convenient symbolism, had, about the year 1860, been accepted by physicists, and used not merely as a convenient symbolism, but as a physical reality.

37. The atomic theory accepted as a physical theory about 1860.

Joule had actually calculated the velocity of a particle of hydrogen gas. The atomic view of nature was now taken in real earnest. To establish it still further, there were required definite numerical data[1] as to the size of the smallest particles (henceforth sometimes called atoms, sometimes more correctly molecules) and their number, and also clearer views as to the composition of the molecules out of their elements, the chemical atoms.

The interest which attaches to this latest development of the atomic theory is very great: it has brought about a union of the researches of chemists and physicists, and has made chemistry a province of natural philosophy.[2] No one has done more than the late Professor Clerk Max-

[1] Numerical data regarding the size and number of smallest physical particles contained in a given volume of matter have been supplied by various methods or various "lines of reasoning." The best summary will be found in Lord Kelvin's lecture, "On the Size of Atoms" (1883: reprinted in 'Popular Lectures and Addresses,' vol. i. p. 147 *sqq.*) The four lines of reasoning are founded on the undulatory theory of light, on the phenomena of contact electricity, on capillary attraction, and on the kinetic theory of gases. They "agree in showing that the molecules of ordinary matter must be something like the one ten-millionth, or from the one ten-millionth to the one hundred-millionth of a centimetre in diameter."

[2] "We can distinguish two kinds of motion, atomic motion and molecular motion. . . . To this distinction corresponds the division of natural philosophy into physics and chemistry, not rigidly, yet in so far as chemistry is mainly occupied with the equilibrium of the atoms, physics with the mechanics of the molecules. Chemical equilibrium, unchanged condition of the molecules, exists if the affinity which holds together the atoms equilibrates the forces which tend to loosen the composition of the molecule: these forces consist in the motion of the atoms. . . . As accordingly in a chemically stable compound the atomic motions remain in lasting dynamical equilibrium with the chemical forces, . . . there remains for the examination of the purely physical phenomena in the first instance only the molecular movements" (O. E. Meyer, 'Die kinetische Theorie der Gase,' vol. i. p. 6).