Science Activities
Leader Guide
For Cadette and Senior Girl Scouts

A collaboration
Between
Discovery Place, Inc.
and Hornets' Nest Girl Scout Council.

BRIDGING THE GAP

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This material is based on work supported by the National Science Foundation under Grant No. HRD-9450006. The opinions, findings, conclusions, and recommendations expressed in this booklet are those of the authors and do not necessarily reflect the views of the National Science Foundation.

The activities described in this Leader Guide are intended to be used under the direct supervision of adults. Discovery Place, Inc. and Hornets' Nest Girl Scout Council cannot be responsible for any accidents or injuries that may result from conducting the activities without proper supervision, from failing to follow the supplied directions, or from ignoring the cautions contained in the text.

Science Activities

Table of Contents

These activities are designed to be fun, easy, and inexpensive. The layout of each activity contains simple instructions for preparation, as well as for sampling the activity before presenting with the Girl Scouts. All GSUSA guidelines should be followed when doing these activities.

Introduction

As Girl Scout leaders and professionals, it is our goal to provide quality programs designed to enable girls to meet the many challenges of the future. Bridging the Gap (BTG) does that by providing easy, fun, and inexpensive activities that build confidence, both in the girls who do them, and in the leaders who guide them. All BTG activities are designed to be hands-on explorations of science, engineering, and mathematics (SEM), where the only limits are the boundaries of the imagination. Here, there is rarely a right or wrong answer. Instead, there is a sense of accomplishment in discovering something new in every effort.

As leaders, BTG gives **you** the opportunity to provide a more successful SEM program for your girls. By providing simple activities in an easy-to-follow format, BTG will enable you to guide your troops with confidence in both the execution and the success of your SEM programming.

With the increasing importance of science and mathematics in our everyday lives, from balancing a checkbook, to surfing the Internet, as well as in the professional world of the future, building confidence and excitement in exploring SEM activities is essential to the success of our girls in the world of tomorrow. But beyond the immediate challenge of these specific activities, there is even a greater importance attached to motivating our girls to explore science, engineering, and mathematics.

Gender Equity and SEM

Girl Scout Councils across the country have done extensive research in the area of gender bias and how girls are affected by it, with a particular view toward science, engineering, and mathematics. In developing materials to be used by troop leaders, special attention has been given to the teaching methods and attitudes that our girls have been exposed to in the conventional classroom.

We know that in formal classroom settings, girls are not always encouraged to develop an interest in advanced science and mathematics studies. Research shows that both male and female teachers tend to expect more from boys, especially in the areas of science, engineering, and math, and, as a result, often unconsciously promote a learning bias. Sometimes this bias is a result of lower expectations for girls, and often reflects the teacher's personal lack of confidence in their own command of the material.

As Girl Scout adults, we need to encourage girls to explore their interests in science, not only for those who seek to become scientists, but also for those who want to become good parents, homemakers, businesswomen, and/or political leaders. Science and math are part of everyday life, from managing the household budget (accounting), to rearranging the furniture (geometry), and even while cooking dinner (chemistry).

The only way that we, as Girl Scout leaders and professionals, can implement a successful SEM program with our girls, is to motivate their natural excitement and curiosity, while reexamining our own perceptions as to what science is, and the role it plays in our lives.

We need to project an enthusiasm for the subject matter, a confidence in using the materials and in teaching the activity. We, the role models, must be *excited* at the opportunity to expand our knowledge through hands-on experiences in science, engineering and math, so that our girls will feed off that enthusiasm, and actively seek to gain the experiences that all of the data suggests they have been missing.

Bridging the Gap lets ***you and your girls*** explore, ask questions, take risks, and stretch their interests as far as your enthusiasm will allow. After all....

Learning is directly proportional to the amount of fun you have!!!

Why SEM is essential for your Girl Scouts

According to data from the Departments of Education and Labor:

- While girls score higher than boys in reading from the 4th grade on, they fall behind boys in science and math test scores as they move further through high school.
- Over the past few years women were awarded fewer than 25% of the degrees in chemistry, less than 20% of the degrees in physics and math, and less than 1 of every 10 degrees awarded in engineering.

This happens despite research that indicates:

- Engineering will be among the highest paying and fastest growing occupations over the next decade.
- Women with good math skills earn more than women without good math skills.
- The fastest growing occupations - computer technology, engineering, and statistical analysis - all require strong backgrounds in science, technology, math, and/or engineering.

Tips for Leaders Beginning SEM Activities

- Examine your own attitude about science and math before attempting the following activities.
- Practice the activities yourself.
- Take risks, get messy, explore, and observe.
- Have fun doing the activities.
- Develop a sense of confidence knowing that it works, it's easy, it's fun, and you can do it.
- Hold high expectations for the girls.
- Encourage the girls to take risks, get messy, explore, and observe.
- Invite the girls to have fun doing the activities.
- Don't readily give the girls answers. Instead, encourage them to discover on their own.
- Help the girls achieve a sense of accomplishment and confidence knowing they can do it.
- Whenever possible invite real role models, female engineers and scientists, to talk with your troop about their careers, and how the girls can start planning a career of their own.

