The Standard of Atomic Weights.

IT is with considerable surprise, as a chemist, that I see in NATURE of April 22, p. 230, arguments as to the structure of atoms based on the deviations of the atomic weights of elements from whole numbers *on the standard* O = 16·00 The reasons for the use of this arbitrary and inconvenient standard are now matters of ancient history, and the values of Stas, which were regarded as fundamental at the time when the standard was adopted, have now been shown by many independent lines of experiment to be inexact. It is almost pathetic to observe modern experimenters who have determined equivalents by the accurate analysis of hydrogen compounds, such as hydrogen chloride, methane, hydrogen bromide, ammonia, etc., all of which are more easily obtained in a state of purity, and analysed, than oxygen compounds, compelled to multiply their results by 1·008 in order to bring them into line with the standard of O = 16·00.

A glance at the International Table of Atomic Weights will show that very few of the elements form oxygen compounds suitable for analysis, and the statement to the contrary, found in most elementary text-books, is clearly inaccurate. A great number of equivalents, on the contrary, have been referred to Ag = 107·88. This number can be brought into ratio with oxygen only through the intermediate link of nitrogen, the atomic weight of which has been most accurately determined by the analysis of ammonia. The latter involves the ratio 1·008 to get the ratio to O = 16·00. But the atomic weight of chlorine has been most accurately determined directly to H = 1·00, and the ratio Ag : Cl is also very accurately known. From hydrogen to chlorine, from chlorine to silver, and from silver to a large number of other elements seems to be the most natural proceeding. Oxygen then comes in from the ratio H : O found by Morley, Scott, and Burt and Edgar. This is now probably one of the most accurately known atomic weights. The above is one instance only of the extraordinary branch-chain methods now necessary in order to get the experimental numbers referred to oxygen.

On the theoretical side the advantages of the hydrogen standard are self-evident. No one has ever pretended that the adoption of oxygen as the unit has any theoretical significance; the retention of the number O = 16·00 alone is sufficient to prove this. The accumulating evidence on the physical side, such as atomic numbers, the structure of atomic nuclei, the periodic law, and the like, all points unmistakably to the mass of the hydrogen atom as the natural standard. It is no longer correct to say, as is still done in elementary books, and even in other quarters, that the standard of atomic weights is a matter of indifference, and that, apart from experimental reasons, one element is as good as another. We have almost certain evidence that the hydrogen nucleus is a fundamental constituent of all atoms. Prout's hypothesis being thus reinstated, there can be no doubt as to the suitable standard of atomic weights, and Dalton's choice has had a most remarkable vindication.

When, therefore, arguments are advanced based on the standard O = 16·00, it seems time to suggest that some steps should be taken to put an end to the prevailing confusion. Physicists have never taken kindly to the oxygen standard, and there is no longer any reason why chemists should be given needless trouble. I have, in my elementary lectures, made a practice of using the hydrogen standard, and thus avoiding all the confusion in connection with vapour densities, etc., which comes in with the other system.

There is one other point which seems to me of importance. On the oxygen scale the atomic weights of a number of elements differ by about half a unit from whole numbers. It has been conjectured that these elements are mixtures of isotopes, with atomic weights which are whole numbers. But if there is anything in the theory of isotopes to justify this, it can only rest on the hydrogen nucleus, and the atomic weight of hydrogen should be taken as unity. If this is done, it is found that the suspected elements are replaced by those not at present under any clouds of suspicion. The following table will illustrate this point:

Element	Atomic Weight O = 16·00	Atomic Weight H = 1·00
Chlorine ...	... 35·45	35·18
Magnesium	... 24·32	24·14
Silicon ...	... 28·3	28·1
Zinc ...	... 65·37	64·88
Copper ...	... 63·57	63·10

It may be that there is some real physical reason for taking O = 16·00, and then supposing that, if some elements deviate from the whole number on this basis, they must be mixtures of isotopes, but this reason has so far escaped my attention.

There seems to me to be a good case for the Committee on Atomic Weights to consider whether the unit O = 16·00, adopted largely on account of the persistence of Ostwald, is any longer necessary. At best it was a temporary decision, and all the reasons which were advanced in its favour have now lost their force. I am convinced that the arguments in favour of a return to Dalton's unit are so cogent that, once they are clearly realised, they will be admitted.

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Mortlakes as a Cause of River-windings.

MORTLAKE on the Thames has a place-name which not only accords with the natural history of the place, but also supplies a word which might conveniently be brought into common use to signify a process which plays an important part in the development of every river system, just as the River Meander supplies a word to signify the windings of any river. The area between Barnes and the Thames was formerly an island *in* the river (Fig. 1), formed by a

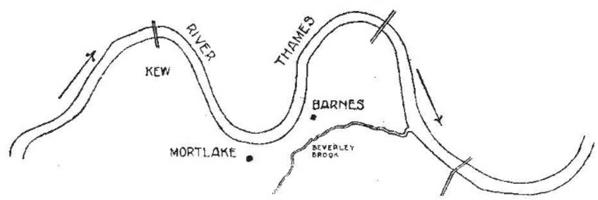

FIG. 1.

division of the stream into a northern and a southern arm reunited at the down-stream ends. The southern arm is now incomplete; the part of it remaining is included in the line of the Beverley Brook, which, having come from the south, turns to the east round a bold curve and joins the Thames. This leaves a gap between the convexity of the curve and the river at the point where it previously divided. This gap now forms the isthmus of a peninsula into which the island has been converted by the partial effacement of the southern arm of the divided river. Here Mortlake stands. It is on or near to the former line of the stream which has been in part effaced. This part has become a dead stream—a mortlake, the word "lake" having been used in the Middle English sense