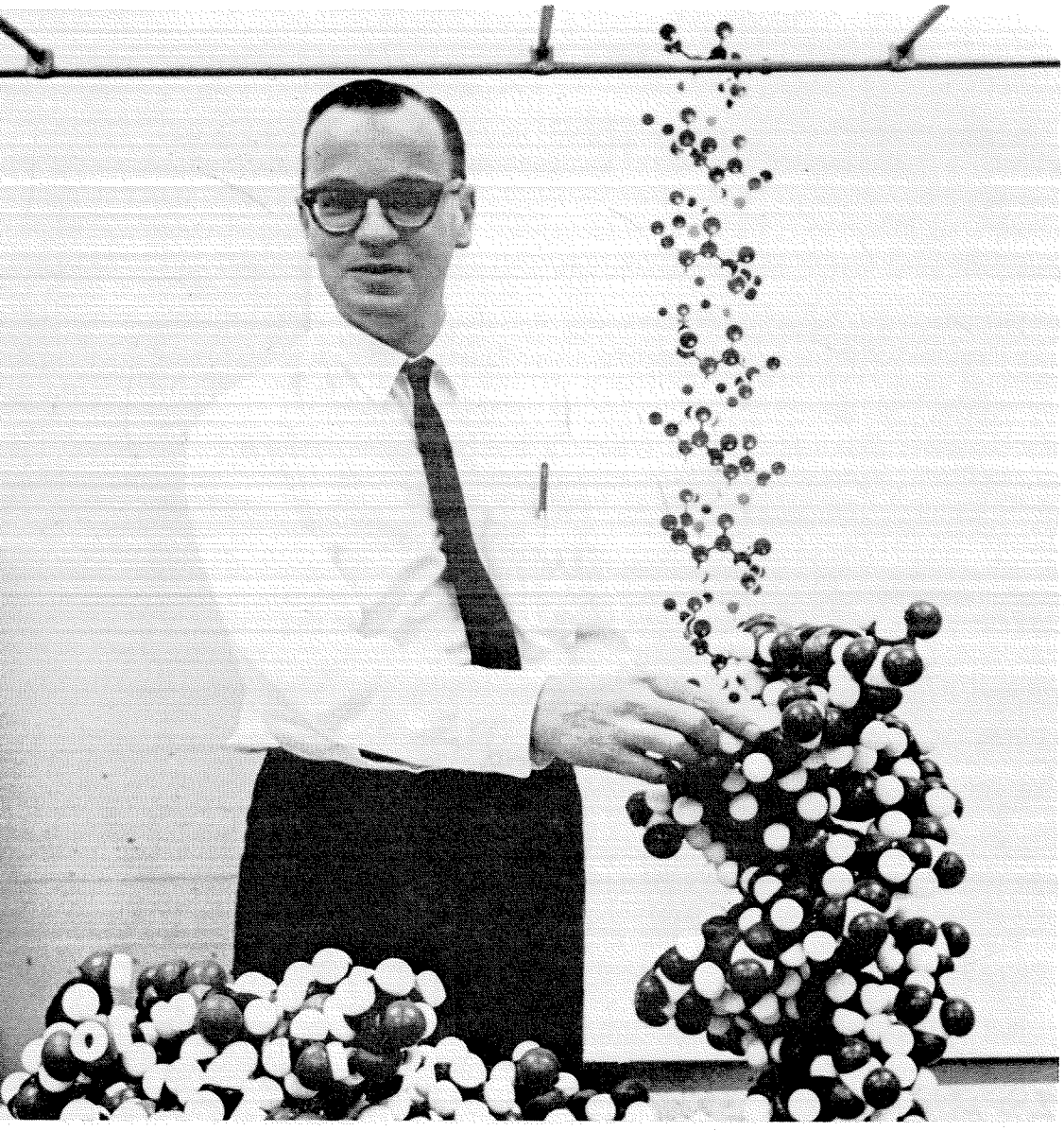
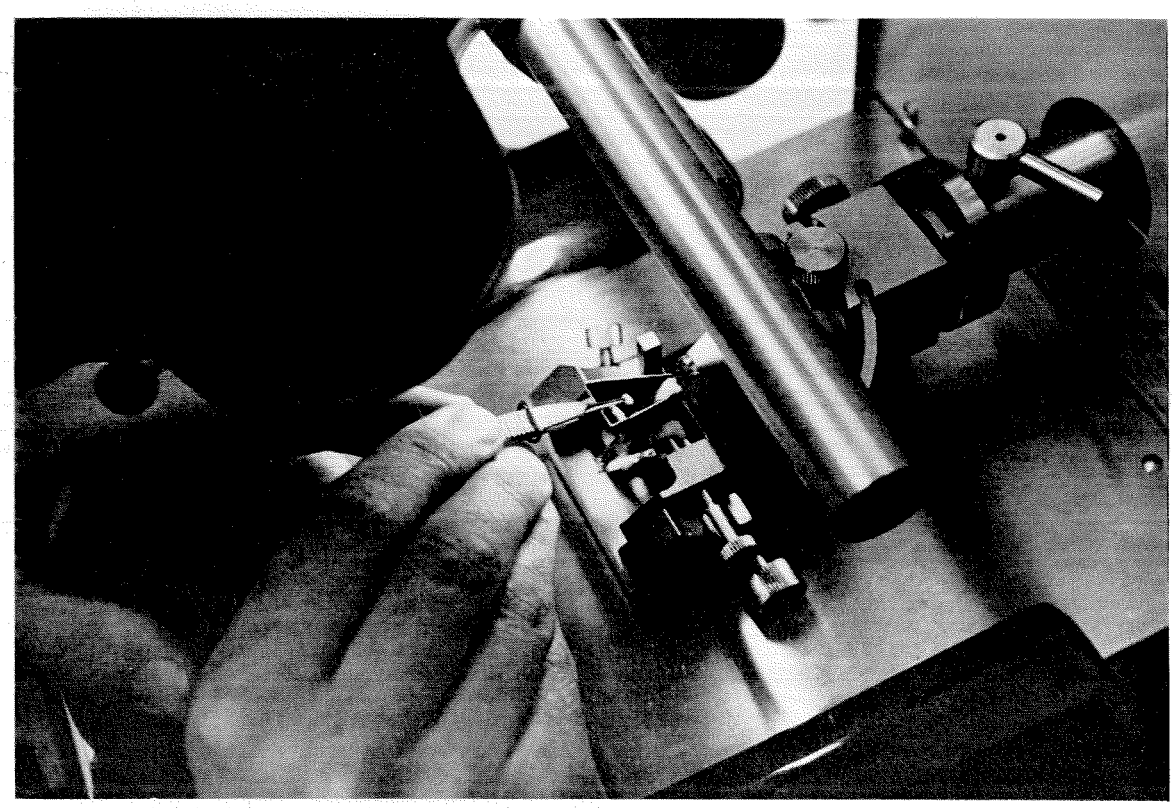


