



# Rubber-Band Car

Gasoline cars are on the way out; the future is alternative fuels, such as electric batteries, hydrogen cells and, er, giant rubber bands...? Well, perhaps not that last one. Rubber-band cars do work, though, and they can cover record-breaking distances.

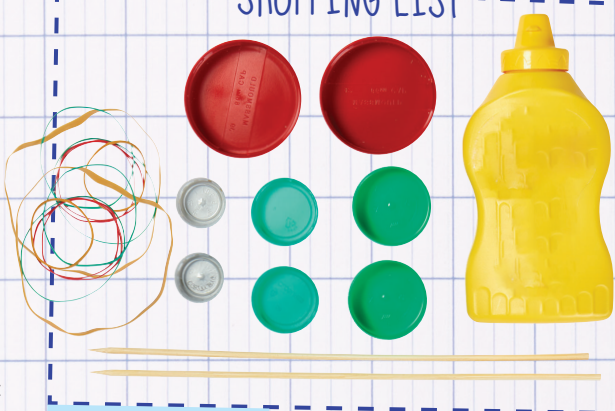
**THE RECORD:** Farthest distance travelled by a home-made rubber-band vehicle

**THE CHALLENGE:** Build a four-wheeled car from random stuff you have lying around at home. Add some rubber bands for power and see how far it goes!

For this record, we're not that bothered about how you make the car - just as long as it has four wheels and gets its power from a stretched rubber band. Over the page, we've put together a set of instructions for a basic design to give you somewhere to start, but you can change some of the elements or come up with your own design. Get creative!

For the record attempt, you're going to want to find a super-flat surface, such as the floor of a school hall or gym. For the initial tests - if your car runs as badly as ours did at first! - you can probably just make do with your hallway or even a dining table.

## SHOPPING LIST



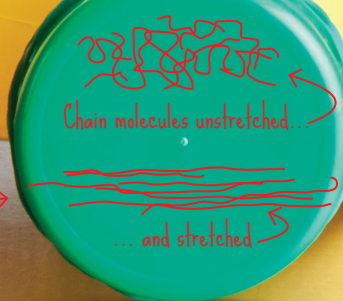
**WE USED:**  
- MUSTARD BOTTLE  
- RUBBER BANDS  
- BOTTLE CAPS OF VARIOUS SIZES  
- SKEWERS

## GUIDELINES

- You can make your car from any combination of the items, such as rubber bands (duh!), plastic bottles, bottle lids, wooden lolly sticks, straws, toothpicks, wooden kebab skewers, glue and tape. Other household items may be used, but they must be pre-approved by GWR.
- The car must have four wheels and must derive its power solely from the energy stored up in the rubber band(s).
- The rubber band(s) may only be wound by hand - no mechanical or electrical aids are allowed.
- The record attempt must take place indoors.
- The car must be released behind a clearly marked starting line, and must travel along a flat surface.
- The distance is measured as a straight line between the starting point and the closest edge of the car to the start line when it stops.

## HOW DOES IT WORK?

By stretching out an elastic band, you're transferring energy (elastic potential energy) into the rubber in the same way that you transfer energy (gravitational potential energy) into something when you lift it up. The rubber used in elastic bands is made from long polymer chains (see p.103) that are, in their natural state, all wrinkled up. When you stretch or twist a piece of rubber, the chains are pulled straight - which they don't like. The moment you let go, they snap back to their wrinkled state - releasing all that stored energy in the process.



## FOR THE RECORD

In Apr 2004, Joel Waul (USA) started making a rubber-band ball at his home in Lauderhill, Florida. He started with office supplies, but soon reached the point where those little bands wouldn't stretch far enough to cover his ball.

By 2007, he was knotting together massive industrial rubber straps. and by the time it was measured in Nov 2008, Joel had the world's **largest rubber-band ball**.

The ball, which he calls "Megaton", was 2 m (6 ft 7 in) in diameter, weighed 4,097 kg (9,032 lb) and contained some 700,000 individual rubber bands!



