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THE BUILDING OF ATOMS AND THE NEW PERIODIC SYSTEM¹

WHAT is usually known as the periodic system of the elements was developed largely in the decade from 1860 to 1870, during the period of our civil war, by de Chancourtois, Newlands, Mendeléeff and Meyer. Mendeléeff, the third to develop the system, has been given almost all of the credit for it, but this is largely because he paid very much more attention to its details than any of the three others. It has now been found that the Mendeléeff periodic relation is simply one method of expressing the arrangement in space of the electrons in the outer part of the various kinds of atoms.

Five years ago I discovered a *new periodic system of the elements, or more properly speaking, of the atoms. This second system is not at all directly related to the arrangement of the electrons in the outer part of the atom, but has been found to indicate how the atoms are built up, that is, it is related to the structure of the nuclei of the different species of atoms.*

In order to understand the meaning of this new periodic system it is important to have a good idea of the present theory as to the general structure of the atom. According to Rutherford the atom is similar to the solar system in that it has a central sun called the nucleus of the atom, and a system of planets, each of which consists of one negative electron. The atom as a whole is electrically neutral, and the electrons outside the nucleus, which we may call the planetary electrons, are held in the atom by a positive charge on the nucleus. This positive charge is equal numerically to the sum of the charges of all of the planetary electrons. This is often expressed

¹ Abstract of a general address presented at the Philadelphia meeting of the American Chemical Society, September 3, 1919.