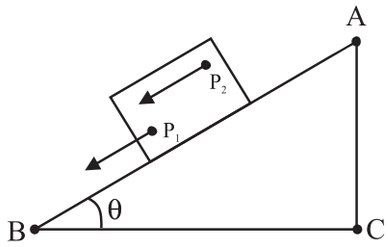


Fig 7.1 *Translational (sliding) motion of a block down an inclined plane.*
(Any point like P_1 or P_2 of the block moves with the same velocity at any instant of time.)

block sliding down an inclined plane without any sidewise movement. The block is taken as a rigid body. Its motion down the plane is such that all the particles of the body are moving together, i.e. they have the same velocity at any instant of time. The rigid body here is in pure translational motion (Fig. 7.1).

In pure translational motion at any instant of time, all particles of the body have the same velocity.

Consider now the rolling motion of a solid metallic or wooden cylinder down the same inclined plane (Fig. 7.2). The rigid body in this problem, namely the cylinder, shifts from the top to the bottom of the inclined plane, and thus, seems to have translational motion. But as Fig. 7.2 shows, all its particles are not moving with the same velocity at any instant. The body, therefore, is not in pure translational motion. Its motion is translational plus 'something else.'

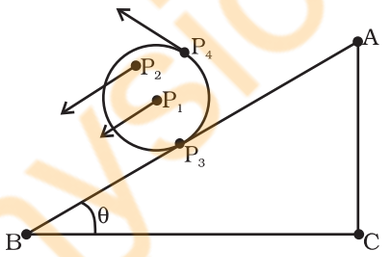
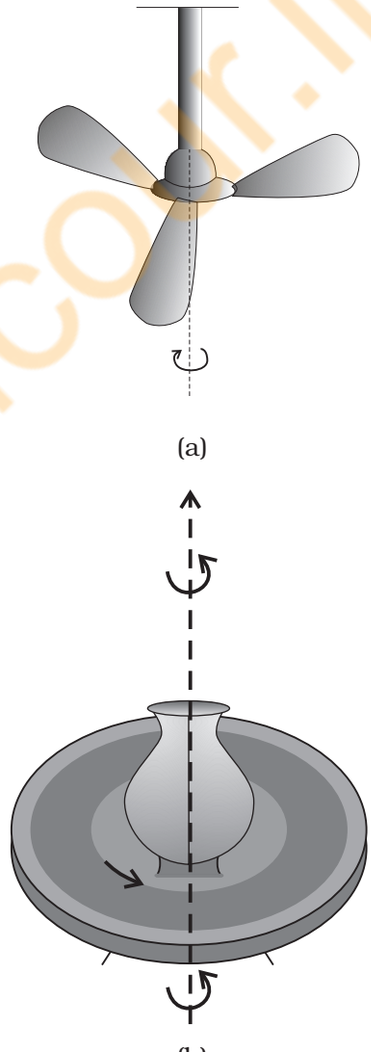


Fig. 7.2 *Rolling motion of a cylinder. It is not pure translational motion. Points P_1, P_2, P_3 and P_4 have different velocities (shown by arrows) at any instant of time. In fact, the velocity of the point of contact P_3 is zero at any instant, if the cylinder rolls without slipping.*

In order to understand what this 'something else' is, let us take a rigid body so constrained that it cannot have translational motion. The most common way to constrain a rigid body so that it does not have translational motion is to fix it along a straight line. The only possible motion of such a rigid body is **rotation**. The line or fixed axis about which the body is rotating is its **axis of rotation**. If you look around, you will come across many examples of rotation about an axis, a ceiling fan, a potter's wheel, a giant wheel in a fair, a merry-go-round and so on (Fig 7.3(a) and (b)).



(a)

(b)

Fig. 7.3 *Rotation about a fixed axis*
(a) A ceiling fan
(b) A potter's wheel.

Let us try to understand what rotation is, what characterises rotation. You may notice that **in rotation of a rigid body about a fixed axis,**