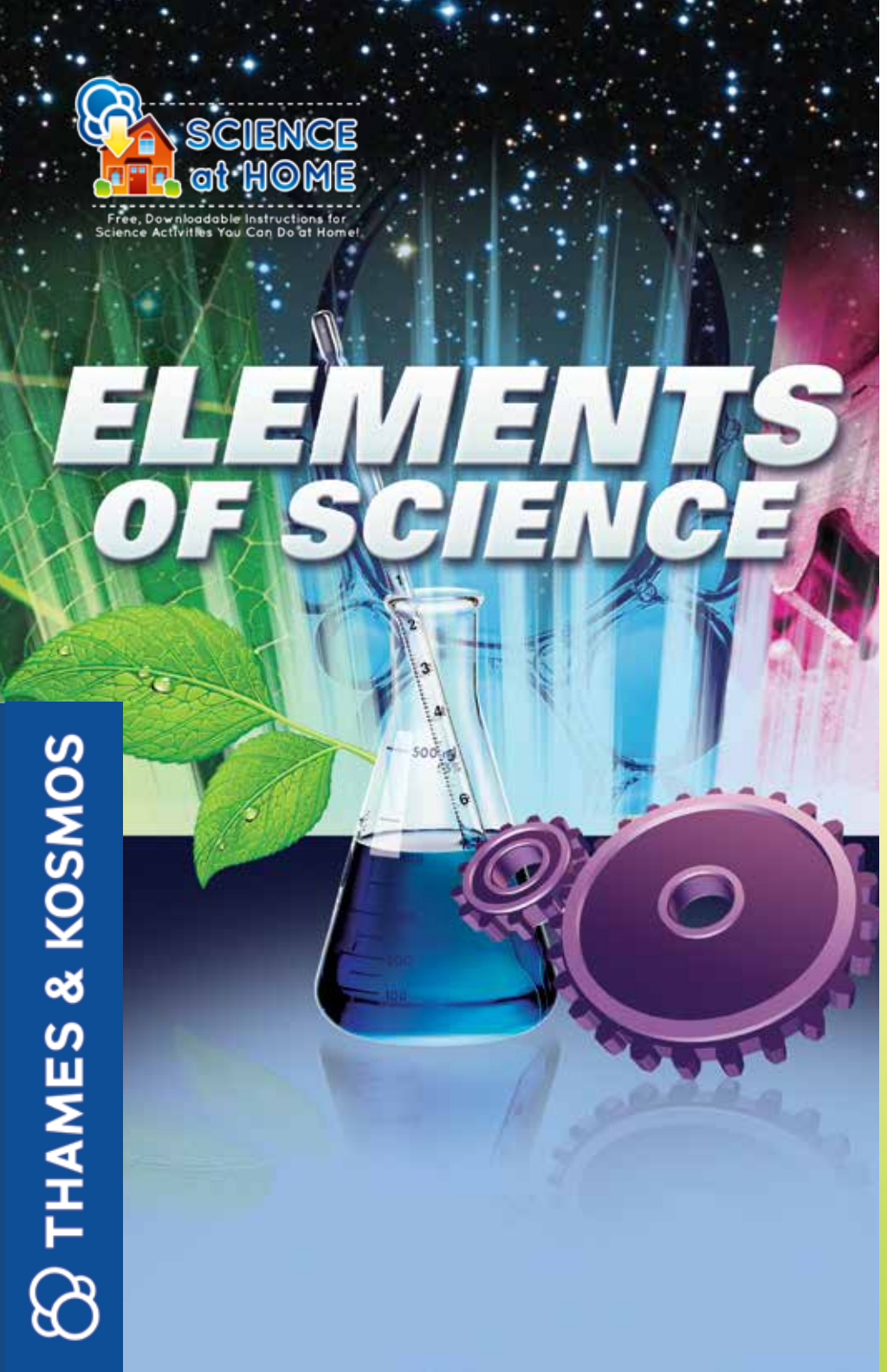


Advice for Supervising Adults

Children are curious by nature. They want to investigate, explore, and understand their environment. The Elements of Science experiment series will help your child do all those things.

A wealth of natural phenomena are explained in a simple and enjoyable style, and explored more closely in safe yet exciting series of experiments. This will also come in handy in school, because these same themes will come up in elementary school and again later in physics, biology, and chemistry classes.

