ASTRONOMY

Atom Building Keeps Stars Shining, Says A.A.A.S. Head

4,200,000 Tons of Heat Per Second From Sun Called Mass Left Over From Element Forming Process

THE BUILDING up of other heavier atoms out of hydrogen stokes the internal heat of the stars, including the sun, Prof. Henry Norris Russell, Princeton University astronomer recently elected president of the American Association for the Advancement of Science, suggested in the Maiben lecture before the Association.

The hardest problem of all star study is the source of the energy which keeps the stars shining, he explained. Synthesis and annihilation of atoms are the only two processes so far suggested which would supply enough heat to last for the millions of years of geological time.

Present theories indicate that the mutual annihilation of the positive and negative particles, the protons and the electrons, would not happen except at temperatures of many billions of degrees such as do not exist within the stars.

Prof. Russell's provisional theory is therefore that atomic synthesis makes the sun and stars give off heat and light.

"A Pound of Heat"

"The rate of loss of heat from a star is almost incomprehensively great," Prof. Russell said. "We can come nearest to realizing it by remembering that, according to the theory of relativity, heat, like other forms of energy, possesses mass. It is as proper to speak of a pound of heat as a pound of ice; but a pound of heat is a very large amount—enough, in fact, to melt 30 million tons of rock and turn it into white hot lava. The sun radiates heat away into the depths of space at the rate of 4,200,000 tons per second—and the sun is a smallish star! Upon what vast stores of energy can it draw to keep going?"

The mechanism for building heavier atoms out of hydrogen visualized by Prof. Russell is that suggested by the new and attractive theory of Prof. Werner Heisenberg, German physicist. Atomic nuclei are built up of protons and the recently discovered neutrons. The incorporation of a proton into a nucleus would in many cases change an

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atom of a known element into one of the following elements. For instance, beryllium of mass 9 would change into boron of mass 10, boron 11 would change into carbon 12. The introduction of a neutron would change an atom into an isotope of the same element, but with atomic weight greater by one, as for example, lithium 6 to lithium 7 and boron 10 to boron 11. By alternation of these processes the heavy elements might be built up, step by step.

1/130 of Mass Lost

The important feature of this process from the standpoint of keeping the stars stoked is that when a proton or hydrogen atomic heart is built into a heavier element, about 1/130 of its mass disappears and must be represented by heat liberated in the process. This is the loss of mass that has caused physicists to say that there is enough energy in a spoonful of water to run a liner across the Atlantic. Building in a neutron probably liberates heat in the same way.

"At distances greater than 1/1000 of the outer diameter of an atom," Prof. Russell explained, "protons and nuclei repel one another. A fast moving proton, rushing directly at a nucleus might, however, get so near it that attraction succeeded repulsion, and thus penetrate the nucleus and be- (*Turn to page* 12)

NUTRITION

Artificial Feeding Keeps Up Weight of New-Born Babies

A SOLUTION of dextrose or grape sugar, gelatin and common salt has been successfully used in combatting birth shock and keeping down to a minimum the weight usually lost by new-born babies, Dr. I. Newton Kugelmass, New York baby specialist, reported to the American Association for the Advancement of Science.

Studies of animals and of primitive tribes of men have convinced Dr. Kugelmass that the customary loss of weight in civilized babies just after birth is neither necessary nor normal. He criticized the usual modern practice of awaiting an ample food supply from the mother before feeding the new baby, and declared that the consequence is an initial period of starvation.

The birth mechanism produces the condition that he calls birth shock, he explained. New-born babies show all the characteristic signs and symptoms of shock, including low blood pressure, low blood sugar, sleepiness, stupor and lack of appetite. Refusing to accept these as normal, Dr. Kugelmass devised the gelatin-sugar-salt solution which he gives every two hours for the first 24 hours beginning immediately after birth. He finds it better than artificial feeding during the first two days of life and although it contains less calories than such feedings, it nevertheless reduces the loss of weight to the irreducible minimum of less than two per cent.

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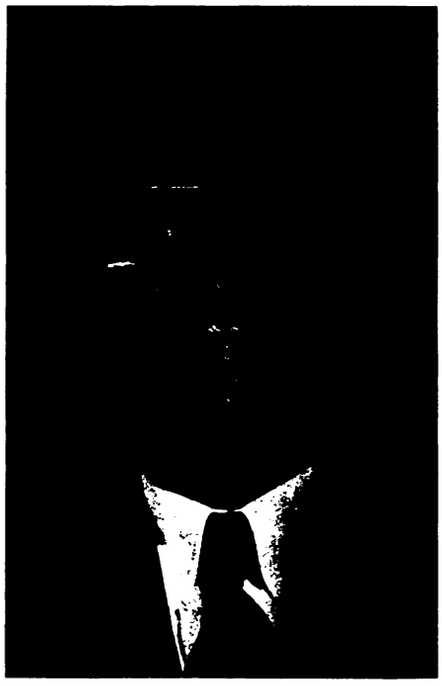
GENERAL SCIENCE

American Association Elects New Permanent Secretary

AT THE MEETING of the American Association for the Advancement of Science in Atlantic City, Prof. Henry B. Ward of the University of Illinois was elected permanent secretary, to succeed Dr. Charles F. Roos, resigned. Prof. Ward is a veteran among American zoologists, and has (*Turn Page*)



PROF. HENRY B. WARD