group of histones. When extracted from cells, DNA partly associated with histones is capable of synthesizing a certain population of messenger RNA's. If the histone association is undone chemically, however, and the histones are then left on their own to rebond with the DNA they were taken from, they do so at random. The same mixture then produces an entirely different selection of messenger RNA's.

In the presence of chromosomal RNA from the same cell, Dr. Bonner reports, the histones all fall back in line

the way they were before. Furthermore, chromosomal RNA and its histones from one organ will act on DNA from another, so that the latter is made to produce the same messenger RNA series that the first organ does. It appears that chromosomal RNA is the sole determinant of what activity a cell will undertake out of the spectrum of activity allowed by the full gene package.

Evolutionarily the advantage of the RNA-histone system is that its working tools, the histones, are so non-specific and interchangeable. In fact they vary little from tissue to tissue and even organism to organism.

## SIXTH HEART TRANSPLANT

### Indian team unsuccessful

It was after midnight on Friday, Feb. 16, when 19-year-old Lalita Balkrishna, was brought into the King Edward Memorial Hospital in Bombay, India, scarcely alive after a fall from a train.

The young woman's heart was transplanted into the chest of an ailing farmer named Bodhan Chitan, who had no chance of survival because of cardiomyopathy, a weakening of the heart muscle peculiar to India and Africa.

Dr. P. K. Sen, chief of a team of 45 doctors, nurses and technicians, said the operation was technically successful, but death came three hours later from a lung infection.

The young woman had had an operation on her brain in an effort to correct injuries received in the fall, but she died soon after surgery. A heart-lung machine kept blood circulating through her heart to keep it viable while surgeons prepared the farmer for the transplant.

Dr. Sen, who is highly respected by heart surgeons in the U.S., had issued a call for a heart to be salvaged after a possible accident. Chitan had been ill for a number of months and it became evident that he could not survive without another heart.

No electric shock was necessary to get the heart to start beating again after the transplant, and it functioned satisfactorily until his death.

This marked the sixth human heart transplant in history, and the first to be performed outside the Union of South Africa and the United States.

All of the six patients are now dead except Dr. Philip Blaiberg, who received the heart of a young man in Capetown's Groote Schuur Hospital, and was still making satisfactory progress 50 days after his transplant.

(See special transplant section: pages 213 to 221.)