We are, therefore, addressing this to you and filling you in on what you should do. Page through the activity sheets and pay special attention to the **safety rules**. Then select the experiments that seem the most appropriate for your child. Some of the experiments for which **assistance or supervision by parents** is especially necessary are marked with the adjacent symbol.

Before starting the experiments, discuss these safety suggestions with your child.

Read and follow the instructions, the safety rules and the first aid information and keep them for reference.

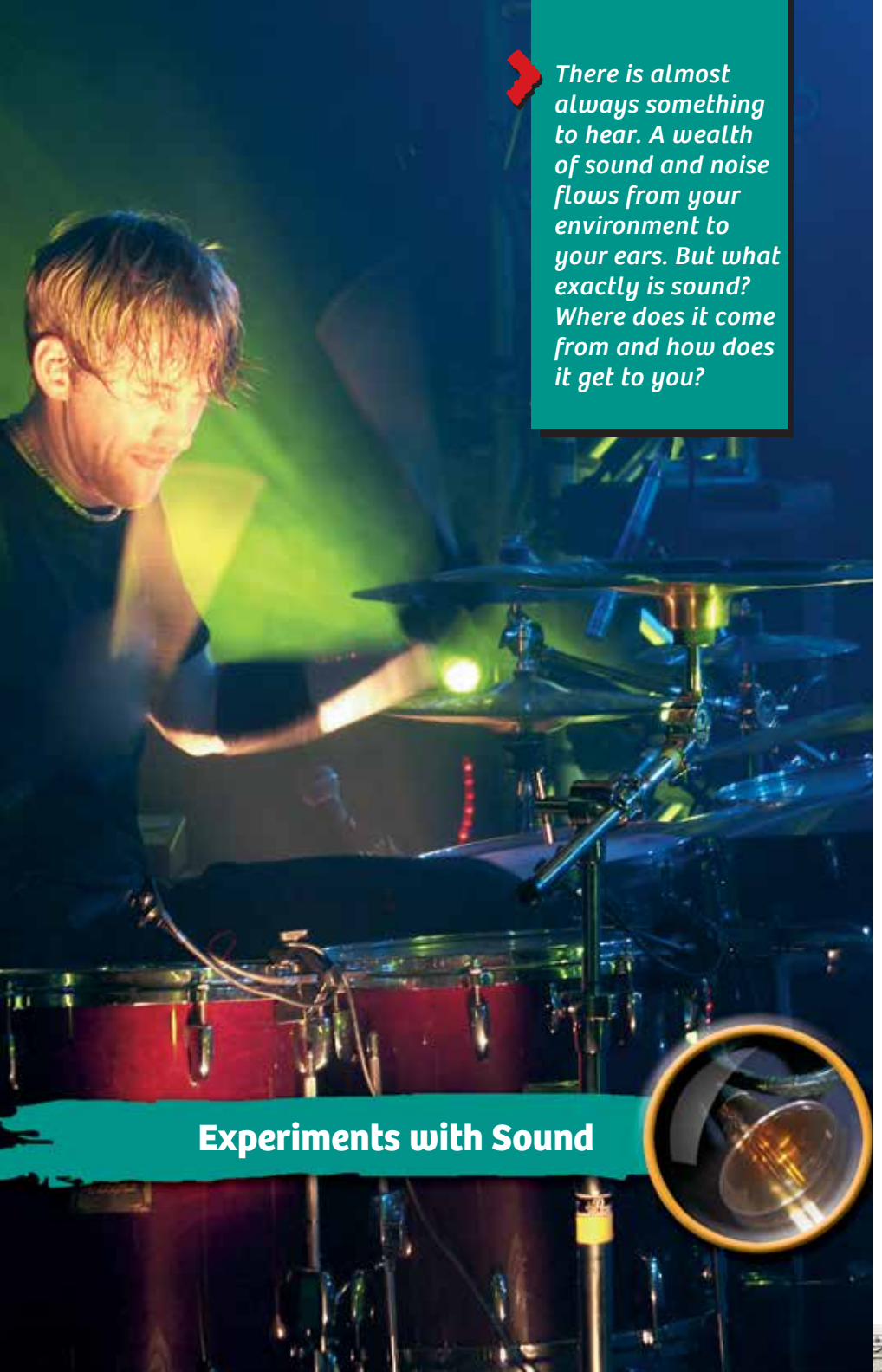
The incorrect use of chemicals can cause injury and damage to health. Only carry out those experiments which are listed in the instructions.

