gation of much experimental material to point out the following regularities.

It is well known that the number of nuclear electrons is not a simple function of the atomic weight. There are many isotopes of different elements having the same atomic weight, but different numbers of nuclear electrons.

The number of isotopes having the same atomic weight, N, can be regarded as a function of this atomic weight. Curve 1 in Fig. 1 represents such a function.

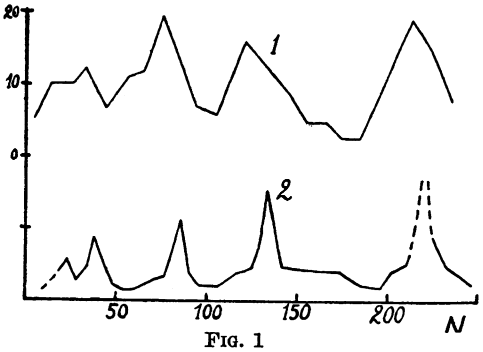

FIG. 1

Each point represents a mean value for an interval of ten atomic weights. It is easy to recognize the periodical character of this curve. It may also be pointed out that the periods correspond to those of the periodical system of the elements. This can be seen comparing curve 1 with curve 2 in Fig. 1. Curve 2 shows also the atomic volume as a function of the atomic weight.

The number of isotopes having the same atomic weight is determined by the properties of the nuclei. On the other hand the atomic volume is determined by the properties of electron coverings of the atom. If we have in both cases the same periodicity we must have also a connection between the outer electrons and the protons and electrons in the nucleus.

There is also another fact showing the same relation. It is known that generally elements having even atomic numbers exist in larger quantities than elements with odd numbers (Harkins' law). This fact can be explained by the greater stability of nuclei with even atomic numbers. Let n_1 be the relative quantity of a given element with an odd number and n_2 the quantity of the next one with an even number. The value

$$E = \lg h_1 - \lg h_2 = \lg \frac{n_1}{n_2}$$

can be regarded as a function of the atomic number 7. Taking experimental material from a work of I and W. Noddak[1] it is possible to receive a curve illustrating this function and shown in Fig. 2 (curve 1). This curve can be compared also with the curve of atomic volumes. (Fig. 2, curve 2).

[1] *Naturwissenschaften*, 18, 757, 1930.

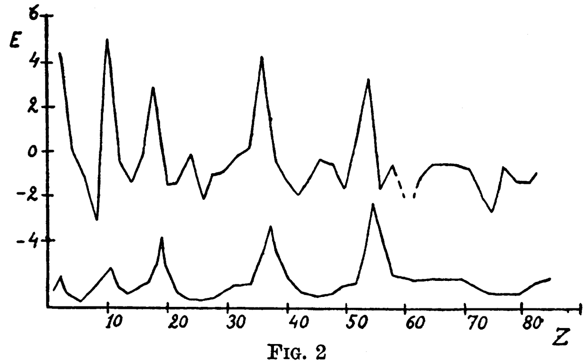

FIG. 2

All the described facts show the existence of some connection between the nucleus and its electron covering. It seems to be probable that quantum laws can be applied not only to the electron covering but also to the nucelus of the atom.

Assuming, (1) that atomic nuclei having the same geometrical structure must have also the same physical properties, (2) that the volumes of nuclei are proportional to the numbers of protons and (3) the protons can not be deformed in the nucleus, it is easy to show that only such nuclei can have the same form as a proton, which have the following atomic weights:

$$N_1 = 1 = 1^3$$
$$N_2 = 8 = 2^3$$
$$N_3 = 27 = 3^3$$
$$N_4 = 64 = 4^3$$
$$N_5 = 125 = 5^3$$
$$N_6 = 216 = 6^3$$

Therefore the atomic nuclei with given values of N must have analogical physical properties. We obtain therefore a periodical system of nuclei, each period limited by N_1, N_2, etc. This is in good agreement with the experimental facts shown in Fig. 1 and Fig. 2.

It is possible also to receive an analogical result from the standpoint of wave mechanics. A more detailed discussion of this possibility will be given in another place.

G. I. POKROWSKI
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