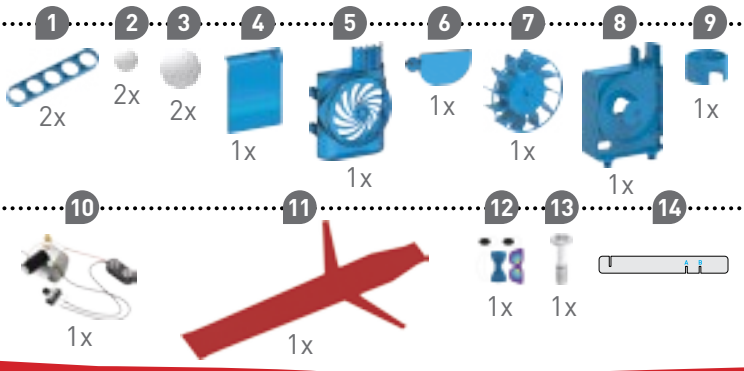
Experiment Manual

INCREDIBLE INFLATABLE Aero Dancer

THAMES & KOSMOS

Kit Contents



1. Flat rounded rod (2)
2. Small foam ball (2)
3. Large foam ball (2)
4. Battery box cover
5. Impeller cover
6. Valve slider
7. Impeller
8. Blower housing
9. Outlet nozzle ring
10. Motor circuit assembly
11. Fabric tube
12. Sticker sheet
13. Screw
14. Cardboard strip for ring

Do you have any questions?
Our tech support team will be glad to help you!
USA: support@thamesandkosmos.com
or 1-800-587-2872
UK: support@thamesandkosmos.co.uk
or 01580 713000

YOU WILL ALSO NEED:
1 x 9V alkaline battery (type 6LR61, a USB rechargeable 9V battery is recommended), small Phillips-head screwdriver (PH00, PH0, or PH1 recommended), scissors, adhesive tape, 2 pencils

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Technical product development: Genius Toy Taiwan Co., Ltd., Taichung, Taiwan, R.O.C.; Text and Editing: Ted McGuire; Additional technical support: Franckh-Kosmos Verlags-GmbH & Co. KG (Kosmos), Stuttgart, Germany; Manual design concept: Atelier Bea Klenk, Berlin; Manual illustrations: Genius Toy Taiwan Co., Ltd., Taichung, Taiwan, R.O.C., Kosmos, and Thames & Kosmos

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A WORD TO PARENTS AND ADULTS

With this science kit, your child can build a model of a fun device often referred to as an air dancer or a tube man, while learning the physics behind how it works. They can also conduct some additional physics experiments with the blower motor to learn about air pressure and air flow. Please read the instructions and safety information with your child before starting. Stand by to assist your child with any challenging steps of assembly or usage.

We hope you and your child have a lot of fun experimenting with the Aero Dancer!

SAFETY INFORMATION

WARNING! Not suitable for children under 3 years. Choking hazard — small parts and small balls may be swallowed or inhaled.
Warning: This toy is only intended for use by children over the age of 8 years, due to accessible electronic components.
Instructions for parents or caregivers are included and shall be followed. Keep packaging and instructions as they contain important information.
Store the experiment material, particularly the battery-powered motor and assembled model out of the reach of small children.
Do not allow your hair to come near the motor-driven impeller.

Safety for Experiments with Batteries

››› To operate the models, you will need one 9V battery (type 6LR61), which could not be included in the kit due to its limited shelf life.
››› An adult should insert and change the battery. For instructions on how to insert and change the battery, see step 7 and the "Replacing the Battery" section on the back side.
››› The battery is to be inserted with the correct polarity (+ and -). Press it gently into the battery compartment.
››› Avoid a short circuit of the battery. A short circuit can cause the wires to overheat and the battery to explode.
››› Different types of batteries or new and used batteries are not to be mixed.
››› Do not mix old and new batteries.
››› Do not mix alkaline, standard (carbon-zinc), or rechargeable (nickel-cadmium) batteries.
››› Always close battery compartments with the lid.
››› Non-rechargeable batteries are not to be recharged. They could explode!
››› Rechargeable batteries are only to be charged under adult supervision.
››› Rechargeable batteries are to be removed from the toy before being charged.
››› Exhausted batteries are to be removed from the toy.
››› The supply terminals are not to be short-circuited.
››› Dispose of used batteries in accordance with environmental provisions, not in the household trash.
››› Be sure not to bring batteries into contact with coins, keys, or other metal objects.
››› Avoid deforming the batteries.
››› Have an adult check the model before use to make sure it is assembled properly. Always operate the motorized model under adult supervision. After you are done experimenting, remove the battery from the battery compartments.
››› Warning! Do not manipulate the protective device in the battery compartment (PTC). This could cause overheating of wires, eruption of batteries and excessive heating.

