BIOCHEMISTRY

Join Links in Life Chain

Two nucleotide molecules, found in RNA inside every living cell, have been joined together for the first time under laboratory conditions resembling primitive earth.

➤TWO LINKS in the molecular chain of life have been joined together for the first time under laboratory conditions resembling a seashore of the primitive earth.

The links are nucleotide molecules, found inside every living cell in long chains called RNA, or ribonucleic acid.

RNA is the substance that guides the growth of the cell and the production of new cells. Evidence that the first RNA chains formed and joined under primitive conditions was reported by Dr. Cyril Ponnamperuma of the National Aeronautics and Space Administration.

Two molecules of the nucleotide uridylic acid were linked in the most recent success of a long series of experiments that Dr. Ponnamperuma began in 1963.

At that particular time he bombarded an atmosphere of water, ammonia and methane with an electron beam.

The bombardment simulated radiation from potassium 40, which must have been present in the simple compounds of primitive earth, he said.

When the same atmosphere was treated with ultraviolet light simulating the sun's rays, the biochemist told the American Chemical Society's national meeting in Atlantic City, N.J., substantial amounts of formaldehyde were produced.

Then additional ultraviolet irradiation of the formaldehyde produced the sugars ribose and deoxyribose, each representing another third of a typical nucleotide molecule.

In later studies Dr. Ponnamperuma irradiated a mixture of adenine and the two sugars to obtain combinations of the base and the sugars. In the experiments he reported, he heated uridine, a combination of of base and a sugar, with a phosphate salt to produce diuridylic acid, the first dinucleotide to be made under simulated primitive earth conditions.

Nucleotide molecules consist of three parts—a base, a sugar and a phosphate. The base and sugar are composed of carbon, hydrogen, oxygen and nitrogen, all present in the primitive atmosphere.

Nucleotides that contain deoxyribose-type sugars join in chains similar to RNA but called DNA or deoxyribonucleic acid. It is the DNA chains in the nuclei of living cells that provide the genetic code, or pattern, from which RNA in turn builds thousands of different proteins that go into living tissue.

The products of Dr. Ponnamperuma's most recent bombardments included adenine, a base that occurs in the nucleotides of both RNA and DNA, he said. He carried out the experiment at NASA's Ames Research Center, Moffett Field, Calif.

• Science News Letter, 88:195 September 25, 1965

CHEMISTRY

Rat Cancer Cells Poison Themselves With Drug

➤RAT CANCER CELLS activate a comparatively harmless drug with their own enzymes, causing the cells to poison themselves.

The new drug, which is still experimental, was injected into a rat tumor called Dunning leukemia. It has a much lower toxicity than the usual nitrogen mustards, both in rats and in dogs, Dr. K. C. Tsou of the University of Pennsylvania School of Medicine said in Atlantic City.

Cancer-cell enzymes attack the chemical agent, Dr. Tsou told the American Chemical Society's 150th national meeting.

The new drug, whose chemical name is N,N'-diallylamide B-aziridinopropionamide, was combined with a chemical structure called an amide to make it harmless to normal cells, he explained.

Since some cancer cells contain high concentrations of amidase enzymes, which attack molecules with an amide group, the "harmless" drug was activated by the cancer cells themselves.

A possible variation of this method is to feed the body a poison that normal cells can combat, or detoxify, but which cancer cells cannot fight.

In the present research, Dr. Tsou and his co-workers used a new class of reactive allyamine compounds that have a basic structure capable of reacting like nitrogen mustards, used in cancer treatment.

Collaborating in the research were Suresh B. Damle, with Drs. R. W. Crichlow and Robert G. Ravdin, all associated with the Harrison department of surgical research at the University's medical school.

• Science News Letter, 88:195 September 25, 1965

GEOCHEMISTRY

Crust's Origin Indicated

➤THERE IS MORE to the common rock than meets the eye. It has a mixture of rare-earth metals that may indicate the origin of the earth's crust as well as the kind of material that lies below in the mantle.

Rare earths and their concentration on the earth's surface was the subject of a major symposium before the American Chemical Society in Atlantic City.

Dr. John W. Winchester, associate professor of geochemistry at the Massachusetts Institute of Technology, said new techniques for measuring rare earths have produced excellent data.

Some 15 rare earths are found in all rocks and minerals. However, light elements are more abundant than heavy elements.

Dr. Winchester's hypothesis is that heavy rare earths will be found in the mantle which lies anywhere from six to ten miles below the surface.

If this is the case, said Dr. Winchester, it will indicate that earth's crust was formed by crystallization, heavier material sinking to the bottom. Sampling the mantle is now of "extreme importance," said the chemist.

The United States hopes to reach the mantle with its Mohole Project, a six-mile drill into the ocean's floor. The Soviet Union has recently announced that it will try for a nine-mile hole in the Murmansk region beginning next year.

Scientists were provoked into this crystallization concept when they found that meteorites have the same rare-earth composition as do rocks and minerals. However, rocks are considerably richer than meteorites.

They also have a higher concentration of the light rare earths. Dr. Larry Haskin of Wisconsin University believes the difference is due to earth's separation into zones (crust and mantle).

Meteorites showing such similarities to material on earth are thought to be planetary objects originating in an asteroid belt between Mars and Jupiter, said Dr. Winchester.

Moreover, the meteorites, called chondrites, look like stone but appear to come from a planet's interior.

• Science News Letter, 88:195 September 25, 1965

Sylvania

NUCLEAR FUEL—Tubes filled with U-235 are lowered into the core shroud at the Hicksville, N.Y., plant of Sylvania Electric Products Inc. Designed to last two and a half years, the core will be used to power the Navy PM-3A reactor at McMurdo Station, Antarctica.