

THE CONSTITUTION OF MATTER

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The constitution of matter by Joseph S. Ames

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JOSEPH S. AMES

**THE CONSTITUTION
OF MATTER**

Northwestern University

THE N. W. HARRIS LECTURES
FOR 1913

The B. W. Harris Lectures

were founded in 1906 through the generosity of Mr. Norman Wait Harris of Chicago, and are to be given annually. The purpose of the lecture foundation is, as expressed by the donor, "to stimulate scientific research of the highest type and to bring the results of such research before the students and friends of Northwestern University, and through them to the world. By the term 'scientific research' is meant scholarly investigation into any department of human thought or effort without limitation to research in the so-called natural sciences, but with a desire that such investigation should be extended to cover the whole field of human knowledge."

Physics
A.

THE CONSTITUTION OF MATTER

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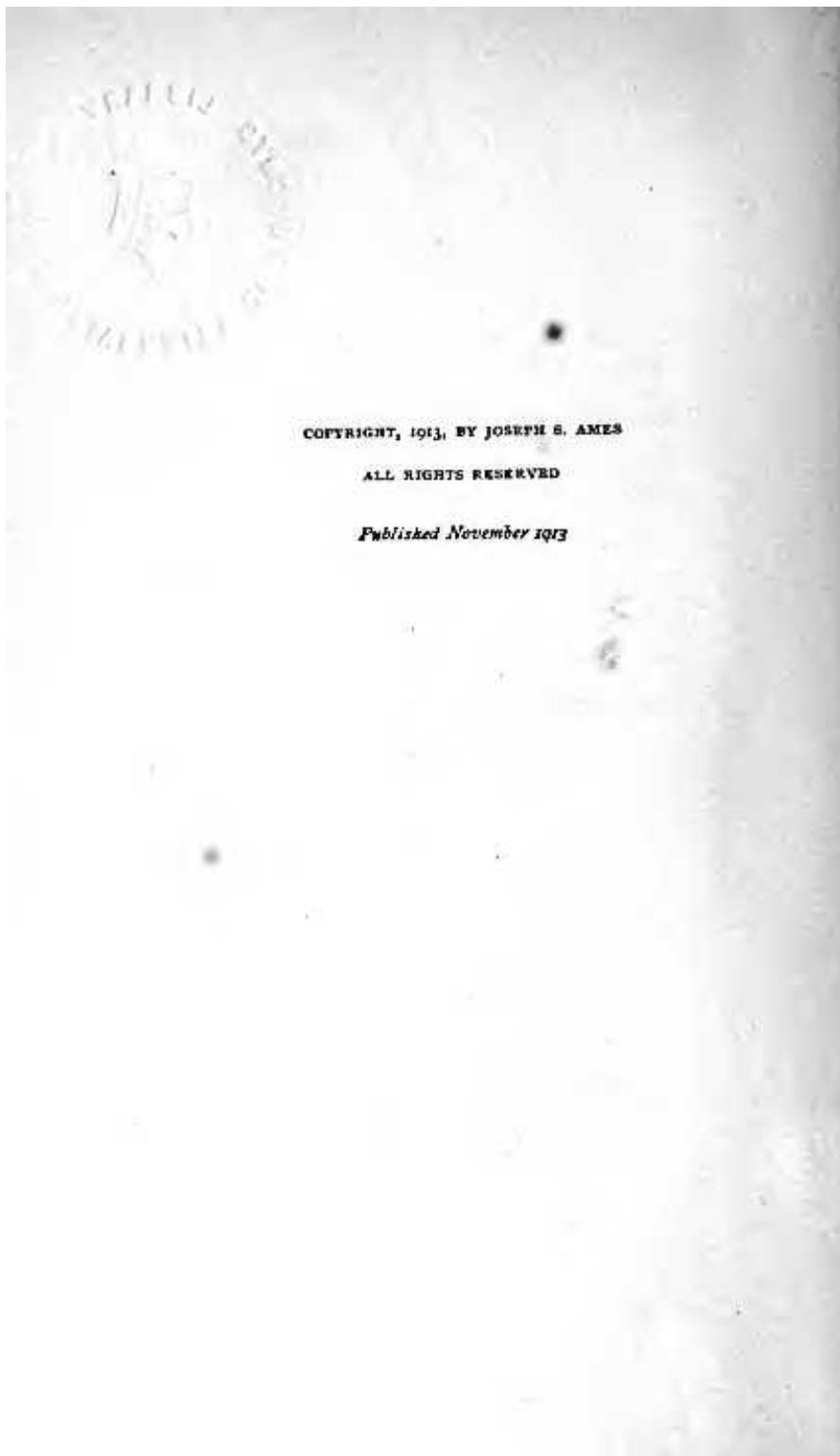


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PREFACE

THE lectures which form the body of this book were delivered at Northwestern University, Evanston, Illinois, in the month of February, 1913, for The Norman W. Harris Lectures of this year. The fact that they were actual lectures accounts for the form in which the text is given; and the further fact that the audience for whom they were prepared was composed, for a large part, of people unfamiliar with both the facts and the methods of science must be accepted as the justification for the treatment of the subject.

Few tasks are as difficult as that of conveying to a general audience a true impression of the results of scientific inquiry. One must avoid the Scylla of too great certainty and also the Charybdis of too great uncertainty. Even the proper words to use are a matter of doubt; and the difficulty is not lightened by the fact that, through the daily press and the

popular magazines, many of the discoveries of science have been given exposition — in many cases, by people entirely ignorant of the subject.

The plan adopted, after most serious consideration, was to accept the general theory of molecules and atoms as proposed by Sir J. J. Thomson and the properties of electrons as deduced by H. A. Lorentz, and to attempt to explain how from these one may deduce the general and even specific properties of matter. This method obviously is one suited only for a general audience; and even there it has its dangers. One is liable to produce the impression that our theories are verified, whereas they are but hypotheses still; but this is better, perhaps, than to leave the conviction that nothing is certain. It is difficult to make any body of listeners, however great their general intelligence, realize that in the end the great purpose of scientific investigation is the pursuit of Truth, the attainment of knowledge. Hypotheses rise and fall; the facts of experiment remain.

The temptation is great to stop here and there and emphasize what is not known, what is not proved; and the real usefulness of the lectures is lessened of course by the fact that this was done so rarely. However successful the attempt has been, the main purpose of the lectures was to make clear to a body of people, not students of physics, some of the results of investigators in unifying our knowledge of the world around us.