have to do with billions and trillions of particles, moving with velocities varying from zero to many thousands of miles per second: we have therefore to do with numbers which practically mean infinity—that is to say, we have to do with that condition of things where alone the laws of probability become strictly correct.[1]

In this case, any deductions which can be made as to the average condition or collective behaviour of an infinitely large assemblage of particles, whose individual members move about with infinitely varying velocities at infinitely varying speeds in infinitely varying directions, must be realised in the well-known laws of gaseous bodies referring to pressure, volume, expansion, molecular structure, and heat, assuming the latter to be merely the sensible effect on our nerves of very numerous impingements of infinitesimally small particles. It is one of the greatest triumphs of the mathematical methods applied in one of the most difficult instances, that the average behaviour and collective properties of

[1] P. G. Tait ('Heat,' 1884, p. 355) says: "It is to Clausius that we are indebted for the earliest approach to an adequate treatment of this question. He was the first to take into account the collisions between the particles, and to show that these did not alter the previously obtained results. He has also the great credit of introducing the statistical methods of the theory of probabilities, and of thus giving at least approximate ideas as to the probable length of the *mean free path*—*i.e.*, the average distance travelled over by a particle before it impinges on another, and thus has its course changed. He thus explains also the slowness of diffusion of gases, and their very small conductivity of heat. Clerk-Maxwell shortly afterwards improved the theory by introducing, also from the statistical point of view, the consideration of the variety of speed at which the different particles are moving; Clausius having expressly limited his investigations by assuming for simplicity that all move with equal speed. Clerk-Maxwell explained gaseous friction, and gave a more definite determination of the length of the mean free path."