Same weight as SIX dairy cows!  
AAAAAaaaaahhhhhoooo

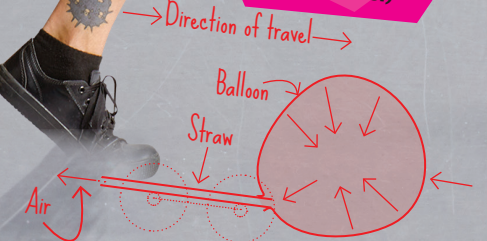
The word "rubber" was coined in 1770 because of the substance's ability to rub out pencil marks. The rubber band was patented in 1845 by British inventor Stephen Perry.

## NOW TRY THIS...

Stretchy things can power cars in more ways than one... You can also make a rocket-style car with a balloon. To build this, you'll need to replace your rubber-band motor with a balloon and a nozzle of some kind (a drinking straw works pretty well). First, feed the nozzle into the mouth of the balloon and bind it up as tightly as you can with rubber bands and tape. Then stick the nozzle/balloon assembly to the car with the nozzle pointing out the back.

Inflate the balloon by blowing (or pumping) air down the straw and then let it go. The force of the air coming out of the balloon will push the car forward like a rocket, except slower, and with a farting noise instead of flames.

**TIL**  
TODAY I LEARNED  
Elastic bungee cords are one of the most common causes of serious eye injury in the USA, although they can't compete with falling on things (ouch), fights (ouch) and accidents involving sharp objects (ooooouch... some people still haven't learned not to run with scissors!)



Every action has an equal and opposite reaction







# Rubber-Band Car (continued)

Professor Orbax is holding the bottle like this to show the camera - you'd be better off laying it flat on the table



1

For our design, we started by cutting out one side of a mustard bottle. It's best to use a sharp craft knife for this, cutting very carefully to avoid weakening the bottle (don't cut into the sides) or stabbing yourself in the hand!



2

Poke holes in the sides for the axles to pass through. When cutting holes with a knife, constantly ask yourself, "What's on the other side of this? Is it my other hand?" You don't want the answer to this question to be yes!

Keep fingers well out of the way when cutting - or get an adult to help with this bit



3

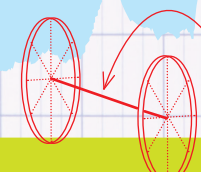
Poke the wooden skewers through the smaller, sturdier bottle lids - depending on the sort of lids you've found, you may need to start this by making a hole with the knife or a metal skewer. Needless to say, don't stab yourself in the hand with the skewers!



4

Secure one end of each axle to the wheel using hot glue (don't do both ends now or you won't be able to push it through the car). Make sure the parts are well glued together, and that none of them are glued to your hands!

Hot glue is hot! (duh!)



Axle: rod/shaft that passes through the centre of a wheel, allowing the wheel to spin



5

Pass the rear axle through one side of the car and tie on the rubber band (see Top Tip!, right). You want your rubber-band motor to be fairly tight and stretched out between the axles.

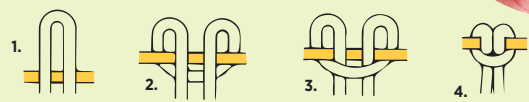


## TOP TIP! FROM PROFESSOR ORBAX

For this to work, you need to attach the rubber band to the axle in the correct way. The way we did it was using a knot called a "cow hitch". Here's how to make one:



1. Put one end of the rubber band over the axle.
2. Wrap that end around the axle.
3. Tuck the other end through the bit that goes around the axle.
4. Pull the whole thing tight.



6

Push the front axle through and loop the other end of the rubber band around it. If your rubber band is too long and slack, tie a knot in it past the front axle to use up any extra rubber.



7

Trim the axles to the right length with wire cutters. You want the wheels to be reasonably close to the body, but not so close as to make it impossible to glue in the wheels (repeating stage 4) on the other side.



Stretch some more rubber bands over each wheel to give them more grip. Now it's time to test your creation. How far will it go?

