FOUNDATIONS OF THE ATOMIC THEORY: COMPRISING PAPERS AND EXTRACTS

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BY

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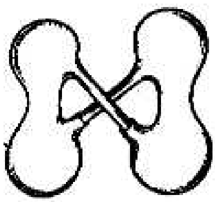

PREFACE.

THIS little book contains reprints of original memoirs and extracts from text-books, embracing the earliest publications by their respective authors bearing upon the foundation of the Atomic Theory.

The view is pretty generally held by chemists that it was in the endeavour to explain numerous examples which were known to him, of that general regularity which is now commonly called the Law of Multiple Proportions, that Dalton was led to entertain the ideas which he held regarding the constitution of compound bodies. There has therefore been included, along with later publications, the paper by Dalton in which there is described probably the first example of this regularity with which he became acquainted.

The first part of Dalton's "New System of Chemical Philosophy," containing his own account of his views, did not appear until 1808, although these views had been embodied in courses of lectures which Dalton had delivered some years previously. The earliest printed account of his views is that given by Dr Thomas Thomson in Volume 3 of the Third Edition of his "System of Chemistry," published in 1807. This account is reproduced in the following pages.

A paper by Wollaston on Super-acid and Sub-acid Salts, giving various examples illustrative of the Law of Multiple Proportions, is also included.

L. D.

EXPERIMENTAL ENQUIRY INTO THE PROPORTION OF THE SEVERAL GASES OR ELASTIC FLUIDS, CONSTITUTING THE ATMOSPHERE. BY JOHN DALTON.*

Read Nov. 12, 1802.

IN a former paper which I submitted to this Society, "On the constitution of mixed gases," I adopted such proportions of the simple elastic fluids to constitute the atmosphere as were then current, not intending to warrant the accuracy of them all, as stated in the said paper; my principal object in that essay was, to point out the *manner* in which mixed elastic fluids exist together, and to insist upon what I think a very important and fundamental position in the doctrine of such fluids:—namely, that the elastic or repulsive power of each particle is confined to those of its own kind; and consequently the force of such fluid, retained in a given vessel, or gravitating, is the same in a separate as in a mixed state, depending upon its proper density and temperature. This principle accords with all experience, and I have no doubt will soon be perceived and acknowledged by chemists and philosophers in general; and its application will elucidate a variety of facts, which are otherwise involved in obscurity.

* From the Memoirs of the Literary and Philosophical Society of Manchester, Second Series, Volume I., 1805, pp. 244-258. In this paper there is announced the first example of the law of multiple proportions.

The objects of the present essay are,

1. To determine the weight of each simple atmosphere, abstractedly; or, in other words, what part of the weight of the whole compound atmosphere is due to azote; what to oxygen, &c. &c.

2. To determine the relative weights of the different gases in a given volume of atmospheric air, such as it is at the earth's surface.

3. To investigate the proportions of the gases to each other, such as they ought to be found at different elevations above the earth's surface.

To those who consider the atmosphere as a chemical compound, these *three* objects are but *one*: others, who adopt my hypothesis, will see they are essentially distinct.—With respect to the first: It is obvious, that, on my hypothesis, the density and elastic force of each gas at the earth's surface, are the effects of the weight of the atmosphere of that gas solely, the different atmospheres not gravitating one upon another. Whence the first object will be obtained by ascertaining what share of elastic force is due to each gas in a given volume of the compound atmosphere; or, which amounts to the same thing, by finding how much the given volume is diminished under a constant pressure, by the abstraction of each of its ingredients singly. Thus, if it should appear that by extracting the oxygenous gas from any mass of atmospheric air, the whole was diminished $\frac{1}{5}$ in bulk, still being subject to a pressure of 30 inches of mercury; then it ought to be inferred that the oxygenous atmosphere presses the earth with a force of 6 inches of mercury, &c.

In order to ascertain the second point, it will be further necessary to obtain the specific gravity of each gas; that is, the relative weights of a given volume of each in a pure state, subject to the same pressure and temperature. For, the weight of each gas in any given portion of atmospheric air, must be in the compound ratio of its force and specific gravity.

With respect to the third object, it may be observed, that those gases which are specifically the heaviest must decrease in density the quickest in ascending. If the earth's atmosphere had been a homogeneous elastic fluid of the same weight it is, but ten times the specific gravity, it might easily be demonstrated that no sensible portion of it could have arisen to the summits of the highest mountains. On the other hand, an atmosphere of hydrogenous gas, of the same weight, would support a column of mercury nearly 29 inches on the summit of Mount Blanc.

The several gases constantly found in every portion of atmospheric air, and in such quantities as are capable of being appreciated, are azotic, oxygenous, aqueous vapour, and carbonic acid. It is probable that hydrogenous gas also is constantly present; but in so small proportion as not to be detected by any test we are acquainted with; it must therefore be confounded in the large mass of azotic gas.

1. *Of the Weight of the Oxygenous and Azotic Atmospheres.*

Various processes have been used to determine the quantity of oxygenous gas.

1. The mixture of nitrous gas and air over water.

2. Exposing the air to liquid sulphuret of potash or lime, with or without agitation.

3. Exploding hydrogen gas and air by electricity.

4. Exposing the air to a solution of green sulphat or muriat of iron in water, strongly impregnated with nitrous gas.