

## ASTROPHYSICS

# Stars Build Elements

➤ ALL KNOWN chemical elements are built in the hot interiors of stars by eight nuclear processes as conditions become ripe.

Thermonuclear reactions such as man is now trying to control in the laboratory are the basis of stellar synthesis of elements.

A tie-in between the relative amounts of the various elements and the properties of nuclei supports this theory of stellar formation of matter, Drs. Margaret and Geoffrey Burbidge of Yerkes Observatory, Williams Bay, Wis., report. In *Science* (Aug. 22), the husband-and-wife team outlines results of a broad-scale attack on the problem of element synthesis.

Although the sun is about five billion years old, it must be at least a third-generation star, they conclude. Otherwise, it would be difficult to account for the variations in the elements in the solar system.

Starting from the observed element distribution, the Drs. Burbidge suggest that matter was created in as simple a form as possible. This could be as pure hydrogen, the lightest and simplest chemical element, or as fundamental particles, protons, neutrons and electrons and, possibly, their anti-particles.

The rest of the elements have been produced subsequently by physical processes according to known laws. This would be so whether the universe started with a big bang or whether matter is being created continually.

When a star first condenses out of interstellar gas and dust, it goes through a period of gravitational contraction. Even-

tually, when its central temperature becomes sufficiently high, it begins to obtain its energy by converting hydrogen to helium in its core. This is the hydrogen bomb reaction man has duplicated on earth in the unleashed fury of nuclear explosions.

After a while, since there is no mixing between the core and outer layers, the star's composition is no longer uniform. Then its structure will change slightly so that it remains in equilibrium, and the star becomes slightly brighter.

By the time the helium core has grown to contain about 10% of its mass, the star must change its structure drastically to remain in equilibrium. At this point, its core contracts, releasing gravitational energy to supplement its energy output and heating up its interior, while the outer envelope expands greatly and cools.

In this way a star moves from the "main sequence" to become a red giant. Eventually the core becomes hot and dense enough for nuclei with charges greater than hydrogen to interact.

When the star has exhausted all of its nuclear fuel, which will take about a hundred billion years for the sun, it may either undergo a gigantic catastrophic explosion as a supernova, or settle down quietly in the form of collapsed matter as a white dwarf. It may also do both.

Besides the hydrogen- and helium-burning process, the Drs. Burbidge report, the other processes are neutron capture, which can occur both slowly and rapidly; catalytic processes; equilibrium process; capture of alpha particles, the nuclei of helium atoms; a modifying process when the nucleus emits a proton or gamma ray, and alpha decay or fission.

The element synthesis theory reported by the Drs. Burbidge is part of a long-range study being made cooperatively by several scientists, including Prof. Fred Hoyle of Harvard College Observatory; Dr. R. F. Christy of California Institute of Technology, Pasadena; Dr. Jesse L. Greenstein, Mt. Wilson and Palomar Observatories; Dr. Martin Schwarzschild, Princeton University; and Drs. Harold C. Urey and Hans E. Suess of Scripps Institution of Oceanography, La Jolla, Calif.

Science News Letter, September 6, 1958

## GENETICS

## Soviet Scientists Revert To Lysenko's Genetics

➤ SOVIET SCIENTISTS at the International Genetics Congress in Montreal are maintaining their biological theory, opposed by most colleagues from the West, that the heredity of plants and animals can be permanently altered by such environmental effects as grafting in the case of plants and the injection of blood in the case of chickens.

The U.S.S.R. delegation is predominantly adhering to Michurinism as advocated by Lysenko, who under Stalin dominated Rus-

sian plant and animal breeding. This persistence and reversion to doctrine thought to be on the way out is surprising and disappointing to most geneticists.

Something seems to have happened in official Russian genetics just a few weeks ago and this has puzzled American leaders. The first list of Soviet delegates to the Congress contained the names of some well-respected scientists who had participated in previous international meetings. Abstracts of their papers were received and printed.

Then at the last minute Congress officials learned that virtually all these older geneticists who accepted Mendel and Darwin would not be in attendance. Instead other delegates were coming with different attitudes.

The papers that were presented included one by I. E. Gloushchenko of Soviet Academy of Sciences, who reported that many years of experiments showed that, by grafting, hybrid forms can be obtained similar to those obtained by sexual hybridization. His colleague, N. V. Tsitsin, told of crossing widely different kinds of cereals to obtain new species of forage grain, perennial and winter wheats.

Another Moscow geneticist, H. F. Kushner, told how transfusion of blood from New Hampshires and gray semi-wild ducks into white leghorns resulted in the inheritance of pigmented feathering of some of the progeny in subsequent generations. (See *SNL*, May 10, p. 298.)

Attempts have been made in past years to have Russian scientists claiming such results come to the U. S. and repeat their experiments here but such invitations have not been accepted. Their Western colleagues will not believe their explanations until there are repeated supervised or independent duplications.

Science News Letter, September 6, 1958

## BIOLOGY

## Water Hyacinth Threatens to Clog Nile

➤ THE EXPLOSIVE growth of a purple-flowered plant is threatening Nile River travel in the Sudan, a scientist reports in *Nature* (Aug. 3).

The water hyacinth, which grows in free-floating mats along many stretches of the Nile, has been found in new spots for the first time. Already, Dr. Peter A. Gay of the University of Khartoum reports, the plant is a minor nuisance to steamboats by interfering with the water intake for engine cooling.

Sudanese and others familiar with the river cannot remember seeing the plant before last winter, thus pointing to the explosive nature of its growth.

*Eichornia crassipes*, the water hyacinth's scientific name, also grows along the river margins and as rooted but floating mats—masses of floating leaves, flowers and stems.

Local tropical storms probably are important in accounting for the wide distribution of the water hyacinth and other water plants help out by reducing the drag of the river current on the growing water hyacinth.

Science News Letter, September 6, 1958



**GHOSTLY FIRE FIGHTER**—The U. S. Army's aluminum fire fighting suit, now undergoing intensive action tests, is made of flame-retardant, treated aluminized kraft paper laminated with a flame-resistant adhesive to a reflective aluminum foil. The face mask has tiny holes to give visibility.