TAP 207- 2: Diluted gravity - projectile paths

An extension of the diluted gravity experiment is to investigate a diluted projectile path. Get a drawing board and fix a large sheet of paper to it. On top of this fix a piece of carbon paper - face downwards. Tilt the board and then roll a heavy ball bearing across the top of the paper in a horizontal direction.

The path of the ball bearing will be produced on the paper. Different angles of tilt and different path directions can be used. This would be suitable for an introduction to projectiles or at a more advanced level where calculation of the parameters of the paths can be performed.

Apparatus required:

- ✓ Drawing board
- ✓ Large ball bearing
- ✓ Carbon paper
- ✓ White paper

External references

This activity is taken from Resourceful Physics http://resourcefulphysics.org/

TAP 207- 3: Mid-air collisions

Do fired and directly falling objects have the same vertical motion?

Firing something sideways and dropping something at the same time can result in a mid-air collision.

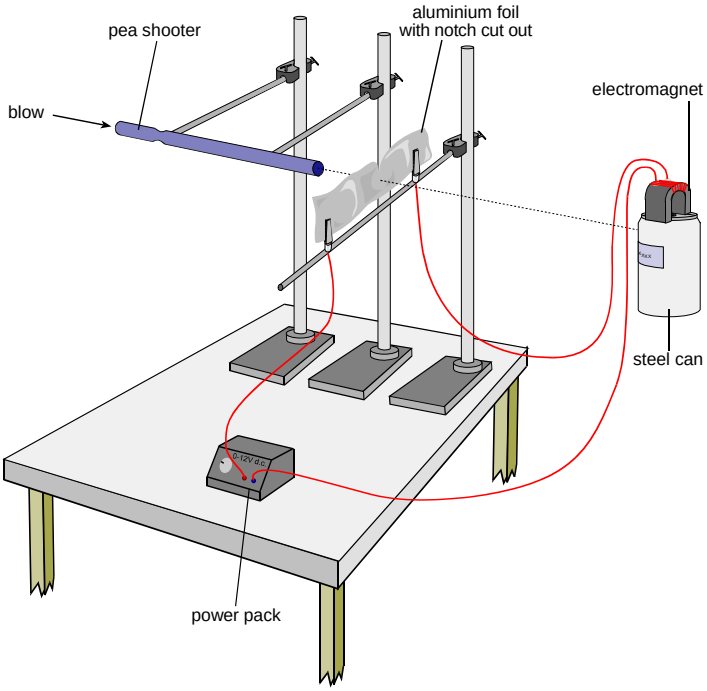
This is often referred to as the Monkey and Hunter experiment, where you can visualise the 'smart' monkey letting go of the branch as the hunter pulls his gun and then being upset when he notes the relative velocity vector is always pointing straight towards him. You may well think of a more humane title.

You will need

- ✓ electromagnet
- ✓ iron can
- ✓ power supply, 12 V
- ✓ aluminium foil with deep notch cut out
- ✓ blowpipe tube
- ✓ ball bearing
- ✓ pair of crocodile clips mounted in a holder
- ✓ 4 mm leads

Remarkable! Two fall vertically the same way

There are a number of ways of performing this demonstration. The essential idea is that both the fired object and the dropped object should start their journeys together.



You may well see the two starting their fall together; you are more likely to hear the collision!

Hearing and seeing

1. Relative motion can be lethal when it causes an unwanted collision. Watch the relative velocity vector with care.

2. Vertical acceleration is quite independent of horizontal movement.

Practical advice

All students should see, and hear, this demonstration at some time in their lives. Now it injects a little life into what might otherwise be a rather dry topic.

Technician's note:

This experiment requires care when setting up. The collision needs to happen before either bullet or monkey hit the floor, for example. That both start falling at the same time is more likely if the smallest possible current is used to activate the electromagnet. A little care and knowledge also helps in designing the circuit breaker. The ball bearing must break the electrical circuit by tearing the foil. It is necessary to make a slit in the foil to initiate the tear. The crocodile clips must be on a non-conducting support.

It is probably best to ensure that the barrel of the blowpipe is horizontal, as this simplifies the discussion.

Alternative approaches

Videos of this event tend to be unconvincing as most equipment does not have a sufficiently high frame rate.

External references

This activity is taken from Advancing Physics Chapter 9, 170D