

fall on every square yard of the sun's surface about 2 pounds every hour. This would increase the solar diameter about one second of arc in 5000 years, a quantity impossible to detect probably in less than 2000 or 3000 years. But the increase in mass of the sun would affect the length of the year, shortening it by about one-eighth of its value in 2000 years. Furthermore, sufficient meteoric matter in the solar system to maintain the sun's heat would cause the earth to receive ten million times as much as at present and either one of these deductions is sufficient to cause the rejection of the theory.

The theory now generally accepted as being the principal cause in the maintenance of the sun's heat — its shrinkage under its own gravitational force and the transformation of the work done by this shrinkage into heat — was first proposed by Helmholtz, about 1853. It has been computed by various writers that a shrinkage of about 250 feet per year in the diameter is now sufficient to make up for the loss by radiation. Newcomb calculated that it will require to shrink to about one-half its present size to maintain the present rate of radiation for 7,000,000 years. Further, if the original nebula, which on condensing, formed the sun originally filled a sphere whose diameter was that of Neptune's orbit, it would have furnished about 25,000,000 times as much energy as the sun now loses in a year.

If the rate of giving out energy had been constant this would make a period of 25,000,000 years during which the earth had been receiving heat as at present. In various ways geologists have estimated the age of the earth as somewhere between 50,000,000 and more than 100,000,000 years, with most of them inclining to the longer period, and the difficulty arises of explaining the discrepancy between the 25,000,000 years and the much longer time required for geological processes on the earth.

It was thought when radio-activity was discovered that this hitherto unknown source of energy might serve to bridge over the gap between the astronomical and geological epoch. But it seems doubtful at present and is not yet definitely settled