Notes on Disposal of Electrical and Electronic Components

The electronic components of this product are recyclable. For the sake of the environment, do not throw them into the household trash at the end of their lifespan. They must be delivered to a collection location for electronic waste, as indicated by the following symbol: Please contact your local authorities for the appropriate disposal location.

IMPORTANT TIPS

– Handle the motor circuit assembly very gently. The soldered connection points can break under too much stress.

– Do not push or pull on the wires. They might break off.

– Refer to the troubleshooting tips on the back side if you are having trouble getting your Aero Dancer to dance.

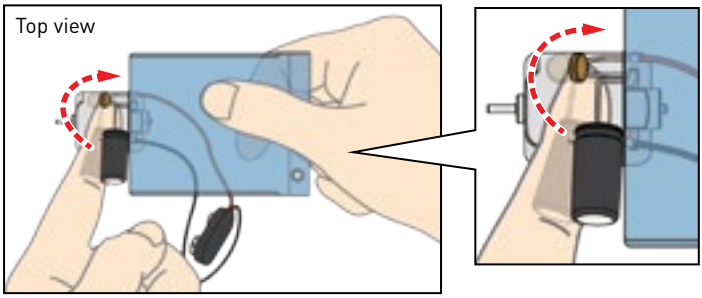
– Use alkaline batteries only; do **not** use heavy duty batteries.

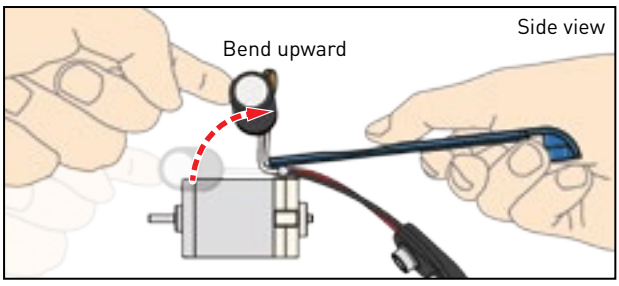
ASSEMBLY VIDEO!

Scan this QR code to view a step-by-step assembly video and tips on how to use the Aero Dancer.

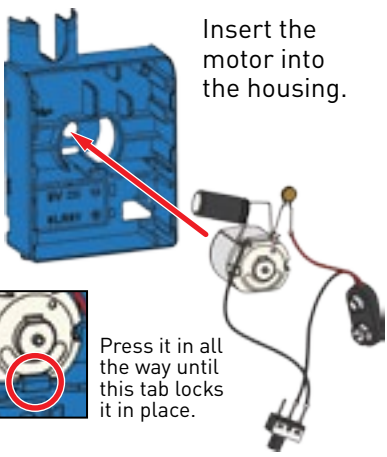
ASSEMBLE THE BLOWER: 1 OF 2

1 Place the battery box cover over the soldered connections on the motor assembly to protect them. Then, using the battery box cover as a tool, bend the pin legs of the two electronic components about 90 degrees upward. Do not bend at the soldered connections.

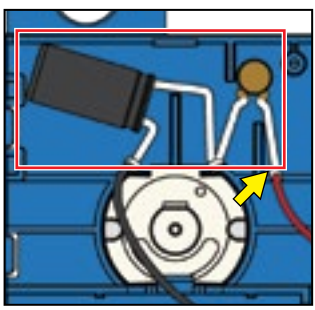




2 Insert the motor into the housing.

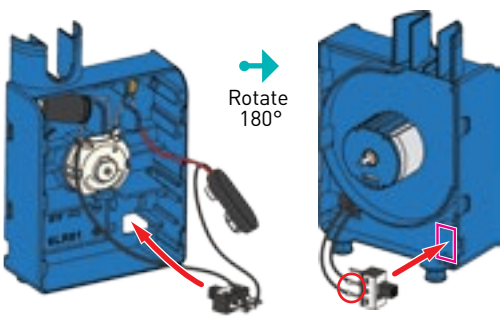


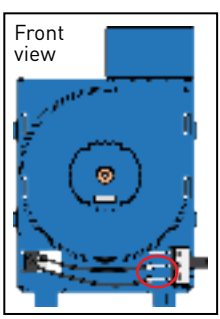
Press it in all the way until this tab locks it in place.



