

INTEGRAL ATOMIC WEIGHTS, PART 1.—BY FRANK WILLIAM
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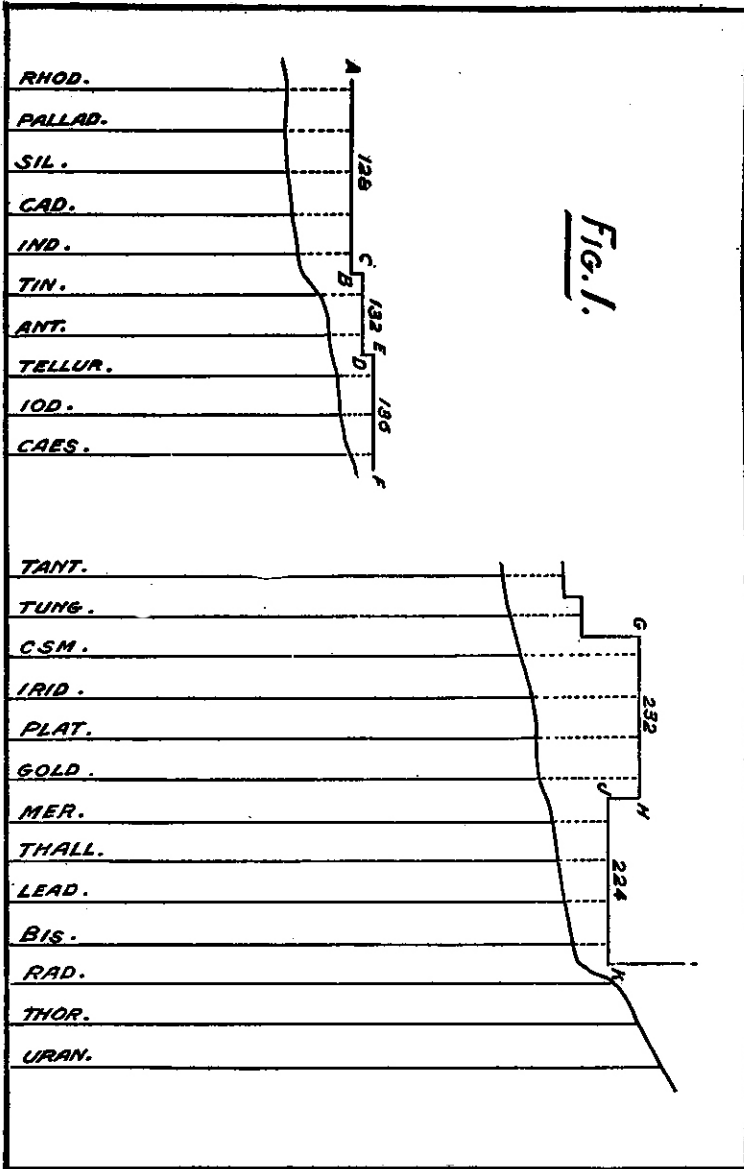
This constitutes a suggestion that the accepted series of atomic weights are fractional parts of a series of higher or Integral Atomic Weights which more correctly represent the properties and constitution of the atoms, except in the matter of weight.

The author was led to make a large number of calculations with a view to find traces of such a series of Integral Atomic Weights, and, at length, found that if the accepted atomic weights were scaled off as ordinates at convenient horizontal distances, and a curve drawn, as shown in Fig. 1, it was possible to draw certain horizontal lines AB, CD, EF, GH, JK, above the curve, in such positions that the specific gravities of the few elements beneath any given horizontal line were a very simple function of the distance between the horizontal line and the curve at that point. Not only so, but the distances of these horizontal lines from the base line were simple functions of of each other.

That is to say, referring again to Fig. 1, that the upper or dotted portions of the atomic weight ordinates, which we may call super-ordinates, are very simple functions of the specific gravity of the elements to which they refer, and that the heights of the lines AB, CD, EF, GH, and JK, above the base line, bear the simple proportions 128, 132, 136, 232, 224, all but one of which are multiples of 8 and the remaining one a multiple of 4.

The super-ordinate divided by 1.8 gives the specific gravity approximately.

The author was led to complete the series but found that in most other parts of the curve a line had to be drawn for



each single element. Nevertheless, the heights of these lines persisted in approximating to multiples of 4 or 8 with a few exceptions. Where it is a multiple of 3, that will crop up repeatedly in the same group of elements. Similarly when it is a multiple of 5. This happens, by the way, in the pentad group, which is decidedly interesting.

He afterwards found that the ratio $\frac{\text{super-ordinate}}{1.8}$ approximated more closely to the specific gravity if the heights of the horizontal lines above the base were measured with 1.008 (atomic weight H) as a unit instead of with 1 as a unit.

The number of units in the ordinates running from the base line right up to the horizontal lines may be called the "Atomic Multiples"; and the Atomic Multiples $\times 1.008$ are what have been called above, the "Integral Atomic Weights."

A list is given in Fig. 2, of these Atomic Multiples, arranged after the manner of Mendeleeff's table.

It will be found that,

$$\text{Specific Gravity} = \frac{\text{Integral At. Wt.} - \text{actual At. Wt.}}{1.8}$$

with an average error of 0.55. A large number work out with great accuracy.

Manganese is not very amenable to the system, but it should be remarked that it stands very much alone in its group any way.

It is well to keep the two factors of the Integral Atomic Weight—namely the Atomic Multiple and the unit of 1.008—separately in mind, as it may be found desirable to alter the the Atomic Multiple for any element, or the unit for all the elements in order to get more precise results later on.