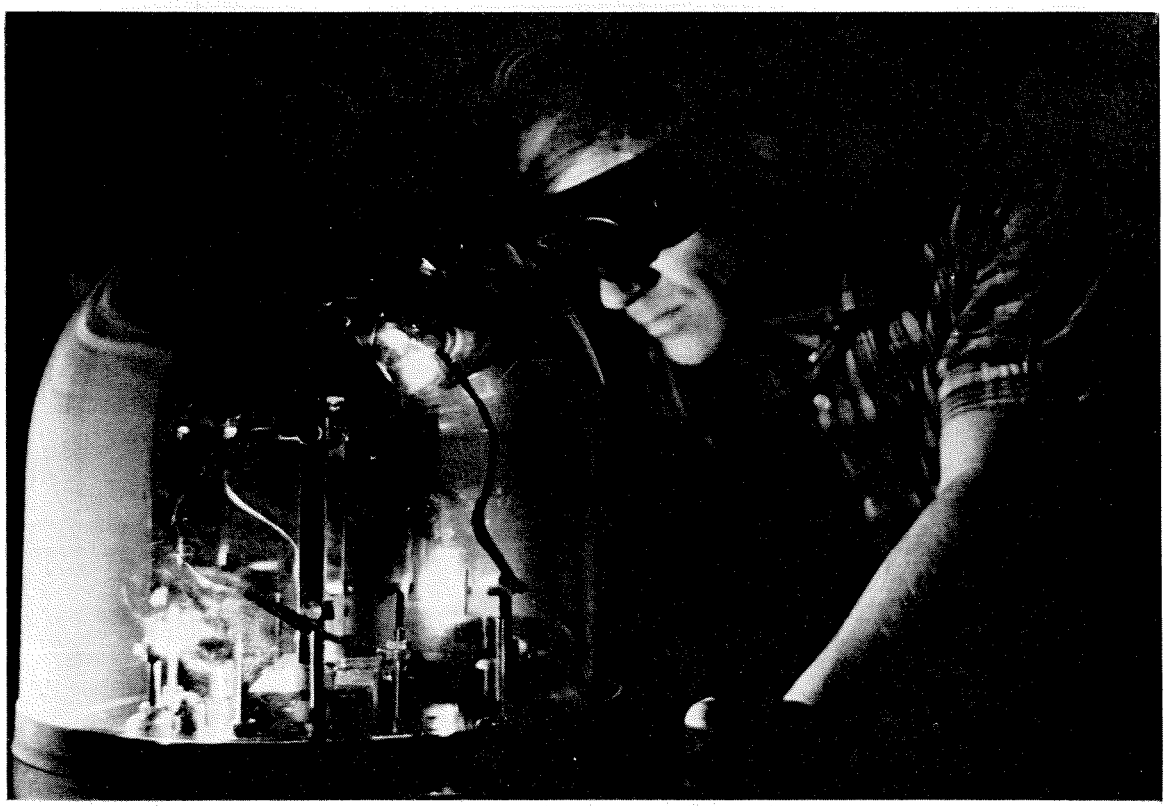
Alan J. Hodge, professor of biology, and the foam plastic models used to study the structures and interactions of complete proteins and portions of the helical structure of DNA—which Dr. Hodge works with here. The atoms in this structure are magnified 125 million times. DNA is one of the nucleic acids which carry and transmit the coded information of heredity. Research at Caltech, plus an accumulation of material from other laboratories, may soon allow biologists to crack the code by which chemical molecules control the processes of life.