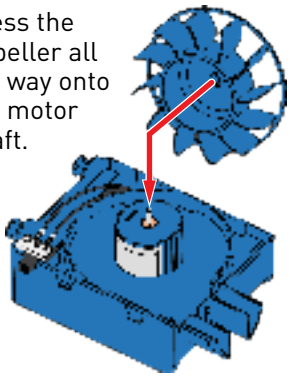
Arrange these two components exactly as shown above. The pin indicated by the yellow arrow must be separated by the blue divider.

3 Pass the switch through the hole and insert it in its spot in the lower right corner of the front. The two pins connected to the wires are on the bottom and the unconnected pin is on the top.

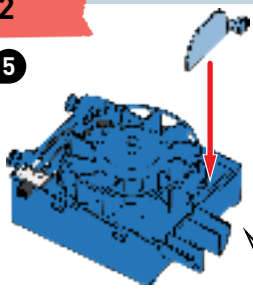




4 Press the impeller all the way onto the motor shaft.

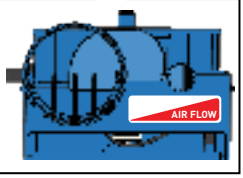


5 Place the air flow valve slider in the slot.



Top view

Add the air flow sticker exactly as shown. Push the valve slider to the right for maximum air flow.



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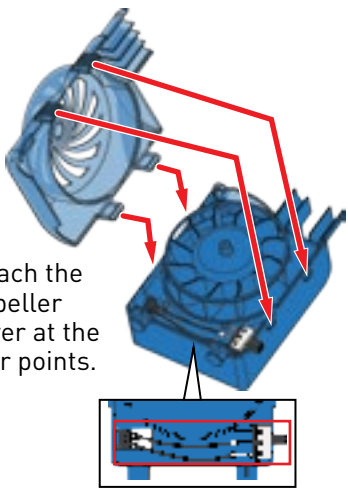
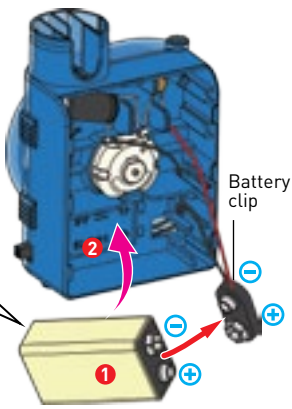


Attach the impeller cover at the four points.

Make sure the two switch wires are on the bottom and neatly arranged out of the way of the cover when you attach the cover.

7



Use **alkaline** batteries only. Do not use heavy duty batteries.

Battery clip

First, insert the 9V battery into the battery clip, paying attention to the correct polarity. Then, insert the battery into its compartment.

For optimal results, use a USB-rechargeable 9V battery. See note on back side for more details.

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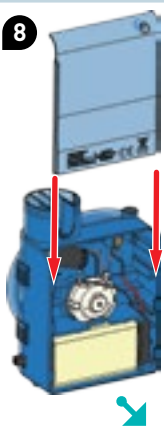
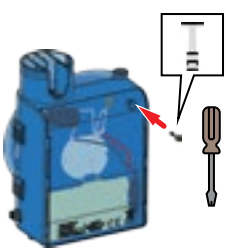


Slide the cover onto the battery box. Make sure the wires are out of the way.

Then secure with a screw.



9 Attach the output nozzle ring and the foot rods.

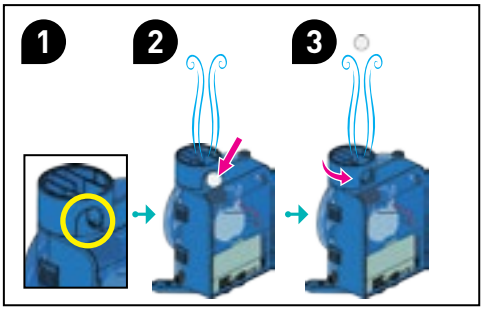
Blower

CONTINUED ON BACK

EXPERIMENT 1

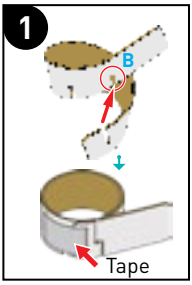
AIR CANNON

1. Turn on the blower with the valve open all the way. Adjust the air inlet in the side of the blue ring to be about half the size of the small foam ball.
2. Place the ball next to the air inlet. The ball will be sucked up to the hole by the stream of air.
3. Rotate the blue ring to open the air inlet to its maximum size. The ball will be sucked in and blown out the top of the output nozzle.

