stars were speeding through the universe; without them these objects of nature would probably never have been seen, and if seen, they would not have been recognised. Similar, and still more intricate, reasonings permitted Mendeléeff[1] to arrange in geometrical order the several elements or simple substances out of which matter is compounded, and to point to the vacant places on the chart, some of which have since been filled up by new discoveries. Thus it has also been shown that the ranges of temperature cannot be extended indefinitely in both directions—*viz.*, those of heat and cold—but that the latter possesses a zero point, representing the complete absence of motion.[2]

[1] The periodic arrangement of the elements, according to which, with increasing atomic or combining numbers, the same properties—such as density, fusibility, optical and electric qualities, and formation of oxides, &c.—recur in periods which are at least approximately fixed, so that they can be represented by curves, dates from the year 1869, when D. Mendeléeff and Lothar Meyer published almost simultaneously their classification of the elements. Newlands seems to have indicated some of these facts as early as 1864. Mendeléeff predicted the properties of a missing element, found to be those of scandium, which Nilson discovered ten years later. The same applies to the two other elements which were subsequently discovered by Lecocq de Boisbaudran (1878, gallium) and Winkler (1886, germanium), and in 1894 the newly discovered element argon was found to fill a vacant place in the plan.

[2] The zero point of temperature was originally a purely mathematical quantity suggested by the formula which gives the expansion of air in the air thermometer as dependent on the temperature. The ideal, not realisable, temperature at which, according to the formula, the volume of air would be nothing, was fixed by calculation at 459°·13 Fahr. or 272°·85 Centigrade. The real physical, not merely mathematical, meaning of the absolute scale of temperature with its zero point was only revealed when, through Carnot and Thomson, it was established that every degree of temperature has an assignable value for doing work, and when a scale of thermometry was suggested by Thomson (1848) in which every one degree had the same dynamical value, 100° in it corresponding to the 100° Centigrade in the air thermometer. It was then found that the two scales—that of the air thermometer and that measuring the dynamical value of temperature—agreed almost exactly. The number 273° Cent. thus acquired a physical meaning (see Clerk Maxwell, 'Heat,' 8th ed., pp. 49, 159, and 215). Another