



The Corpuscular Theory of Matter

J. J. Thomson

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It is stated in the preface that this book is an expansion of the series of lectures delivered at the Royal Institution in the spring of 1906.

The book consists of seven chapters which deal respectively with the origin and properties of corpuscles, the two different corpuscular theories of metallic conduction, and in the number and arrangement of corpuscles in the atom.

In the first chapter corpuscles in vacuum tubes are considered, and evidence is given showing that the corpuscles act as carriers of electricity, and that a positively electrified body owes its positive electrification to a defect of corpuscles. Also a positive charge is always associated with a mass comparable to that of the hydrogen or helium atom, whereas the corpuscles appear always to have the same mass, viz., that of about 1/1700 the atom of hydrogen.

As is well known, the positive ions are given off by radium, and constitute the "X" rays. These have been examined by Rutherford and others, and the ratios of — e/m measured.

The second chapter deals with the origin of the corpuscle, and here all the arguments are carefully set forth, and these tend to show that its mass is wholly electrical in origin.

The evidence for the existence of corpuscles afforded by the Zeeman effect is discussed in a most luminous manner. The chapters of most interest to electrical engineers are IV and V, in which the two theories of metallic conduction of electricity are most carefully explained. These are very interesting indeed, and the mathematics used is not too heavy.

The first of these theories assumes that the corpuscles are in temperature equilibrium with their surroundings, and that the "drift" of the corpuscles which constitutes the electric current, is started and maintained by the direct action of the electric field which acts on them. From considerations of the expressions derived for the conductivity of a substance, a rough estimate of the number of the corpuscles in a cubic centimetre of silver is arrived at, and the number is shown to be of the same order as the number of atoms in that volume. Again, the comparison between the ratio of the thermal to the electric conductivities gives a fairly close approximation to the results of experiment. The anomalous behaviour of alloys is pointed out in connection with the above, and the fact that pure metals appear to tend to zero resistance at the absolute zero of temperature, whilst that of alloys seems to tend towards a definite limiting value.

Lorenz's theory of radiation is next discussed, as well as the theory of the Hall, Peltier and Thomson effects. By considering the amount of heat absorbed or developed in a junction of two dissimilar metals when a current passes through it, the ratio of the number of corpuscles in unit volume of each metal may be determined, and from the Thomson effect, the change in this number for any one metal with temperature. The number arrived at in this way for silver is 1.8×10^{24} . It is then shown that this makes the specific heat of silver about 10 times larger than the value required by experiment....

— The Electrical Review, Volume 61 [1907]

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