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SUN TO SHINE 15 TRILLION YEARS

The interior of the sun must have a temperature of 70,000,000 degrees Fahrenheit, at the center, which gradually decreases until it is only about 10,000 degrees at the surface. That this is necessary to keep the sun at the size it is at present, and to prevent the gravitating mass of the outer part from collapsing to the center, is the opinion of Prof. A. S. Eddington, professor of astronomy at Cambridge University, stated in a series of lectures at King's College, of the University of London.

As a result of this conclusion, says Prof. Eddington, "no source of energy is of any avail unless it liberates heat in the deep interior of a star." This, he believes, effectually disposes of an idea, suggested in the past, that the sun received its energy from meteors which fell into it from outer space. "Clearly," he states, "you cannot maintain a temperature gradient by supplying heat at the bottom end. If this year the sun encountered a swarm of meteors which bombarded it with enough energy to furnish a year's supply of radiation, that would not add a year, or even a day to the life of the sun; its internal readjustments would go on unaffected. All that would happen would be that the sun would give us twice the normal amount of radiation this year."

The theory once proposed that the sun is gradually contracting, and so releases the energy which forms the heat, is also untenable, says the astronomer, because with such a theory the sun cannot be more than 46,000,000 years old. "Physical and geological evidence seems to be conclusive," he says, "that the age of the earth - reckoned from a period which by no means goes back to its beginnings as a planet - is much greater. The age of the older rocks found from their uranium-lead ratio is generally put at 1,200,000,000 years; lower estimates have been urged by Prof. Joly, but none low enough to save the contraction hypothesis."

Astronomical facts also support these ideas of the age of the solar system, and so, says Prof. Eddington, "we seem to require a time-scale which will allow at least 10,000,000,000 years for the age of the sun; certainly we cannot abate our demands below 1,000,000,000 years."

"Since we cannot very well imagine an extraneous source of heat able to release itself at the center of the star, the idea of a star picking up its energy as it goes along seems to be definitely ruled out. It follows that the star contains hidden within it the energy which has to last the rest of its life. But energy cannot be successfully hidden; it betrays itself because it has (or because it is) mass. How much of the sum total of the energy of the sun is capable of being converted into radiation we do not know; but if it is all available, there is enough to maintain the

sun's radiation at the present rate for 15,000,000,000,000 years. To put the argument in another form, the heat emitted by the sun each year has a mass of 120,000,000,000,000 tons; and if this loss of mass continued there would be no mass left at the end of 15,000,000,000,000 years."

Since all the other alternatives are eliminated, Prof. Eddington supposes that the source of the energy must be in the protons and electrons, charges of positive and negative electricity, of which the atoms are composed.

"We have to suppose," he says, "that a proton and electron run together, their electric charges cancel and nothing is left but a splash in the ether which spreads out as an electromagnetic wave carrying off the energy."

He admits the difficulty of some of these ideas, for apparently at a temperature of 70,000,000 degrees the energy is liberated so copiously that he asks, "can we suppose that energy issues freely from matter at 70,000,000 degrees as steam issues from water of 212 degrees? I think that physicists would be hard put to it to reconcile such extraordinary behavior with any accepted principles, yet that is what the astronomical observations taken at face value seem to insist."

In a reply to this suggestion, Prof. J. H. Jeans, president of the Royal Astronomical Society, denies that this can happen, for, he says, the transformation of matter to energy itself is a process which liberates more heat, and, "as soon as the center of a star reached 70,000,000 degrees, the heat generated would raise the neighboring parts to 70,000,000 degrees, these would generate more heat, and so on, the high temperature spreading explosively throughout the star. The true analogy would be, not the issue of steam from water, but the explosion of a magazine of gunpowder."

ROCKEFELLER FOUNDATION LEADS WORLD FIGHT ON DISEASE

Over nine million dollars were spent during 1925 by the Rockefeller Foundation in its great campaign throughout the world to oust disease.

Hookworm, yellow fever and malaria are the enemies of mankind its International Health Board especially aims to annihilate. This organization follows the policy of working only through governments of the countries to which it lends aid and helps out only at the invitation of an official agency. It concerns itself only with new methods, one of its primary ends being to help a health official prove to his community the value of an innovation, but the board undertakes cooperation only with the clear understanding that the project in hand is eventually to stand on its own financial feet.

In 18 different countries and in 220 counties in 26 different states in our country, the International Health Board backed up the local officials in their struggles with the hookworm problem with the result that nearly a million and a half people were treated. Around hookworm disease as a nucleus, the International Health Board has a general educational plan to instruct the populace of tropical and subtropical countries in sanitation and preventive measures against all disease. This idea has spread to Europe and cooperation along these lines has been extended to