

**THE ADVANCE IN  
ELECTRICITY SINCE THE  
TIME OF FRANKLIN**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649038190

The Advance in Electricity Since the Time of Franklin by John Trowbridge

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**BY**  
**JOHN TROWBRIDGE**



**CAMBRIDGE**  
**HARVARD UNIVERSITY PRESS**

**LONDON: HUMPHREY MILFORD**  
**OXFORD UNIVERSITY PRESS**

**1922**

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*Mrs. Parker Katten*

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## PREFACE

THE reader perhaps will ask "How can such a great advance be treated in a small volume?" There are, however, salient topics, apart from the discussion of the vast practical employments of electricity, which are of great intellectual interest to one who wishes to keep informed upon the progress of science. In discussing these epoch-making topics we can understand the importance of Franklin's work and find today a remarkable return to his theories of electricity: the prevailing electron theory resembles greatly his theory of excess and deficit of electrical charges. It is interesting, moreover, to reflect upon what barred his advance in the study of electricity and what a new world has been opened since his time; what infinite complexity has been found in what seemed comparatively easily comprehended phenomena — that of lightning, and the colors of the rainbow.

In his time these two impressive manifestations in the sky were supposed to be entirely unrelated. No one had the imagination to conceive that they were both electrical. There were those who dreamed of the transmutation of metals; there were philosophers who anticipated the modern atomic theory; but there was no one who at the time of Franklin conceived of any relation between magnetism, electricity, and light. Even the atomists thought of the motions of the particles of matter without any intimations of electrons.

In reading the various lives of Franklin, I have been struck by the absence of consideration of his greatest

contribution to natural philosophy — his theory of an excess and deficit of electricity. His popular scientific reputation may be said to rest entirely upon his celebrated kite experiment. But among scientific men there has been due appreciation of his scientific work. Sir Humphrey Davy said that a singular happiness of induction guided all of Franklin's researches; he established very great truths by extremely simple means. Among literary men Sainte Beuve, in his *Causeries de Lundi*, was the most appreciative of Franklin's scientific mind.

Franklin's prestige in France was due more to his researches in electricity than to any other cause. He did not rank as a master in diplomacy among the most skilled diplomats of the time; he was not recognized as a mental philosopher and writer by a nation which has always considered itself supreme in the fields of literature — a nation which had at that time Voltaire; moreover, he came from the Provinces. It can be said that, "He hitched his wagon to a star." Lightning flashes seen by every one in terror spread his name on the heavens, and Condorcet's words, *Erupuit fulmen caelo, mox sceptrum tyrannis* (he snatched lightning from the sky, and afterward, sceptres from tyrants), established his fame among all classes — the rarest fortune of a scientific man.

Franklin was fortunate in receiving such fame for his scientific work in a country which was preëminent in both science and literature, and this reception probably led to his statement that he desired to abandon diplomacy and public life and to devote himself to the study of electricity. We realize, now, that his further work in this field would not have been fruitful, for the



electric current and its effect upon magnetism was not discovered until after his death: he had not in his power fundamental means to advance the subject. The centre he had created of electrical research in America shifted to Italy, where a new world in electricity was discovered. Franklin's work may be said to have paid back to the old world the debt America owed for the discovery of its continent.

In a limited space I have sketched the state of Franklin's mind in regard to the singular phenomenon of the existence of attracting or repelling charges of electricity; and I have endeavored to show that the latest theory in electricity — the electron theory — closely resembles his theory of excess and deficit. While his philosophical views of the phenomena of electrical sparks are largely accepted, his experiments cannot be said to have led the way to practical employments of electricity. Their lack of influence on a great future development was due to a want of perception of the relations of magnetism to electricity. Franklin's advance in his favorite subject was completely barred by an ignorance of these relations. I have quoted his words to show how feeble he considered the manifestations of magnetism in comparison with those of electricity. A giant was lying concealed in his workshop. All our great advance in electricity since the time of Franklin has been due to the increase of our knowledge of magnetism. After we have considered the wonderful phenomena of radium we may be led to ask: are not the manifestations of magnetism still more wonderful?

I have supplemented Franklin's study of lightning in the sky by a laboratory study of the nearest approach to this manifestation which has been made; and in addi-

tion to the means he employed to study electricity I have employed the method of the revolving mirror which has revealed the possibility of tuning in wireless telegraphy. My treatment of the advances in electricity since the time of Franklin is included under the following: lightning in its general aspects; the dynamo which has so to speak brought down lightning from the skies; the discovery of the electron and its influence upon our views of matter — our increased appreciation of the immense and the infinitesimal; the influence of electrical discoveries on some phases of contemporaneous thought; and the embracement of all the divisions of electrical science under the one head, energy.

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