This experimental series is for use only by children over 10 years.

Because children's abilities vary so much, even within age groups, supervising adults should exercise discretion as to which experiments are suitable and safe for them. The instructions should enable supervisors to assess any experiment to establish its suitability for a particular child.

The supervising adult should discuss the warnings and safety information with the child or children before commencing the experiments.

The area surrounding the experiment should be kept clear of any obstructions and away from the storage of food. It should be well lit and ventilated and close to a water supply. A solid table with a heat resistant top should be provided.



There is almost always something to hear. A wealth of sound and noise flows from your environment to your ears. But what exactly is sound? Where does it come from and how does it get to you?

Experiments with Sound

If You Can Hear, You Can Also Feel

You can hear sound, that's obvious. But sometimes, you can feel it too.

You will need: tracing paper

Here's how: Hold the paper in front of your mouth and hum. If you touch it with your fingertip, you will feel it vibrate as it moves rapidly back and forth. If it touches your lips, the vibration will tickle.

What's going on? Sound apparently has something to do with vibrations, since your voice made the paper vibrate.

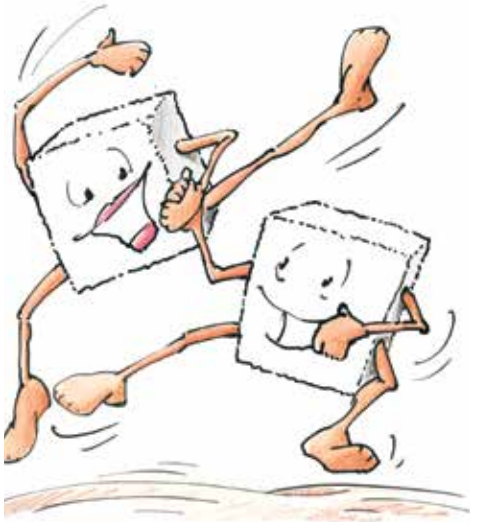
Seeing Sound

The vibrations of a piece of film, a membrane, can be made visible.

You will need: 1 large measuring cup, 1 balloon, *some sugar, radio (with speaker), scissors*

Here's how: Cut off the long section of the balloon and stretch the balloon skin tightly over the opening of the measuring cup. Place the cup directly in front of the radio speaker. Sprinkle a few sugar crystals on the balloon skin (the **membrane**), and turn the radio up. The sugar crystals will dance in rhythm with the music or words.

What's going on? The sound coming from the radio starts the membrane vibrating, which makes the crystals jump. The sugar "dances" on the vibrating membrane.



Ringing Wood

If sound can make a membrane start to vibrate (as in the last experiment), can vibrations also produce sound?

You will need: wooden stick, a glass of water

Here's how: Hold the wooden stick against the edge of a table so that half of it sticks out, and pluck on it. It will vibrate, and you will hear a tone. The shorter the end that vibrates, the higher the tone.
A glass of water will also produce a tone when you gently flick it with your finger. Fill a glass almost full with water and flick it. What sound did you hear? Now fill the glass half full, how did the sound change when you gently flicked it? Now empty the glass, what happened when you flicked it?

What's going on? Quickly vibrating objects do in fact emit sound. Quicker vibrations produce higher tones, while slower ones produce deeper tones.

Waves of Air

Somehow, sound gets from vibrating wood or a rubber band to your ear, through the air that lies between them. So air must transport the sound. How does it do that?

You will need: funnel, balloon skin from the seeing sound experiment, 1 large measuring cup, 1 rubber band

Here's how: Stretch the balloon skin over the large opening of the funnel and pull it nice and tight. Hold the small funnel opening in front of your lips (because they are particularly sensitive) and tap lightly against the rubber. With each tap, you will feel a puff of wind, or an airwave. Next, hold the funnel a few centimeters from your ear and tap on the rubber again. Now you will hear a light tap of sound. **Under no circumstances should you put the funnel inside your ear!**

What's going on? If you tap on the membrane, it compresses the air behind it and a wave of compressed air (a compression wave) begins to spread out. In the very next moment, the membrane swings back and creates a region of somewhat thinner air behind it, which likewise spreads out. All vibrating objects behave the same way. So sound waves consist of zones of compressed (higher pressure) and thinned (lower pressure) air following each other in rapid succession.

