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IONS IN GASES[1]

By Professor JOHN ZELENY

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The problem of size and that of mass, which is usually connected with it, has been one of great perplexity. This problem presented itself at the very outset of the study of these ions, and has remained with us ever since.

Forty-four years have passed since Thomson and Rutherford[2] adopted the ionization theory to explain the conductivity imparted to gases by x-rays. At the time, the electron had not been isolated, and the process of ionization of a diatomic molecule was regarded as consisting in the pulling apart of its two atoms.

However, when Thomson and Rutherford obtained a rough estimate of the speeds with which the ions migrate in an electric field, they found that the mobility was much smaller than an ion of atomic size should have according to the kinetic theory of gases.

[2] J. J. Thomson and E. Rutherford, *Phil. Mag.*, 42: 392, 1896.

WHAT I propose to do in this paper is to outline briefly some of the difficulties which have been met in our attempts to get a better understanding of gaseous ions, and to indicate the present state of our knowledge about these ions. And then lastly, I shall go somewhat afield to say something about the theories that have been proposed to account for lightning.

To begin, then, what is there that we should like to know about ions in gases? We should like to know their mass, size, composition and structure. We should like to know the amount of charge that each carries. And we should like to know how they differ and what part each plays in the various electrical discharges. For obvious reasons, I shall not attempt to discuss all these various aspects of the subject.

[1] Address of the retiring president of the American Physical Society given in Philadelphia, December 27, 1940.