MOLECULAR BIOLOGY

Molecular biology — which deals with the nature of molecules that are important to living systems, their forms, functions, and organization — is one of the active research areas in Caltech's biology division Much of this research is carried out in a new laboratory of electron microscopy, housed in the Gordon A. Alles Laboratory for Molecular Biology. Here, three highly critical electron microscopes and many supporting instruments are helping to open up the world of ultrastructure in the minute cells of higher plants and animals, and also in many viruses. On these pages, a pictorial report on current research in the new laboratory.

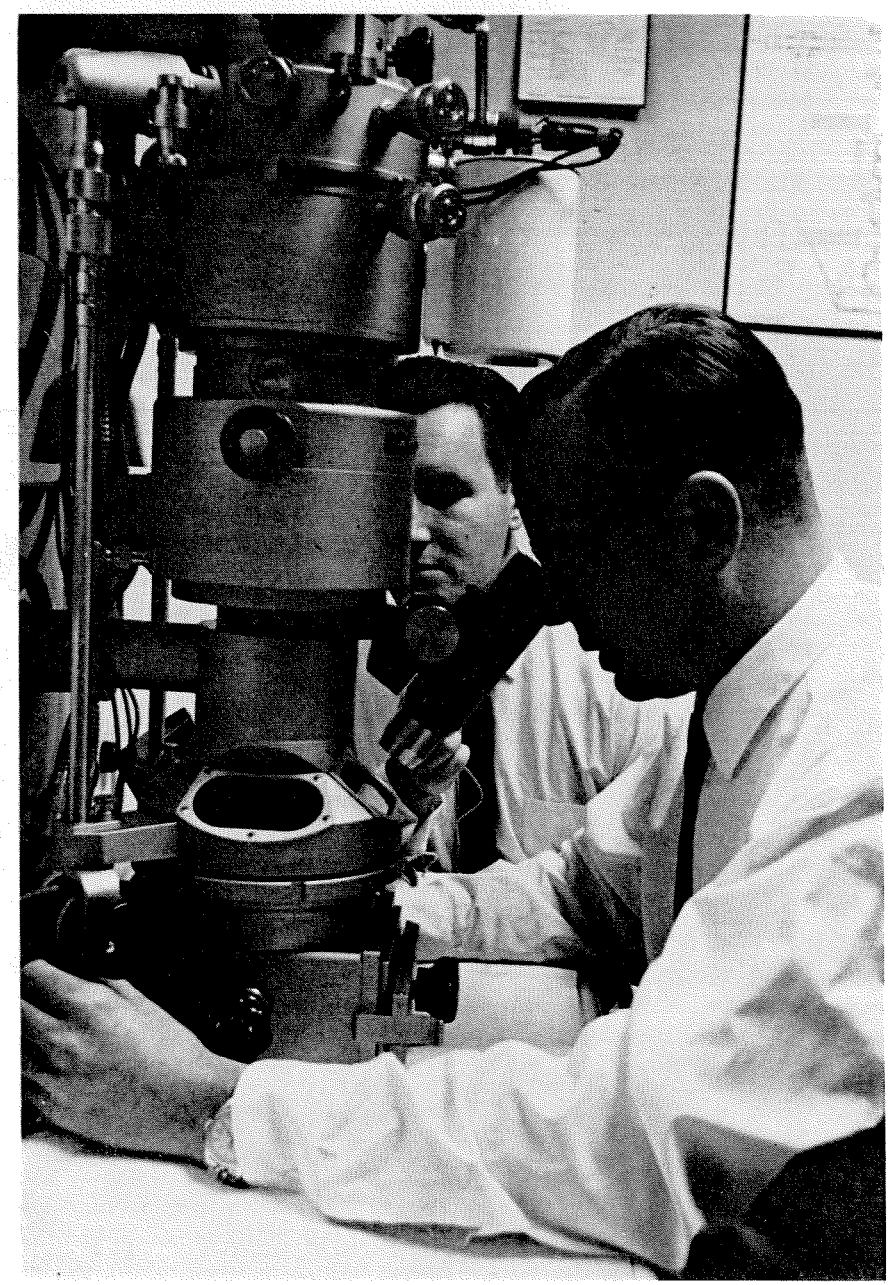


In the new laboratory an ultramicrotome is used for cutting ultrathin slices of tissues embedded in clear plastic. The machine cuts slices of tissue less than half-a-millionth of an inch thick.

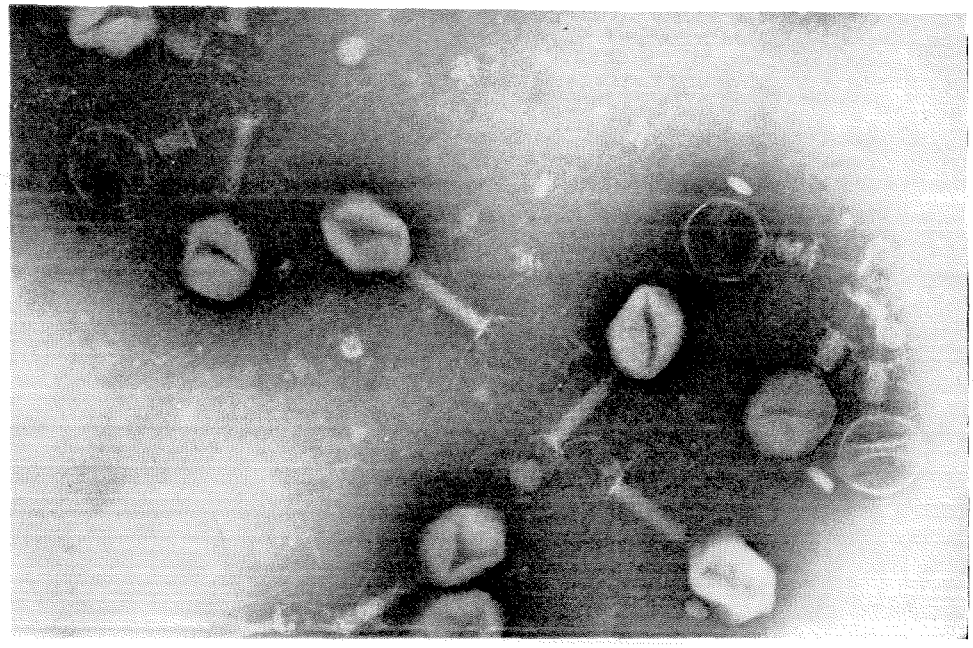


Before viruses or thin slices of tissue can be photographed with the electron microscope, a thin film of carbon must be deposited in this vacuum evaporator in order to support the specimen. Here, too, thin films of heavy metal elements are sometimes deposited on the specimens to enhance contrast in the negatives.

The very thin, almost invisible, slices of tissue on their supporting grills, shown here in a petri dish, are put into a special holder and cap, which can be seen just below the dish. The holder is then inserted into the electron microscope for photographing.



The electron microscope is capable of photographing details of structure more than 200 times smaller than are visible in the best optical microscope. It is used not only for study of tissues, but for a wide variety of other projects, such as investigations on the fine structure of viruses, the membranes, and many other components of cells.



An electron microscope photograph of one of the many viruses studied in the laboratory. This is an interesting one identified as T-4, here magnified 100,000 times. T-4 possesses a remarkably complicated structure, including a highly specialized tail which has a hollow core surrounded by a contractile sheath, and a baseplate with fibers. The head is filled with DNA.

The T-4 virus, magnified even more, shows the structure plainly. Infection of the host cell by T-4 is thought to occur when the tail attaches to the cell by means of the fibers. The tail sheath then contracts, causing penetration of the cell wall by the hollow core. DNA flows from the head, through the core, into the cell. At the left, an intact virus particle; at the right, the DNA has passed through the core, leaving the head empty. The DNA, having entered the cell, then reorganizes the cell machinery to manufacture 100 or more copies of the complete virus.