YOU have probably seen a magician pull a tablecloth off a table without upsetting any of the table settings. You may not have tried this trick yourself with your family’s dishes and glasses because of fear of breaking the costly fragile utensils. The magician performing this trick wasn’t really using magic. He or she just had a good understanding of a scientific principle called Inertia. It is the property of matter by which an object continues in its existing state of rest or uniform motion in a straight line, unless that state is changed by an external force.

You may want to try some simple experiments that will help you understand inertia and how that magic trick works.

You will need:
Wooden Block (75mm X 75mm X 75mm), Wooden Stand, Hooks, Cotton Thread, Raw Egg, Hard Boiled Egg, Wooden or Metal Ring, Steel Ball (1” diameter), Plywood Board (150mm X 50mm X 12mm), Piece Cardboard, Glass, Sand, Used Hack Saw Blade, Ruler, Strip of Newspaper, Bottle with wide mouth or Used Soft Drink Container.

A passenger standing in a moving bus leans forward when the brakes are applied all of a sudden since the body of the passenger is in motion along with the bus. But when the bus stops all of a sudden, the lower part of his/her body comes to rest along with the bus whereas the upper part of the body continues to move forward.

1. Break the Thread
   At Your Will
Suspend the wooden block from the stand using a loop made out of thread and one feet long thread tied to the bottom end of the block. Make sure that the stand and the hanging objects are stable. Hold the bottom string in your hand and guess which thread will break – top or bottom – when you pull down the string. You might be thinking the top one will break. But you can break the thread as you wish. There is a secret method to do this trick.

How to Break the Bottom Thread
Hold the bottom string in your hand and pull down with slight jerking action as fast as you can. The bottom string will break without affecting the top loop of the thread. The wooden block offers resistance when the bottom string is pulled abruptly.

How to Break the Top Thread
Tie a new piece of thread to the bottom end of the wooden block and do the experiment again. Now this time pull down the string slowly and steadily. When the string is pulled slowly, the wooden block tends to move with the string causing little resistance which is not sufficient to break the bottom thread. As a result you would be able to break the top loop somewhere close to its point of suspension.
2. Amazing Egg Experiment

Take two eggs out of which one is hard boiled. Lay each egg down on a flat surface and spin them like a top. Try to get them all spinning at the same time and then touch them briefly with your finger just long enough to stop them. When you take your finger away the boiled egg will stop spinning completely whereas the raw egg will still continue to spin for just a quick second. This is due to the inertia of the fluid inside the egg, which is moving at a different rate than the outside of the egg because its mass is in liquid state. When the hard boiled egg is spun, the solid mass immediately moves with the shell causing less resistance to the spinning motion.

3. Ring and Steel Ball

Balance the ring in the centre of the mouth of bottle and balance the steel ball on the ring aligning it with the centre of the bottle mouth. Pull the ring fast sideways as shown here. The steel ball will fall straight into the bottle. Since the steel ball is just resting on the ring, it shows resistance to sideways motion when the ring is pulled. However, having no place to stay it falls straight down under the influence of gravity.

4. Cardboard and a Steel Ball Placed on an Empty Glass

Fix the hack saw blade to the plywood base by a screw. Place a cardboard on a glass filled with sand and steel ball on the cardboard. Pull the hacksaw blade backwards and then release it so as to flick the cardboard.

What do you observe? The steel ball drops into the glass. When we flick, the cardboard moves fast where as the steel ball continues in its state of rest and hence drops into the glass. For the same reason a passenger standing in a moving bus leans forward when the brakes are applied all of a sudden as the body of the passenger is in motion along with the bus. When the bus stops all of a sudden, the lower part of his/her body comes to rest along with the bus whereas the upper part of the body continues to move forward.

5. Remove the Paper Strip without Touching Glass

Lay a strip of newspaper about 10 cm wide on a flat table surface and put a heavy smooth bottomed glass filled with water in the middle of the paper strip. Hold the free end of the paper and move it slowly. Both paper and glass will move. Now try it in different way, pull the paper straight down or use a ruler to apply downward force. The paper will slide off leaving the glass behind. When the paper is pulled suddenly, the resistance of the glass to change in the state of motion is distinctly visible. It is the same technique used in moving tablecloths from under the dishes that magicians perform.

Contributed by Mr Iqbal Abdul Dhalait, Education Officer, Goa Science Centre, Marine Highway, Miramar