Supplemental Experiment

Stretch the rubber band between your thumb and forefinger and pluck on it. Then stretch it over an empty measuring cup (see the illustration above) and pluck on it again. Now you will hear the tone much more loudly. The vibrations have become transferred from the rubber to the cup. The surface area of the cup is much greater than that of the rubber band, so it can in turn transfer its vibrations to a greater amount of air and create stronger sound waves. In a violin or guitar, the wooden housing (the **resonator**, or sound box) is a sound amplifier for the strings. Stretch the rubber band over the cup and scratch lightly on its bottom. You will be astounded how well the cup works as a resonator to amplify the noise.

Sound Makes Waves

The compression wave produced by the funnel is remarkably powerful.

You will need: funnel, balloon skin from waves of air experiment, *bowl, water*

Here's how: Fill the bowl with water and place it on a flat surface so it will sit perfectly still. Pull the rubber membrane over the funnel and point the exit hole toward the surface of the water, at a distance of a few centimeters. Now, if you tap firmly on the membrane, you will see a small disturbance in the water.

What's going on? The shape of the funnel makes it a good sound amplifier. The pressure waves coming from the membrane get bunched together and concentrated. That also makes them more powerful, so they can produce small waves in the water. People used to use funnels in hearing aids and gramophones to amplify sound. You can also make a sort of funnel in front of your mouth with your hands and use that to amplify your voice.

All Kinds of Tones

You can use many techniques to produce vibrations and sounds.

You will need: balloon, 2 large measuring cups, 2 styrofoam pieces, *10 dried beans or pebbles, tape, blade of grass*

Here's how: You can create an extremely penetrating sound if you blow against a blade of grass held tightly between your thumbs. Instruments such as clarinets, oboes, and saxophones also produce their musical tones with a vibrating reed in the mouthpiece. A balloon is also good for making tones. Inflate it and then let the air escape again. If you press the opening in just the right way, you can create a squeaking sound or a noise like a trumpet. If you rub two pieces of styrofoam together, you can create a high-pitched sound that is particularly irritating. A rattle works better as a rhythm instrument: put a few dried beans or pebbles in one of the measuring cups and hold it up to the other so their two openings meet. You can secure them together with some tape. When you shake them, the beans create a rattling noise.

What's going on? All of these instruments produce vibrations in the air.

Did you know...

...that sound has a specific speed?

Investigate this during a thunderstorm. You will hear thunder after seeing lightning, never before. In air, sound moves at a speed of about 340 meters per second (m/s) or 1115 feet per second. To go 1 kilometer, it takes 3 seconds. One mile takes about 5 seconds. So you can deduce the distance of a thunderstorm by counting the seconds between lightning and thunder: The number of seconds divided by 5 tells you how far away the lightning is in miles.

THAMES & KOSMOS

SCIENCE at HOME

Free, Downloadable Instructions for Science Activities You Can Do at Home!

We hope you enjoyed this activity—and learned something cool while you did it!

Thames & Kosmos was founded in 2001 with the mission of improving informal science education outside of the classroom. T&K's mission has since expanded from its STEM roots to encompass other educational branches, including arts and crafts and games and magic. T&K places an emphasis on teaching concepts and skills through tactile processes. Our vision is to give all children access to real, physical activities and projects that teach them how things work.

If you liked this experiment, we encourage you to check out our other free and downloadable educational resources that will keep your mind sharp and provide an afternoon of fun. From science experiments to coloring pages to word searches, we've got a little something for everyone. Scan the QR code to see!

Scan for more!

We want to hear about your experience with this activity! Share your pictures, videos, and comments on social media and tag **@thamesandkosmos.**

http://www.facebook.com/thamesandkosmos

http://www.instagram.com/thamesandkosmos/

http://www.twitter.com/ThamesAndKosmos

http://www.youtube.com/thamesandkosmos

Thames & Kosmos
A Kosmos International Company
89 Ship Street
Providence, RI 02903, USA

phone: 401.459.6787
toll free: 800.587.2872
fax: 401.459.6775

email: contact@thamesandkosmos.com

www.thamesandkosmos.com