

and had confounded Francis Bacon with Roger, either because Roger was a *Franciscan* or because *Fr.* has been taken for *Francis*, instead of *Frater*.

It is only in a few particularly simple cases that the results of natural laws can be predicted by unaided common sense. In the great majority of cases, their operation is far too complicated to be thus traceable with any tolerable accuracy, and we require the aid of Mathematics to determine, in number, weight and measure, the resulting phenomena which will flow from given laws. To take a simple instance, but one which is a type of many: When a heavy body falls towards the earth it moves with continually increasing velocity, which is always directly proportional to the time it has been falling. Knowing this, how can we find the distance fallen in a given time? or if the distance be determined experimentally, how can we reason back from it to the velocity? The solution, when higher mathematics are applied, is extremely simple, but the processes of ordinary arithmetic fail us, because the element of velocity with which we have to deal is not constant, even for the shortest conceivable time, but is in a state of continual change.

So it is with the motion of the planets about the Sun. The attractive force of the Sun, and the angle which this force makes with the planets' path, are both in a continual state of change. The great law of gravitation, which governs all the motions of the heavenly bodies, simple as it is in itself, rests on high mathematical grounds, and to say nothing of the possibility of discovery, the proofs of its truth, even now that it is discovered, cannot be rendered intelligible to a person ignorant of Mathematics.

In some departments of natural philosophy, the domains of experiment and a priori reasoning trench upon each other, and the truth of the elementary principles can be established by either method. This is especially the case in the science of Mechanics. The whole of Statics, as commonly taught, is made to rest on a priori grounds, and the attempt has been made by some writers to place Dynamics on a similar basis.

This is one out of many instances of the complete accordance between truths learnt by experiment and the inherent fitness of things. As science advances, we perceive more and more clearly, that the facts which are to be learnt from an examination of the material world are not isolated or arbitrary, but connected by relations of order and mutual dependence, so that no law could be other than it is without clashing with the rest. Metaphysicians have sometimes asserted that while the laws of logic and mathematics are necessary, the laws of nature are mere facts, an arbitrary impress of creative will. But we must beware of pushing this distinction too far. Some of the laws of nature are of such a character that, if there are to be any laws at all, they must be as they are, since a different law would involve a contradiction in terms. Other laws again if not necessary in so strict a sense, are marked by such eminent simplicity, and what strikes our minds as fitness and beauty, that they seem to flow as a necessary consequence from the wisdom of the Creator. The old philosophers endeavored to discover natural laws by a priori