This is the classic demonstration showing that the acceleration of free fall is independent of mass, in the absence of other significant forces such as air friction.† A metal disc and a small piece of paper are placed inside two identical vertical glass tubes, and the tubes are rapidly rotated so the objects remain stuck at one end. When the tubes are upside down, the disc and the paper begin to fall to the lower end. Due to air drag the paper falls more slowly than the disc. When the air is pumped out of the tube, the disc and the paper fall with the same acceleration and reach the bottom end of the tube at the same time.

We are used to seeing light objects fall more slowly than heavy objects. But why do light and heavy objects fall differently?

We will use this pair of tubes containing metal and paper discs to show the effect of eliminating air resistance. This is how the objects fall when the tubes are filled with air.

If we now remove most of the air from the tubes with a vacuum pump and repeat the demonstration, the results change dramatically.

Equipment

1. Guinea and feather tube—sealed and equipped for evacuation.
2. Vacuum pump.
3. Perhaps a light and heavier object to drop through open atmosphere as a comparison.