

Some Facts Bearing on the Structure of Atoms, Particularly of the Helium Atom. R. A. MILLIKAN. (*Phys. Rev.*, Dec., 1921.)—Professor Millikan has developed a wonderful method by which he can measure the electric charge on the fragment of an atom to the same degree of accuracy with which the census enumerates the number of people in the United States. When he applies this method to the atoms that have suffered bombardment by alpha rays coming from a bit of polonium he can tell exactly how many electrons have been knocked off, because each detached electron has carried away a definite and known quantity of negative electricity. When oxygen, nitrogen or carbon with their few electrons or iodine or mercury with their many electrons are subjected to assaults of the alpha particles, it is found that a single such particle practically never detaches more than one electron. "This, in itself, throws a certain light on atomic structure, for it shows conclusively that the electrons within an atom act quite independently of one another. They are certainly not in rings, of say four or eight or any other number which become unstable when one of their number is removed, or which can in general be shattered as a whole."

With helium it is different. The result is thus picturesquely phrased, "The alpha particle shooting at random through the helium atom at its maximum ionizing speed gets both electrons every sixth shot in which it gets anything." Such a fact does not determine the structure of the helium atom but it does make certain structures impossible. One such structure thus ruled out is the original Bohr arrangement according to which the helium atom has its two electrons at opposite ends of a diameter. Another is that suggested by Sommerfeld in which one electron rotates close to the nucleus while the other is in an orbit much farther away.

To kill the traditional two birds with one stone it is necessary that they be close together at the time of their demise. Similar reasoning leads to the conclusion that the two electrons which get knocked off once out of six must be close together in the atom a considerable part of the time. This is in consonance with the recent arrangements of Landé and of Bohr, according to which the electrons move in roughly equal orbits whose planes are inclined to each other. "Bohr may also find in it support for his recent contention that the outer shell of heavy atoms possesses few electrons instead of many as postulated in most of the discussions of the "static atom."

This article is from the Norman Bridge Laboratory of Physics, Pasadena, California, and may perhaps be regarded as the first fruits of Colonel Millikan's activities in his new surroundings.

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