Melting Points.

These Atomic Multiples have a very distinct relation to the melting point curve of the elements. As the list of the

elements progresses, the Atomic Multiples either remain constant or rise (with one exception).

While they remain constant, the melting point curve falls rapidly. Where they materially increase, the melting point rises abruptly. Small increases only just check the fall of the melting point curve or may just give a slight rise, thus forming the double periodicity humps. This is most readily seen by marking the Atomic Multiples on a melting point curve. It will be seen that in the one instance where the Atomic Multiple falls the melting point drops below zero.

Specific Heat.

The Integral Atomic Weight of an element multiplied by the specific heat of the element is a more constant quantity than the ordinary atomic weight of an element multiplied by its specific heat, the departure from a mean being reduced by about 30 per cent. In the lower parts of the scale the reduction of variation is much more than this.

Conclusions.

The author thinks there is strong evidence that these suggested Integral Atomic Weights are a real function of their respective elements, and if they be accepted the inferences are:—

- (a) That the heavier elements are built up from the lighter elements with probably hydrogen, helium, and possibly lithium largely as constituents, these sub-atoms being conjoined in some vibratory system which renders a part of their material unnecessary to the structure of the complex atom; for if the Atomic Multiple, or the Integral Atomic Weight be taken as proportional to the number of ultimate sub-atoms constituting any given atom, then the excess of these magnitudes over the accepted atomic weight may be

considered proportional to the loss of material in the formation of the atom.

- (b) That the quantity of missing material is a very simple function of the closeness of the combination: that is to say of the density of the substance.
- (c) That the specific heat of an element depends more upon the number of ultimate sub-atoms in its main atom, than upon the actual weight of the said main or complex atom.
- (d) That with a given number of sub-atoms the melting point is a direct function of the quantity of missing material, so that melting point curve and specific gravity curve are similar so long as the number of sub-atoms (i. e., the Atomic Multiple) remains constant.

A curve showing the closeness of agreement between actual specific gravities and those worked out by the above method, is appended (Fig. 3).

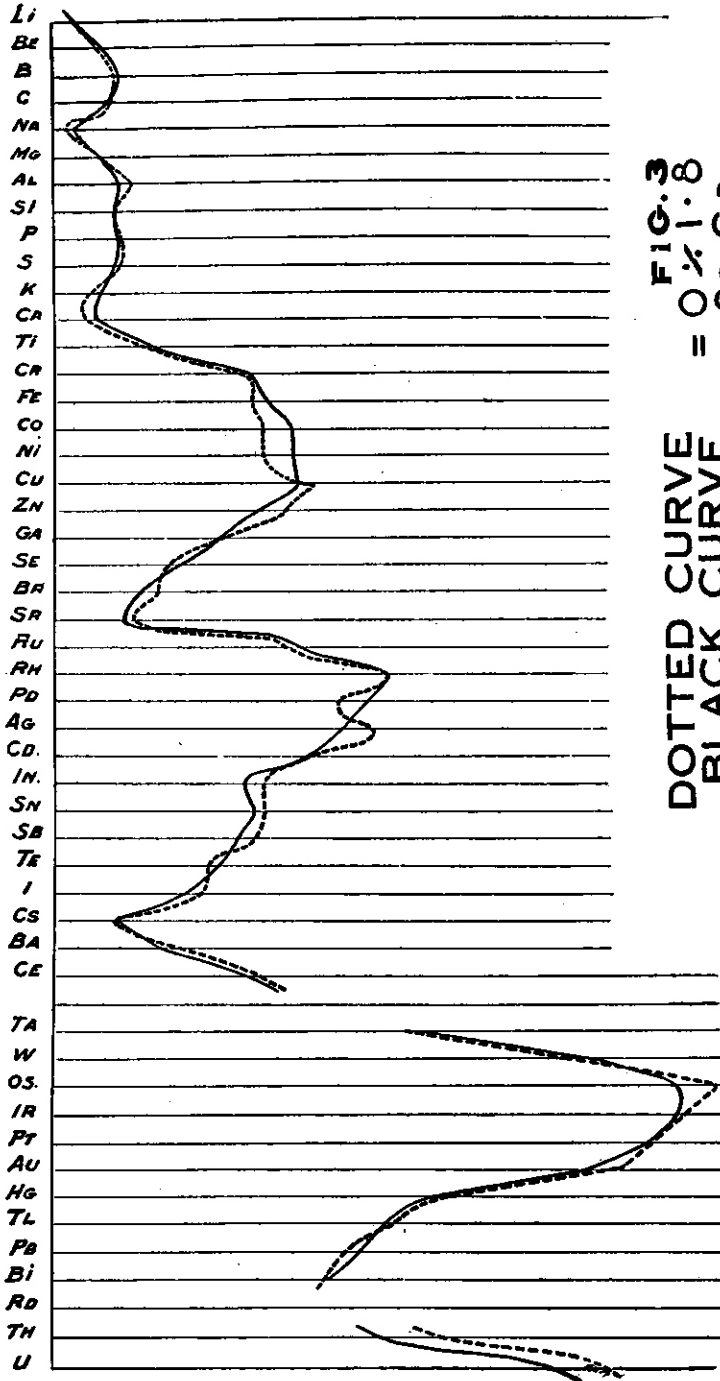


FIG. 3
= 0.1.8
= SP. GR.

DOTTED CURVE
BLACK CURVE