matical formula which expresses the existing relations of natural things acts in a similar way, but probably few, if any, subsequent discoveries have given scientific minds so much fruitful work to do as the gravitation formula. An analysis of it will serve us as a guide through a very large portion of the scientific work of our period; it will serve also as an example of the great service which the mathematical mode of dealing with conceptions renders to the progress of science and of thought.

The so-called law of gravitation states that every two portions of matter, placed at a distance from each other, exert on each other an attractive force,[1] which depends on the masses of each, and on their distance from each other. The attractive force varies in the direct proportion of the mass of each, and in the inverse duplicate ratio of the distance. Three distinct lines of

[1] The gravitation formula gives no indication of the actual or absolute amount of the force in question; it only establishes a relation. It was fully three-quarters of a century after the publication of the 'Principia' that experiments were suggested in order to determine the actual magnitude of the force of gravitation—*i.e.*, the constant c in the formula $f = c\frac{m.m'}{r^2}$. Michell in 1768 devised an apparatus, employed later (1797) by Cavendish, and Maskelyne made measurements towards the end of the last century. More and more accurate determinations were made all through the present century, and latterly by Prof. Boys. Few persons have an idea of the extreme feebleness of the force, which nevertheless, through the magnitude of the earth, acquires in our daily experience such ormidable proportions. As it is desirable, in accordance with one of the principal scientific tendencies of our age, to place the knowledge of absolute physical quantities in the place of merely relative numbers, I mention here that the force with which two units of matter (*i.e.*, 2 grammes) placed at unit distance (*i.e.*, 1 centimetre) apart attract each other is such that they would approach each other with a velocity of nearly 7 hundred millionths of a centimetre in the first second of time. As a pound is a more familiar quantity, we may also say that two masses, each containing 415,000 tons of matter, and situated at a distance of one statute mile apart, will attract each other with the force of 1 lb. (see Sir R. S. Ball, 'Ency. Brit,' 9th ed., art. "Gravitation"). See also Sir R. S. Ball, 'The Story of the Heavens,' p. 106, and Prof. Boys in 'Nature,' vol. 50, p. 330, &c.