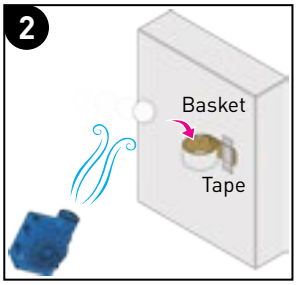


EXPERIMENT 2

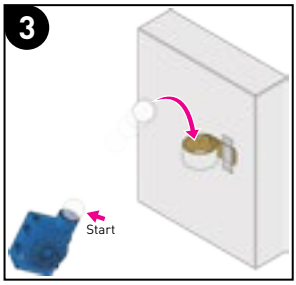
AIR BASKETBALL



Roll the cardboard strip into a ring, securing it at the B notch. Then use tape to secure it.



Tape the ring to the box. Turn on the blower. Slide the valve open all the way. Position the ball in the stream of air. It will stay floating in the air! Then try to make a basket by only moving the blower.

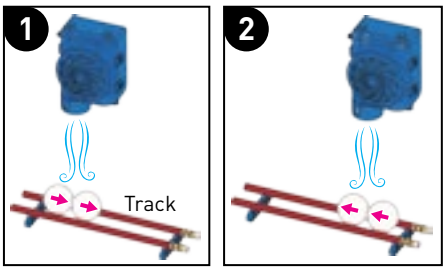


Try to shoot a basket with the ball. First, hold the ball right above the outlet nozzle. Then, let go. Try to position the blower so the ball flies into the basket.

EXPERIMENT 3

AIR SHIFTER

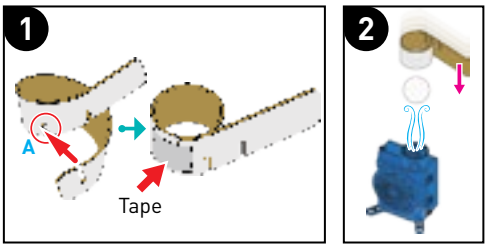
Build a track using two pencils and the two 5-hole rods as shown. Put two balls on it, making sure they don't touch the tabletop. Turn on the blower with the valve open all the way. Aim the stream of air at one ball directly from above. Try to move the balls to the right and then to the left. Then, try to aim the stream of air between the two balls and watch what happens.



EXPERIMENT 4

JUMP RING

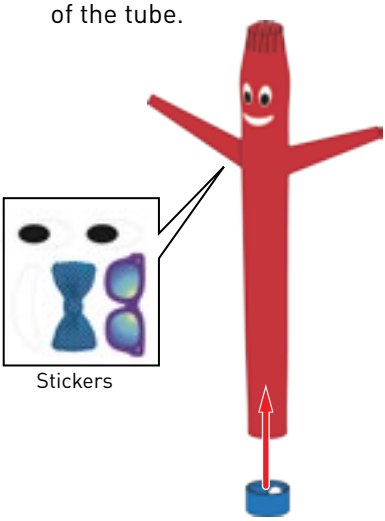
Roll the cardboard strip into a ring secured at the A notch and tape it. Turn on the blower with the valve open all the way. Float the ball in the stream of air. Holding the ring by the handle, slowly guide the ring down over the ball. The ball will quickly shoot upward as it passes through the ring.



ASSEMBLING THE AERO DANCER

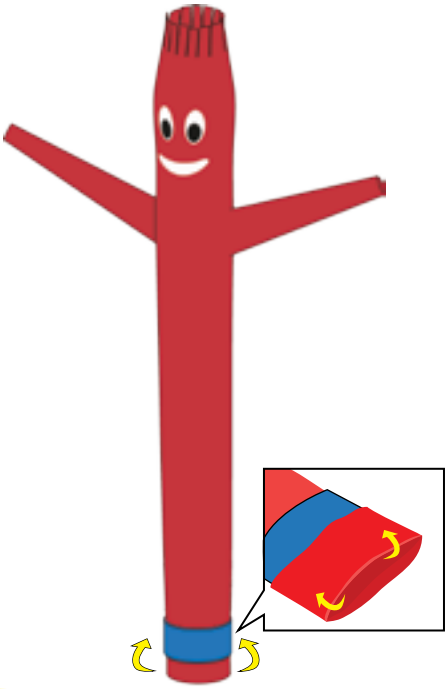
1 Gently roll the tube between your hands to soften the seams of the fabric.

