ASTRONOMY

Elements Which Refuel Stars Found in Planetary Nebulae

Great Clouds of Gas Surrounding the Very Hot O-Type Stars Composed of Hydrogen, Helium, Carbon, Nitrogen, Oxygen

STAR "shells" are made of the same elements as stars themselves, according to two Harvard astronomers, Dr. D. H. Menzel and L. H. Aller. They find that the planetary nebulae, which are great clouds of gas surrounding the very hot O-type stars, are composed chiefly of hydrogen, helium, carbon, nitrogen and oxygen.

These are the same five elements which play the important role of furnace-men in the sun and most other stars. In the well-established carbon cycle, originally proposed by Dr. Hans Bethe, of Cornell University, hydrogen is the fuel and helium the ash of stars, while carbon, nitrogen and oxygen are the elements which keep the process going.

Dr. Menzel and Mr. Aller obtained their results, reported to the American Astronomical Society, from a study of "enhanced" and "forbidden" lines in the spectra of the planetaries. The new findings confirm the belief of astronomers that the same proportion of elements makes up all things in the universe.

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ZOOLOGY

Animal That Is Still Alive Has Produced 21,000 Generations

AN ANIMAL that has produced 21,000 generations of offspring and yet is still alive is celebrating its 35th anniversary in the Osborn Zoological Laboratory of Yale University.

The animal in question is of a race of the microscopic water-dweller known as paramecium or slipper-animalcule. Because this particular race was started on its career of biological immortality by Prof. Lorande Loss Woodruff, it has come to be known as the Woodruff race.

Paramecium is able to reproduce itself indefinitely by simply dividing in two, without any sex process. Each of the two parts rapidly grows again to original size, so that each can claim to be the original individual; also, barring accidents, this continuously dividing-and-multiplying individual never dies. So that we arrive at the paradoxical situation of having millions of microscopic animals, each with as good a claim as any of the others to being the founder of the line, and all of them 21,000 generations old without having experienced death.

Of course, the great majority of the offspring of the Woodruff paramecium race have been discarded and destroyed. If all had been kept, and food enough could have been provided, the race would in the first five years have packed all known space, out to the farthest stars, with a solid mass of paramecia.

This race of microörganisms has passed through 21,000 of its generations in little more than the time reckoned as one human generation. In human terms, 21,000 generations would be 630,000 years—a period going back to the haziest conjectural beginnings of the most primitive prehistoric human beings.

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BOTANY

Boron Lack Causes Wild Growth in Plant Cells

ABNORMAL growth of certain cells in plant cells, so sudden as to be almost explosive, is caused when the plant is starved for boron, Prof. Taylor R. Alexander of the University of Miami, Florida, has discovered. The wild growth of some of the cells crowds others aside and disrupts the life processes of the plant.

Prof. Alexander worked with young squash plants. He supplied some of them with the exceedingly minute amounts of boron which plants ordinarily require, but kept others on a mineral-nutrient ration from which boron had been totally excluded.

Abnormal growth must have set in practically at once, for within 48 hours effects began to be visible. First there was a sudden spurt on the part of the cells in growing tips, then they collapsed.

There were many distressing symptoms, but the most marked was a similar spurt of wild growth by pulpy cells (parenchyma) in the stem, producing a great thickening of the stem and so crowding the long fibrous tubes that are the plant's internal transportation system that the movement of foodstuffs was apparently seriously interfered with.

The suddenness and violence of the reaction, to the absence of a mineral salt that ordinarily exists only in a few parts per million of soil solution, suggests a possible use of plants instead of chemical analyses to determine need for this and possibly other plant food elements. This biological test seems to be very much more sensitive than any easily applied chemical method.

Prof. Alexander has reported technical details of his research results to the *Botanical Gazette* (May).

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CHEMISTRY

Dehydrated Foods May "Spoil Themselves"

DESPITE their superior resistance to spoilage due to attacks of molds, bacteria and other outside organisms, dehydrated foods sometimes lose quality in storage. They become tough, or develop hay-like "off" tastes and odors. Causes for this were traced to the vegetables' own internal enzyme chemistry by Prof. W. V. Cruess and Prof. M. A. Joslyn of the University of California.

These enzymes are organic catalysts or ferments, necessary to the normal life activities of the plants, but damaging to their quality as foods if permitted to continue activity after harvesting and storing. In vegetables properly prepared for the dehydrator, all such life processes are stopped by steam or hot-water blanching. Profs. Cruess and Joslyn described several chemical tests which they recommended for determining the amount of enzyme activity persisting in dehydrated vegetables.

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