undisputed and indisputable bases.[1] In proportion as this has been done the calculated results have proved to be in closer and closer accord with observed facts. I will here mention only one of the latest achievements in this line of research and reasoning. Assuming—as the atomic and kinetic theories do—that all external phenomena of bodies can be reduced to the collective or mean effect of a practically infinite variety of turbulent movements of a very large number of particles, it must be possible to give a mechanical explanation of that remarkable property of all phenomena of nature, first noticed by Lord Kelvin, that they are essentially irreversible—*i.e.*, that, with very rare exceptions, they take place in a certain direction which we may define as an equalisation of existing differences of level, temperature, electric pressure, and similar inequalities. In order to fix this remarkable property of all natural phenomena, physicists found themselves obliged to introduce, alongside of energy and mass (which are both assumed to conserve or maintain their total quantity), a third something which is the measure of the degree in which an existing distribution of mass and energy can be considered to be capable of external, visible, finite activity

29. Irreversibility of natural processes.

[1] Those who are interested in seeing how difficult it is to link together the common-sense arguments of the theory of probabilities in a consistent chain of unimpeachable logic, should read the report on the various attempts to prove Clerk-Maxwell's law (mentioned in the foregoing note) contained in Prof. O. E. Meyer's 'Kinetische Theorie der Gase' (2nd ed., Breslau, 1899), especially p. 46, &c., and 'Mathematical Appendix,' p. 17; and the great number of memoirs referred to on p. 60 of that book. Nevertheless Tait speaks of the still remaining difficulties in the kinetic theory of gases as having been "greatly enhanced by an apparently unwarranted application of the theory of probabilities on which the statistical method is based." ('Properties of Matter,' 2nd ed., 1890, p. 291.)