method of taking the arithmetical mean in determining what figure to accept in a number of slightly differing computations. Where more than one quantity is to be determined—for instance, where from a series of observations dotted on a chart the continuous curve which marks the course of a planet or comet is to be deduced —the simple method of averaging cannot be applied. Every set of three complete observations suffices, as Gauss has shown, to determine the elements or constants of an elliptical orbit. But astronomers try to get as many observations as possible, and none of these is a repetition of the same observation—as, for instance, are the repeated weighings of a substance in chemistry, of the measurings of a length in surveying, or the counting of a number in statistics: on the contrary, each is the independent ascertainment of definite positions in a moving object. It is clear that the method of averaging must be more general than the common-sense method of taking the arithmetical mean, but must — where the latter is applicable — coincide with it. It has been shown that the following rule answers this purpose. Fix the average constants or elements so that the sum of the squares of the differences between the observed and calculated positions is a minimum. In mathematical language this results in the algebraical determination of the constants in an equation.

Whereas the labours of Gauss and the school of astronomers which he headed in Germany were mostly occupied in the mathematical proof of this rule, and in its applications in astronomical and geodetic computations, the doctrine of probabilities acquired a larger