

power is expended, and then it begins to fall. But gravity is a force that acts continually upon a body, not only at the moment it begins to fall, but every instant during its fall, so that, in calculating the time required to bring a body from any height to the surface of the earth, an estimate must be made of its constantly increasing velocity. The force of gravity is therefore an accelerating force; and when it acts upon bodies moving obliquely to its line of direction, a curvilinear motion is produced.

Sir Isaac Newton chose the sling as an illustration of his doctrine of the curvilinear motion of the planets. Now in this instrument, or toy, we observe that the stone placed in the bag of the sling makes an incessant effort to escape, but is restrained as long as the string is held in the hand. The string may represent the attraction of a central body, or, as it is technically expressed, the centripetal or centre-seeking force; the stone is the revolving body, and the effort it makes to leave the string is called the centrifugal or centre-flying force. But it is evident that some power is necessary before these forces can be developed, for the string may be attached to the sling without producing motion; some impulse must be impressed before the body will begin to revolve; this is done by a sudden effort of the hand, and that is called the projectile force.

It is easy to apply these remarks on the sling to the motion of the heavenly bodies, which is entirely dependant on the continued action of a centripetal and centrifugal force.

Let the body A, representing the earth, be projected along the line AH, into space, and if it be acted on by no other force, it will move in that line for ever. But let S, the sun, begin to attract it with an adjusted force, at the same moment that the projectile force is impressed, and it will revolve in a curvilinear line, as ATW, instead of flying off in the line AH. Now, according to the power of the projectile force will be the curve in which the planet will move; and hence it is that we perceive an evidence of design in the forms and arrangements of the orbits of these bodies. If either the centripetal or centrifugal force were to cease, the connexion between the members of the solar system would be immediately dissolved; in one case they would be thrown abroad in space, and in the other they would rush towards the body of the sun, which they would reach in longer or