BIOCHEMISTRY

Explore Life Processes

Sea creatures are serving as experimental animals for scientists investigating the complex biochemical processes that underlie growth, aging and death.

➤ A BIOCHEMICAL blueprint of the developmental processes that underlie growth, aging and death is being drawn by a team of American scientists using purple pin cushions and tiny yellow stalks.

The purple pin cushions are sea urchins, orange-sized underwater animals that have served biologists well as unique guinea pigs. The tiny yellow stalks are tunicates, undersea creatures that in great numbers resemble seaweed and belong to that half-world somewhere between the invertebrates and vertebrates.

These two primitive creatures, from egg to adult, are presently being subjected to the most modern scientific research techniques in an attempt to explain their life processes. These are the same life processes that determine growth and development, aging and death in humans.

Sea urchins and tunicates are abundant in Bermuda's blue waters. Man's knowledge of how cells develop, change, mend, disappear and age is scarce. These factors have brought the scientific team to the Bermuda Biological Station, St. George's, Bermuda, where they are working under a grant from the U. S. Atomic Energy Commission.

The research is many-sided, but if there is a common denominator, it is cell development. Of particular interest to the scientists is how cells develop from a chemical point of view. They are trying to describe the chemical mechanisms and reactions that take place in the tiny factory known as the cell.

It may take years before the biochemistry of development is known. But once it is known it will be a major achievement that could very well mean that scientists could control all life by directing a cell's growth.

Using the sea urchin, tunicate and other Bermuda fauna, Drs. Clement L. Markert and Ronald R. Cowden of Johns Hopkins University, Baltimore, Md., and Dr. Robert R. Kohn of Western Reserve University, Cleveland, Ohio, are concurrently attacking five specific problems:

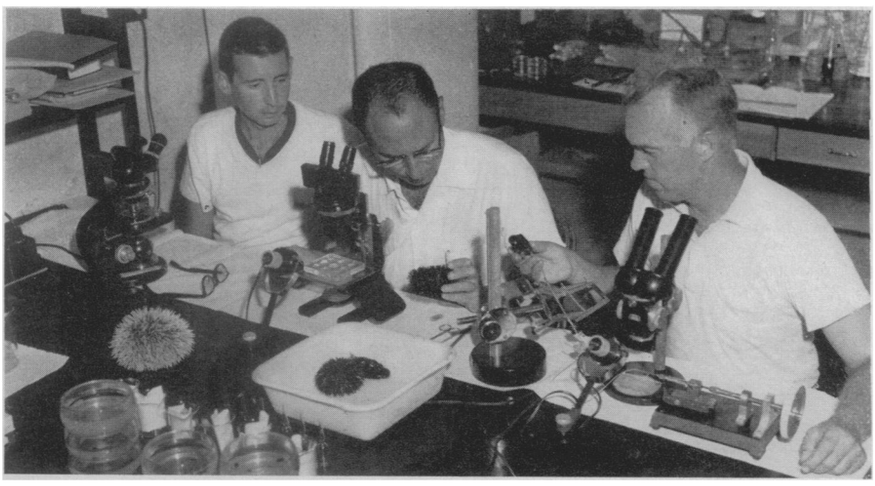
1. To draw the blueprint of the cell's chemical factory, they are feeding the sea animals radioactive substances and then seeing how the animals use the substances. They are also trying to determine in what sequence enzymes and proteins are made during development, as well as the major metabolic steps that occur during all differentiation.

2. They are screening anti-cancer compounds such as 6-mercaptopurine and 8-azaguanine to determine their effect on the earlier stages of growth in sea animals. The compounds are being used to stop selectively vital life processes to determine which are essential for normal growth and development.

3. Using flatworms, the scientists are attempting to find evidence for the theory of wound-healing which holds that reserve cells rush from other parts of the body to mend an injury. Autoradiographic studies (radioactive snapshots) of flatworms shown in preliminary studies that cells from throughout the rest of a decapitated worm's body flock to the wound to regenerate a new head.

4. When man ages, certain cells disappear. As a tunicate develops, certain of its cells disappear. Studies are in progress to try to discover what happens to the tunicate cells. These, in turn, might provide a clue to the degenerative process in man.

5. Congenital abnormalities in humans occur during embryological development. An oversupply of lithium, for example, has been shown to inhibit the growth of part of the central nervous system in various animals, resulting often in partial brain development. Lithium, therefore, is being introduced into the embryological development of Bermuda's sea creatures. It is hoped that the results of these experiments will give a clue to abnormal growth in human beings.



PURPLE PIN CUSHIONS—Drs. Ronald R. Cowden, Robert R. Kohn and Clement L. Markert (left to right) examine sea urchins in their Bermuda laboratory as part of a study of cell development.

Science News Letter, August 30, 1958

ASTRONAUTICS

Explore Space Flight Using Jets of Light

➤ THE SCIENTISTS are looking toward flight beyond the moon, and even outside the solar system, among the stars.

At the Ninth Annual Congress of the International Astronautical Federation in Amsterdam, The Netherlands, Dr. Eugen Sanger of the Research Institute for Physics of Jet Propulsion, Stuttgart, said that jets of photons will compete with other systems of jet propulsion in travel in interstellar space when speeds exceed perhaps one million kilometers an hour (620,000 miles per hour).

Dr. Sanger suggested that gases of heavier chemical elements could be used as the source of radiation by being heated to some 150,000 degrees Kelvin (about 270,000 degrees Fahrenheit).

Several small rocket motors instead of one large one have an advantage when solid propellant power is used to produce large thrusts for a short time, engineer Jean A. Vandenkerckhove of Brussels University told the Congress. This is a change from previous ideas that held that there was an advantage in bigness.

Dr. J. H. Huth of the Rand Corporation, Santa Monica, Calif., told the Astronautical Federation that the electrical power for earth satellites of limited life may be satisfactorily supplied by such devices as solar cells, provided micrometeorites and cosmic rays do not overrule this source.

For space vehicles that might use streams of ions for propulsion, much more electricity would be demanded and therefore Dr. Huth sees nuclear reactors as a better method of electrical generation than solar power. For standby and emergency power, fuel cells operating on hydrogen and oxygen gas would seem to be possible, with solar cells used to electrolyze water to furnish the two gaseous elements needed in the fuel cells.

The solid fuels for rockets that are most effective, said Dr. E. E. Buechner, chairman of the advisory committee of the German Society for Rocket Technology, are the equivalent of dynamite, guncotton, nitroglycerin, and potassium and ammonium chlorates, all chemicals that are well-known for their explosive qualities. For liquid fuel rockets, highly concentrated nitric acid is found to be superior to liquid oxygen as an oxygen carrier.

Science News Letter, August 30, 1958