
This book contains a very interesting treatment of a fascinating subject by a writer who speaks with the authority of a leading investigator. Dealing effectively as it does with one of the most remarkable developments of modern physics, a science which has sprung anew into the most rapid growth in the present generation, it is assured of a wide range of readers and of a valuable place in the development of science. For the most part it deals with experimental researches and results and makes but a small use of mathematics in their interpretation. For this reason only a brief notice of it should be given here, although it appears to be a book of more than usual value.

The investigations of radioactivity are too new for the subject yet to have taken on a mathematical form. Mathematics is the dress in which a physical science is best expounded and developed after it has come to maturity and the fundamental laws involved in it have been determined with precision; but it ill becomes a subject while yet in the infancy of early experimental stages.

But in spite of this newness of the subject there is one mathematical investigation connected with it and of considerable interest owing to the differential equation to which it gives rise. This seems not to be mentioned by Rutherford. It was initiated by J. J. Thomson (see Encyclopaedia Britannica, 11th edition, volume 6, page 371) and further developed by Mie (Annalen der Physik (4) 13 (1904): 857–889) and others. In investigating the distribution of electric force when a current is passing through an ionized gas Thomson obtained a differential equation which Mie has transformed to

\[
\frac{1 - k^2}{2\lambda} \frac{d^2z}{d\xi^2} - \frac{1 - k^2}{4\lambda^2} \left( \frac{dz}{d\xi} \right)^2 + \frac{k}{\lambda} \frac{dz}{d\xi} - z + 1 = 0,
\]

where \(k\) and \(\lambda\) are constants. In developing the theory of this equation considerable difficulty has arisen. A reading of the papers which have been devoted to it leaves one with the conviction that they do not satisfactorily dispose either of the mathematical question involved in the solution of the equation or of the electrical question of which this equation is in part the mathematical expression.

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