centres, or to lines, called axes, or to planes of symmetry.[1] French and German investigators have deduced in different ways the different possible forms of symmetry, and have shown that in all thirty-two different forms of symmetry or groups are geometrically possible. These thirty-two fundamental groups of crystals can be gathered up into six classes or types, according to the different systems of crystallographic axes or the number of planes of symmetry belonging to them.[2]

[1] The question may be raised, to what extent crystallography is obliged to assume a molecular structure of matter, or what support does the atomic view receive from it? On this point see Ostwald's 'Allgemeine Chemie,' vol. i. p. 855, &c. The geometrical forms of crystals can either be derived from elementary polyhedra, as Haüy attempted to do by his "molécules intégrantes" and his theory of decrescences, space being in this system considered as continuously filled; or the elementary particles may be considered to consist of meshes of points geometrically arranged in the corners of a primitive figure in three dimensions; or elementary spheres or ellipsoids may be supposed to be piled on each other like cannon-balls. The two latter systems assume vacant spaces; the first view refers the crystalline shape to some primitive crystal, and, therefore, does not explain it. It has accordingly been said that "the structure of crystals is one of the principal supports of the molecular theory. In assuming continuous matter without at least points which are geometrically or kinematically distinct, the anisotropic structure of crystals is quite unthinkable" (Lehmann, 'Molecular-physik,' vol. ii. p. 376). This view does not agree with what Ostwald says ('Allgemeine Chemie,' vol. i. p. 868); he considers that the structure of crystals affords no proof for the molecular constitution of matter, as the data of elasticity by no means necessarily require a molecular arrangement, but formally can be ascribed as easily to continuous matter. "Nevertheless the molecular view has the advantage of greater evidence, and leads to the same results with much greater simplicity, and hence more convincingly." It seems, however, that if chemical facts and physical theory force upon us the atomic view, crystallographic phenomena force us to complete it by some conception of geometrical arrangements.

[2] This purely geometrical treatment was introduced by Bravais in his 'Études crystallographiques' (1851), the much earlier work of Hessel ('Krystallometrie,' 1831) having been forgotten. It was further developed by L. Sohnke ('Entwickelung der Theorie der Krystallstructur,' 1879), and completed by Curie (1884) and Minnigerode (1886). A concise summary will be found in Liebisch, 'Physikalische Krystallographie,' Leipzig, 1891, pp. 3 to 50; also Groth, 'Physikalische Krystallographie,' Leipzig, 1895, p. 324, &c.