2 Attach the face stickers to the fabric tube. Slide the blue ring over the bottom of the tube.



Stickers

3 Roll the bottom of the tube over the edge of the blue tube.

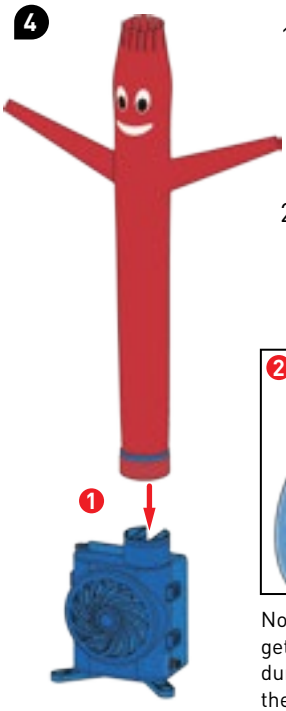


TROUBLE WITH YOUR TUBE?

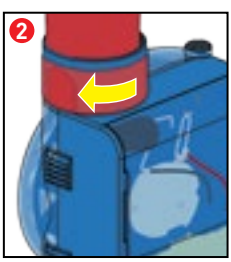
If your tube becomes too frayed at the bottom, or you are having trouble installing it, check out the tip on the next page.

Is your tube ripped? Contact us for a free replacement! See manual cover for contact info.

4



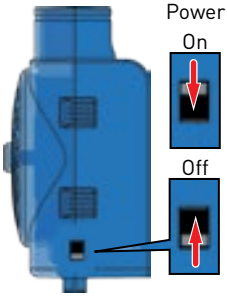
1. Carefully slide the blue ring and fabric tube down over the output nozzle.
2. Turn the ring so the opening in the blue ring is pointed right.



Note: if the tube is getting stuck on the fan during operation, rotate the tube 90°.

DONE!

EXPERIMENT 5



To operate your Aero Dancer, slide the power switch to the on position. The impeller will immediately start blowing air through the tube, and the Aero Dancer will dance!

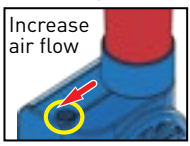
TROUBLESHOOTING TIPS!

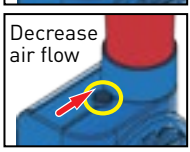
If your Aero Dancer stands straight up too much, try sliding the valve inward to **decrease the flow of air** a little. You can also try blowing on the tube or pushing lightly on it to get it to move more. Play around with it.

If your Aero Dancer is flopped over, and you want it to stay standing upright more of the time, try these four things:

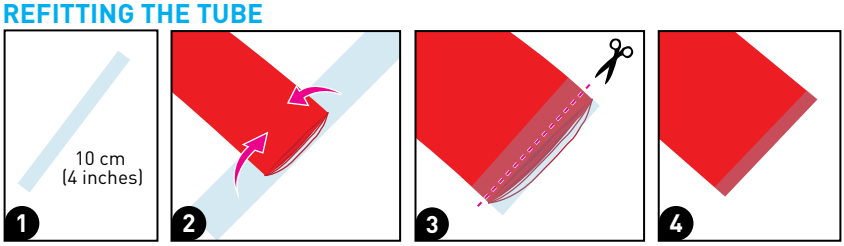
1. Increase the air flow with the valve.
2. Use a brand new 9V battery, or a fully recharged 9V battery.
3. Make sure the bottom of the tube has no wrinkles in it and is exactly at the bottom of the output nozzle.
4. Reduce the number of stickers.

AIR FLOW VALVE SLIDER





REFITTING THE TUBE



1. If the bottom of the tube has frayed, cut a piece of adhesive tape that is approximately 10 cm (4 inches).
2. Lay the tape on a table with the sticky side facing up. Then carefully wrap the tape around the frayed edge of the tube.
3. Use scissors to cut across the tape. Trim off as little of the tube as possible, because the Aero Dancer may not dance as well if the tube is too short.
4. Now try replacing the tube over the blower.

