BIOPHYSICS

Biophysics Comes of Age

The relationship between the physical and natural sciences has been recognized with the formation of a Biophysical Society, which reports on research at its first national meeting.

➤ THE GREAT current importance of molecular biophysics, the study of the structure of living matter at its fundamental, molecular level, has sparked the formation of the Biophysical Society, which held its first regular national meeting at Cambridge, Mass.

Biophysics has been defined as the application of physical methods and concepts to fundamental problems about living things: their minute structure, their growth and inheritance, the chemistry of their processes, and the ways they produce and and use energy. The ten-month-old Biophysical Society represents a loose collaboration of molecular biophysicists with biophysicists from other branches of this broad field, experts who come originally from such different disciplines as physics, biology, chemistry, mathematics and engineering.

Dr. Otto H. Schmitt of the biophysics department at the University of Minnesota, vice chairman of the Society's council, expects the Biophysical Society to form these diverse experts into a new scientific team.

"From this union," Dr. Schmitt said, "there will arise an entire new generation of scientific investigators, teachers and applied scientists."

The main emphasis of the meeting, for which Harvard University and the Massachusetts Institute of Technology were joint hosts, was on the minute structure of living matter. Many of the more than 200 papers presented were devoted to the precise location of reactions in structures present within the cell. Special emphasis was placed on the transformation of electrical energy or light to chemical energy.

These fundamental transformations can be understood only by studying the organization of living matter on a molecular level.

Dr. Walter A. Rosenblith of the department of electrical engineering and the research laboratory for electronics, MIT, characterized biophysicists as "interested in the peculiar and special kinds of organization of matter in living organisms."

There is a parallel between the fundamental problems of modern physics and those of the new science of biophysics, Dr. Rosenblith pointed out. Modern physics is concerned with the organization of matter at the level of the atom and its nucleus. Biophysics is concerned with the organization of the large, complex molecules found in living tissue, and with the increasingly complex organization of these molecules that we find as we go up the scale of complexity from cells to organs to individual animals and plants.

The biophysicist uses mathematics as a tool, Dr. Rosenblith said. However, one of the difficulties of quantitative biophysics is that classical mathematics does not deal with such complex systems as living cells. For this reason, new techniques of mathematics involving statistics and probability theory are being developed. Increasing use is being made of analogue and digital computers for analysis of data and for testing theories of biological processes.

Reset Biological "Clock"

➤ IT IS POSSIBLE to reset a "clock" in a tiny one-celled sea animal called *Gonyaulax polyedra,* according to J. Woodland Hastings and Beatrice M. Sweeney of the University of Illinois, Urbana, Ill., and the Scripps Institution of Oceanography, La Jolla, Calif.

The scientists explained to the Biophysical Society meeting that the one-celled animal, which is a dinoflagellate, is luminescent, and its internal "clock" causes a regular variation in the amount of light it gives off. The cells become brighter and dimmer at approximately the same time every day, and this daily rhythm persists even when they are taken out of their natural ocean environment and kept in constant dim light at a constant temperature.

The "clock" can be reset, however, the scientists reported, if the cells are placed in either bright light or darkness for several hours. When they are returned to dim light, the cells resume their 24-hour cycle of giving off light, but the bright and dim periods occur at different times of day than they did before.

The number of hours by which the clock is reset depends both on the intensity of the exposure to light and the length of exposure. Moreover, the cells exposed in the same way at different times in their 24-hour cycle are not all reset by the same number of hours.

The scientists believe that the 24-hour cycle of luminescence in the cells is caused by an oscillation inherent in their chemical or physiological processes.

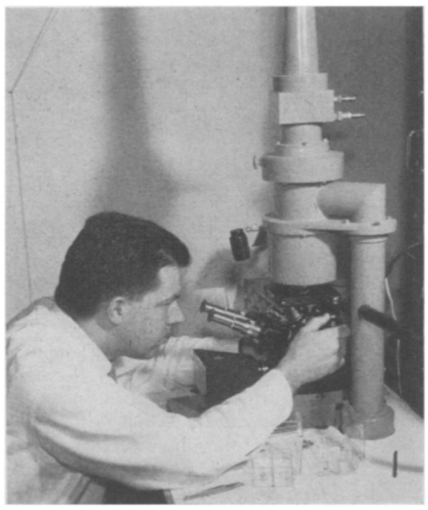
Heart Muscle Changes

➤ CHANGES that occur in heart muscle, but not skeletal muscles, of rats exposed to high altitude were reported to the biophysicists

When rats are exposed to air pressure corresponding to altitudes of 18,000 feet, their heart muscle builds up a higher concentration of myoglobin, a muscle protein important in the utilization of oxygen, according to Adam Anthony, Eugene Ackerman and G. K. Strother, department of physics, The Pennsylvania State University.

The increase of myoglobin in thigh muscles was found to be much lower. The scientists believe the mechanism of myoglobin concentration may be related to a change in water balance of rats accustomed to high altitudes.

Science News Letter, February 22, 1958



MICROFLUOROSCOPE—Dr. Howard H. Pattee Jr. examines yeast cells under the "microfluoroscope," a new kind of X-ray microscope he developed at Stanford University. The instrument permits scientists to observe and measure directly growth inside the cells. Dr. Pattee's work was supported by grants from the American Cancer Society and the National Institutes of Health in Bethesda, Md.

BIOLOGY

Can Watch Cell Growth With X-Ray Microscope

➤ SCIENTISTS can now watch and measure growth in the living cell with a new kind of X-ray microscope described to the National Biophysics Conference meeting in Cambridge, Mass.

The instrument is called a "microfluoroscope" by its developer, Dr. Howard H. Pattee Jr., acting director of Stanford University's X-ray Research Laboratory.

"The microfluoroscope," Dr. Pattee said, "is just like a medical fluoroscope except that everything has been scaled down 2,000 times in size. Everything, that is, but the X-rays it uses, which are 100 times longer than usual."

Artificial staining is not necessary with the microfluoroscope and a specimen can be mounted for viewing in ordinary air.

It can be used to watch tiny cells grow or for taking pictures of them in action. Analysis of specimens is possible down to one-trillionth of a gram of weight.

The microfluoroscope, which acts like a doctor's fluoroscope by passing X-rays through a subject and catching them on a fluorescent screen beyond, promises to make it easier for scientists to make quantitative X-ray absorption measurements of mass, thickness and content of tiny structures.

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