Causes of *change* of motion which at each instant operate upon it; and thus men would have been led to the notion of Accelerating Forces, that is, Forces which act upon bodies already in motion, and accelerate, retard, or deflect their motions. It was, however, only after many attempts that they reached this point. They began by considering the *whole motion* with reference to certain ill-defined abstract Notions, instead of considering, with a clear apprehension of the conditions of Causation, the *successive parts* of which the motion consists. Thus, they spoke of the tendency of bodies to the Centre, or to their Own Place;—of Projecting Force, of Impetus, of Retraction;—with little or no profit to knowledge. The indistinctness of their notions may, perhaps, be judged of from their speculations concerning projectiles. Santbach,[5] in 1561, imagined that a body thrown with great velocity, as, for instance, a ball from a cannon, went in a straight line till all its velocity was exhausted, and then fell directly downwards. He has written a treatise on gunnery, founded on this absurd assumption. To this succeeded another doctrine, which, though not much more philosophical than the former, agreed much better with the phenomena. Nicolo Tartalea (*Nuova Scienza*, Venice, 1550; *Quesiti et Inventioni Diversi*, 1554) and Gualtier Rivius (*Architectura*, &c., Basil, 1582) represented the path of a cannon-ball as consisting, first of a straight line in the direction of the original projection, then of an arc of a circle in which it went on till its motion became vertical downwards, and then of a vertical line in which it continued to fall. The latter of these writers, however, was aware that the path must, from the first, be a curve; and treated it as a straight line, only because the curvature is very slight. Even Santbach's figure represents the path of the ball as partially descending before its final fall, but then it descends by *steps*, not in a curve. Santbach, therefore, did not conceive the *Composition* of the effect of gravity with the existing motion, but supposed them to act alternately; Rivius, however, understood this Composition, and saw that gravity must act as a deflecting force at every point of the path. Galileo, in his second Dialogue,[6] makes Simplicius come to the same conclusion. "Since," he says, "there is nothing to support the body, when it quits that which projects it, it cannot be but that its proper gravity must operate," and it must immediately begin to decline downwards.

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[5] *Problematum Astronomicorum et Geometricorum Sectiones* vii. &c. &c. Auctore Daniele Santbach, Noviomago. Basileæ, 1561.

[6] P. 147.