

**THE CENTURY SCIENCE  
SERIES: JOHN  
DALTON AND THE RISE  
OF MODERN CHEMISTRY**

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**SIR HENRY E. ROSCOE**

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JOHN DALTON, D.C.L., F.R.S.

THE CENTURY SCIENCE SERIES

JOHN DALTON

AND THE

*RISE OF MODERN CHEMISTRY*

BY

SIR HENRY E. ROSCOE

D.C.L., LL.D., F.R.S.

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## INTRODUCTION.

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IN the vestibule of the Manchester Town Hall are placed two life-sized marble statues facing each other. One of these is that of John Dalton, by Chantrey; the other that of James Prescott Joule, by Gilbert. Thus honour is done to Manchester's two greatest sons — to Dalton, the founder of modern Chemistry and of the Atomic Theory, and the discoverer of the laws of chemical-combining proportions; to Joule, the founder of modern Physics and the discoverer of the law of the Conservation of Energy. The one gave to the world the final and satisfactory proof of the great principle, long surmised and often dwelt upon, that in every kind of chemical change no loss of matter occurs; the other proved that in all the varied modes of physical change no loss of energy takes place. Dalton, by determining the relative weights of the atoms which

take part in chemical change, proved that every such change — whether from visible to invisible, from solid to liquid, or from liquid to gas — can be represented quantitatively by a chemical equation; and he created the Atomic Theory of Chemistry by which these changes are explained. Joule, by exact experiment, proved the truth of the same statement for the different forms of energy.

As we can neither create nor destroy matter, so also we can neither create nor destroy energy. As when the candle burns and the wax disappears, its constituent parts are not lost, but escape in the form of steam and carbonic acid gas formed by the union of the hydrogen and carbon of the wax with atmospheric oxygen; so the energy of the chemical forces locked up, or potential, in the wax and oxygen becomes evident, or kinetic, in the heat of the flame. In other words, the molecular motion of the particles becomes motion of the mass. And just as there is a definite and unalterable relation of weight between the carbon and the hydrogen of the wax and the products of their combustion — carbonic acid and water — so there is a definite and unalterable relation between the amount of the chemical

potential energy of the constituents of the wax, and that of the heat evolved by their oxidation. Each relation can be expressed by numbers, and these numbers are the Foundation Constants of science. By the determination of the combining weights of the elements, and of their compounds, Dalton ascertained the truth of the first principle. By rigorous experiment, Joule measured the mechanical equivalent of heat, and proved that a weight of 772 lbs. falling through the space of one foot developed a fixed and unalterable amount of heat capable of raising the temperature of one pound of water one degree Fahrenheit—thus proving the truth of the second.

Before John Dalton's discovery of the laws of chemical combination, and without his Atomic Theory to explain those laws, Chemistry as an exact science did not exist, because although many facts were known, the relation between these facts was unknown. Thus before Dalton's time, although a chemist might predicate the kind of action which occurs when two chemical substances are brought together, no one could calculate with precision how much of each ingredient is required to build up the