

We see that the smoother the surface is (*i.e.*, the less the friction) the longer the ball continues to move. What would happen if the surface were *perfectly* smooth and level, *i.e.*, had no friction at all? Of course no one has ever seen such a surface, but we can easily conceive what would happen if we had one. The ball would continue to move at the same rate.

Suppose the base-ball were taken far off in space, away from the influence of sun and planets, and were thrown in any direction with a certain speed, it would continue to move in that same direction with the same speed.

Now in all our experience we have never known of any body which was moving all the time in a single direction with a perfectly constant speed. Why not? In explanation we say that some *Force* has been acting on it and has changed its motion.

We can state our conclusions in the following words:

Every body continues in its state of rest or of uniform motion in a straight line unless it be compelled by external FORCE to change its state.

This is known as Newton's First Law of Motion. You see it is just a brief statement of our experience.

25. Force and Momentum. Just as we found that it required greater effort to stop the base-ball than the hollow rubber ball, so it requires a greater effort or greater *force* to put it in motion. To throw a heavy stone requires much greater force than to throw a light one with the same velocity. It is really the quantity of motion, or the momentum, which we must consider. To produce or to destroy much momentum (in a given time) requires the application of a great force. If a definite amount of momentum is produced or destroyed by a certain force, then to produce or destroy one, two, three or a hundred times that amount of momentum we must exert one, two, three or a hundred times the force.