# The Death of Matter

By Edwin E. Slosson

"A star is in effect nothing but a huge X-ray apparatus." That is the novel view of stellar structure advocated by Dr. J. H. Jeans, secretary of the Royal Society of London.

The interior of a star, according to his theory, is hotter and heavier than the exterior. At the surface of the sun, for example, the temperature is only about 6,000 degrees centigrade, a temperature attainable in the laboratory. But in the center of the sun the temperature rises to the enormous figure of seventy million degrees. Sirius, the Dog Star, is supposed to be twice as hot as the sun.

The density or specific gravity of the sun as a whole is 1.4 times that of water, and one-fourth that of the earth. But the core of the sun is calculated to have a density of 300, compared with water. This is fourteen times as heavy as the metal platinum. No element on earth comes anywhere near this figure in density. Some 90 or 95 per cent of the mass of the star must then be concentrated in a central sphere of half the radius and one-eighth the volume of the star.

This Dr. Jeans explains on the supposition that the dense interior is composed of heavier atoms than any found on earth. The heaviest atom on earth is uranium, and this is so unwieldy and complex that it is continually breaking down spontaneously into smaller atoms and giving off enormous amounts of energy in the form of rays resembling the X-rays, but of much higher frequency. The radio-active elements, like uranium and radium, "probably represent the last surviving vestiges of more vigorous primeval matter" of the stars which is breaking down into lighter and more permanent elements, such as we see on earth. The youngest and largest stars must consist mostly of such bulky unstable atoms, and these evaporate off in radiation, like the X-rays and other wave lengths, in the course of millions of millons of years, leaving a ball of burnt-out ashes like the cinder on which we live. The evolution of a star is, therefore, from the complex to the simple, which reverses Herbert Spencer's famous definition of evolution.

Matter, according to the modern theory, consists of negative and positive charges of electricity, electrons and protons, in equal numbers, and when these come into contact the opposite charges are neutralized and annihilated. As Dr. Jeans describes it:

"Throughout a star's interior, electrons and protons must at intervals fall into one another and mutually destroy one another, the energy of their fall being set free as radiation . . . . Each proton or atom, as it is annihilated, makes a splash of radiant energy which passes through the star until, after innumerable absorptions and re-emissions, it reaches the star's surface and wanders off into space."

These splashes are similar to the flashes you see when you look through a microscope at luminous radium paint, except that they are thousands of times more powerful. In no way can you get so much energy out of matter as by abolishing it altogether. The heat produced by burning is trivial in comparison. Jeans gives this comparison:

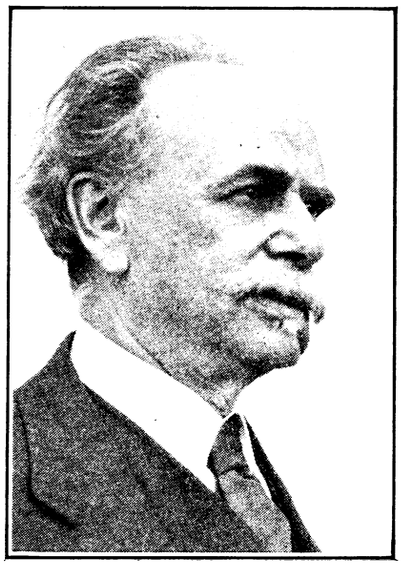
"Whereas the ordinary combustion of a ton of coal provides energy enough to drive an express locomotive for an hour, the annihilation of a ton of coal would provide enough energy for all the heating, lighting, power and transport in Great Britain for a century."

So we are not getting nearly as much heat out of the coal we buy and burn as we could if we knew how to reduce it entirely to immaterial undulations instead of converting it into smoke. A single lump of pea coal would keep our house warm for a lifetime.

But does the matter so transformed into scattered rays of energy ever get materialized again? This is one of the controverted questions of the day. Dr. Arthur Haas of Vienna conceives it possible that matter may be created by a head-on collison of atoms of light and atoms of matter. If an atom (quantum) of light runs into a particle of matter traveling with half the velocity in the opposite direction, the quantum will be turned back on its track and its frequency multiplied three times by the force of the impact. In this way a quantum of light may be converted into a portion of matter. So here we may have the beginning of the building up of matter again out of the errant energy escaped from the disruption of atoms in the star.







FRANZ BOAS

## Anthropological Organizer

"The proper study of mankind is man" said Pope many years ago, but not until about two decades ago did the study of mankind, or anthropology, become a science in the United States. Prior to that there had been anthropologists, to be sure, but the study was more of a side line with them. And that it is a science today, rather than a hobby, is due principally to Dr. Boas.

He is the father of one of the two great American schools of anthropology. Mention the name of any of the leading American archæologists, and you probably name a Harvard man, a student of F. W. Putnam, but if you name an ethnologist, he will have doubtless been a student of Dr. Boas'. In this training that he has given, and the influence he has had, on his fellow ethnologists, he has accomplished a work as great, perhaps, as his own scientific researches.

Born in Germany, at Minden, Westphalia, on July 9, 1858, the young Boas studied at the universities of Heidelberg, Bonn, and Kiel. After he received his doctorate from the latter institution in 1881, he began his researches almost immediately with explorations of Baffin Land. Then came two years as docent of geography at the University of Berlin, and in 1888 he came to America—to Clark University as docent of anthropology. In 1896 he went to Columbia, where he has remained ever since, receiving honors from scientific bodies throughout the world.