

and from now on, through condensation continues the temperature begins to fall. If, however, the star is very massive, the temperature rises still further and we have the lines of helium appearing with occasionally silicon and at the still higher temperature of 20,000° F. and over.

From this period onward the temperature begins to fall, very slowly of course, with pauses, and yet with a downward trend. The star is shrinking gradually, becoming denser but owing to its density the shrinkage is not so great, the quantity of heat produced does not quite equal that radiated, and the temperature must inevitably fall. Hence it becomes yellower and passes through the same or nearly the same spectral types as in its ascending phase. It is believed that our sun is on the descending scale of temperature, is at a stage where the change is very gradual, where the loss of heat through radiation is nearly neutralized by that gained through shrinkage. It has been calculated that a contraction in its diameter of 300 ft. a year is sufficient to compensate for the heat lost by radiation. At that rate in some 12,000,000 or 15,000,000 years it will be so dense as to be incapable of further contraction, will then relatively rapidly solidify and cool down and become a dead sun while its attendant planets will soon reach the temperature of outside space—460° F. and all life will become extinct. This comparatively short time that must have elapsed between the time when our globe was in a molten condition and the present, a time which according to the contraction theory can not be more than about 50,000,000 years and which is much too short for the geologists who require the earth to be hundreds or even thousands of millions of years old, may be indefinitely extended on the assumption of the presence of a comparatively small quantity of radio-active material. Even supposing that the energy given off by substances like radium played a very considerable part in compensating for the enormous loss due to radiation yet it is inevitable that finally there must be loss of temperature and gradual cooling down of all the stars.

The plan of evolution here developed which postulates both an ascending and descending scale of temperature differs from that generally held which assumes that the development is from the nebulae to the white and blue stars without intermediate stages and then by descending stages to yellowish and red stars and extinction. Although such a plan, requiring both ascending and descending scales of temperature was formulated by Sir Norman Lockyer many years ago it did not receive much support and it is only within the last year or two that it has come into favor chiefly by the evidence collected from many sources by Dr. H. N. Russell of Princeton University.