31. Development of the atomic view.

growing volume of chemical knowledge; that the conception of the atom must be extended and more closely defined; that the proportions of weight were inadequate for the purpose of distinguishing and identifying the many organic compounds; and especially that the relations of volume and the arrangements of particles of matter in space must be taken notice of, if the atomic view of matter was to be made further serviceable for scientific purposes. That purely geometrical relations, such as can be grasped only by our space conceptions, are of importance in the chemical composition of substances, was very evident, for instance, in some of the optical properties of crystallised organic substances. The discoveries of Pasteur, published in 1850, mark in this respect an epoch in science.[1] He showed that there exist chemical substances which are different, but only as a right-hand glove differs from a left-hand one, a right-handed screw from a left-handed,

32. Pasteur's discovery of "chirality."

[1] A special line of "physical" or "mechanical" reasoning which bears upon the atomic view of matter began with Biot's discovery in 1815 that certain fluids—notably organic—have the property of rotating the plane of polarisation of light which passes through them. Later on he extended this observation to the vapours formed by such fluids. Faraday found in 1846 that substances which are optically "inactive" become active in the manner described under the influence of powerful electro-magnets. An explanation of the phenomenon by Fresnel, which was based upon crystalline structure, would — for liquids and vapours — have to be applied to the structure of the molecule itself. Pasteur found in 1850 that there exist two modifications of tartaric acid, which differ in this only, that one of them turns the plane of polarisation to the right, the other to the left, and that a mixture of both in the proper proportions is inactive. As far back as 1860, in his 'Leçons de Chimie,' he put the question, "whether the atoms in tartaric acid are arranged like the turns of a right-handed screw, or situated in the corners of an irregular tetrahedron, or have they any other asymmetrical grouping? . . . There can be no doubt that the atoms have an unsymmetrical arrangement after the fashion of mirrored images which cannot be made to fall into each other" (quoted by Van't Hoff, 'Die Lagerung der Atome im Raume,' German translation, 2nd ed., p. 9).