

# SCIENCE

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## WAVES AND PARTICLES<sup>1</sup>

By Professor GEORGE P. THOMSON

OF THE UNIVERSITY OF ABERDEEN, NON-RESIDENT LECTURER IN CHEMISTRY AT CORNELL UNIVERSITY  
UNDER THE GEORGE FISHER BAKER FOUNDATION

No one who has been so fortunate as to experience the magnificent reception—surpassing even the usual high standard of American hospitality—which you accord to the lecturers of this foundation could possibly begin his duties without a grateful recognition of such splendid treatment. To Mr. George Fisher Baker, the founder of this lectureship, and to Professor Dennis, to whom falls the arduous duty of administration, I want to express thanks which are out of all proportion to what can be expressed in these few words. This foundation is of inestimable value to the men who are fortunate enough to hold it, in giving them an insight into the working of one of the most progressive universities of this country and an opportunity of becoming personally acquainted with a group of very distinguished men. I have a hard task in attempting to give anything approaching a

<sup>1</sup> Introductory public lecture.

fair return for these advantages, and I hope you will judge leniently my attempts to do so.

If I break this piece of chalk, then take each of the bits and break them, and so on, is there any theoretical limit to the progress other than that imposed by the coarseness of mechanical appliances? This is a question which has occupied science since the twilight of its earliest dawn.

In the last three or four years opinions have altered as to the best answer to this question. During the first quarter of this century the answer to the question was quite definite. If the piece of chalk is continually broken and rebroken a time comes when the pieces are no longer merely smaller but become different in kind. This stage can not be reached by mechanical breaking, but it can be reached by heat and suitable chemical action. The chalk has been broken into its atoms. In chalk there are three kinds; other sub-

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