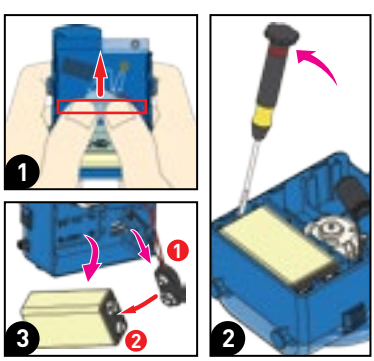
TROUBLESHOOTING!

If you are having trouble getting your Aero Dancer to dance, scan this QR code for help.

REPLACING THE BATTERY

The Aero Dancer works best with a fully charged battery. 9V batteries that can be recharged with a USB cord are recommended.

1. Unscrew the screw and slide the battery compartment open.
2. Use the screwdriver to pry out the battery.
3. Remove the battery and replace it with a new one.
4. Replace the cover.

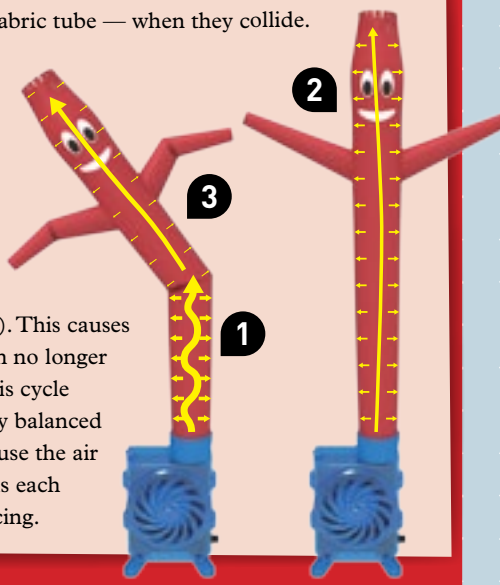


CHECK IT OUT

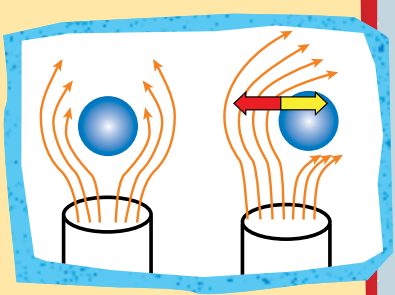
HOW DO *air dancers* WORK?

You have probably seen these funny, eye-catching devices dancing in front of businesses in your town. They are often called tube men, air dancers, or skydancers. They move in complex ways, almost as if they are alive, but they are really rather simple devices. They work because of a principle of air flow called **Bernoulli's principle,** which basically says that as the speed of flowing air increases, its pressure decreases. Air is made of small particles flying around in space. **Air pressure** is the force these particles exert on each other and their surroundings — like air dancer's fabric tube — when they collide.

When an air dancer's blower is first turned on and its tube is folded over, the air flows slowly into the tube. The air pressure builds up and the air particles push against the sides of the tube, causing it to stand up (1). But because the top of the tube is open, once the air can flow all the way through the tube, its speed increases (2). This causes the pressure to decrease, and the air can no longer hold the tube up, so it falls over (3). This cycle repeats itself over and over in a perfectly balanced air dancer. Wind and other variables cause the air dancer to fall over in different directions each time, creating the illusion that it is dancing.



WHY DOES THE BALL *float*?



In experiment 2, the ball floats in the stream of air and does not fall to the side or fly away. Gravity is pulling the ball down toward Earth and the flow of air directly hitting the bottom of the ball is pushing it upward. But the air flowing quickly around the sides of the ball is what keeps it in place: the fast-flowing air immediately surrounding the ball has a lower pressure than the slow-moving air further away from the ball. The high pressure air pushes inward on the ball from all sides. A phenomena called the **Coanda effect** describes this tendency of the flowing air to stick tightly to the curved surface of the ball, keeping a pocket of low pressure all around the ball. This also explains how the blower can move the balls on the track in experiment 3. In experiment 4, the ring blocks the flow of air moving around the ball, essentially eliminating the Coanda effect and causing the stream of air to push the ball away. Finally, the small ball in experiment 5 demonstrates how a ball that is too light simply gets sucked up into the stream of air, shooting high up above the blower.