How To Use This Guide

The activities in this guide are intended to be as user-friendly as possible. They were developed to be easy to do, easy to set up, and virtually always successful. Each refers to a corresponding section from an official Girl Scout leader handbook, and that is noted on the 'Contents' page as well as in each activity. For your convenience, we have included an overview, the estimated amount of time you'll need in doing the activity with the troops, the materials needed, safety and clean-up suggestions, and planning suggestions in order to better prepare to do the activity with your girls.

The step-by-step instructions include tips, cautions, questions to challenge your girls, and explanations. Since trying the activities before the troop meeting is strongly encouraged, we have included instructions with most of the activities on how to do it by yourself first. Please read all sections of the activity before trying with your girls. With many of the activities we have included references and resources at the end of the section, or in the back of the Leader Guide, to direct you to areas where your girls may explore further, or where specialty items might be purchased.

You will also find various icons throughout the guide which are placed to draw special attention for the following reasons:

When you see this **pay close attention** to the instructions.

These are questions you may wish to use to challenge your girls.

Look here for an explanation of what is happening and why.

This icon indicates a more in-depth explanation of what is happening.

Here you will find hints on making an activity easier.

Piezo Popper

Overview

The girls will build an electrical device that will make a spark and a miniature explosion, similar to how a gas grill igniter works.

Big Idea

The girls will gain hands-on experience in building a mechanism that produces a definite working result. Girls need positive reinforcement that they can build things that work.

Estimated Activity Time

30 - 45 minutes

Materials Needed

Your VSC provides:

- ☐ Piezo (pronounced Pie-ee-zo, or Pee-ay-zo) Popper kits
- ☐ Eye Droppers
- ☐ 1 fully assembled piezo popper (sample)
- ☐ Goggles or glasses

Items you provide:

- ☐ 3-4 rolls of black electrical tape
- ☐ Scissors
- ☐ 91% or 99% isopropyl alcohol (rubbing alcohol)
- ☐ Ballpoint pens
- ☐ 35mm film canisters (empty)
- ☐ Copies of "A Film Canister Explosion" for each girl

Safety

- Review the "Chemistry Safety Guidelines" with the girls before beginning this activity.
- The rubbing alcohol is extremely flammable. Do not use it near open flame, and **make sure that the girls don't use more than 2 drops of alcohol** in their popper. Extra alcohol will burn as a flame and can melt the canisters.
- **Safety goggles** are required when the girls are using alcohol, and when test firing their piezo poppers.
- Warn the girls to be prepared for a loud noise when firing.
- When the film canister fires, it can travel over 10 feet. **Make sure to fire it in an open area, and be sure to point it away from people before firing.**

Clean-Up

Make sure that all alcohol is emptied from the droppers and is put back into its container. Take the piezo poppers (except one) apart so the next group of girls can use them. Make sure to leave the sample assembled.

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How to Do It

1. Take one of the piezo popper kits, look at the pieces, and read the instructions. Don't try to put it together yet.

2. Closely examine the finished piezo popper. Notice that the grill igniter is well wrapped with no metal showing at the bottom. Open the film canister and look at the end of the lamp cord. Note that the lamp cord is pushed through the lid of the film canister. The end of the lamp cord is split, and the two wire strands are spread apart.

Wrap more electrical tape around the grill igniter if any metal is showing on the button assembly.

3. While looking at the 1/4" gap at the split end of the lamp cord, push the red button of the grill igniter until it clicks. You will see a spark at the gap.

If you do not see a spark, adjust the gap and try again, making sure you push the button firmly.

If the grill igniter is not well wrapped, you may feel a slight shock to the hand when pushing the red button. This is not dangerous, but it <u>can</u> surprise you. A well-built piezo popper will not give you a shock.

If you don't get a spark, your popper may not be built correctly. To check this, refer to the "A Film Canister Explosion" handout.

The spark comes from the electricity produced by the grill igniter. When you push the red button, it strikes a crystal inside when it clicks. Some crystals will produce electricity when they are struck or put under pressure.

In physics, this method of producing electricity is called the piezo electric effect. Pushing the button strikes the crystal inside making a small spark that ignites the gas in a gas grill.

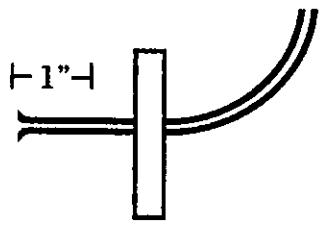
4. Now that you know your piezo popper sparks, you are ready to test fire it. **Be sure to wear safety goggles.**

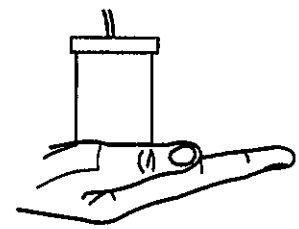
5. Use the eyedropper to put 2 drops of rubbing alcohol in the bottom of the film canister.

*Be sure to use **only** 2 drops.*

6. Make sure the lamp cord is pushed through the top of the film canister to a length of about 1 to 1-1/4 inches.

7. Hold the film canister in an upright position, and put the cap on top, making sure it seals tightly. Continue to hold the canister upright and warm it in your hand for a minute to evaporate the alcohol.





8. To fire it, you must be in an open area or a large room. Hold the lamp cord in the middle with one hand to aim the film canister.

Remember, the canister can travel over 10 feet.

Don't hold your hand too close to the canister. If anyone else is with you, warn them that you will be making a loud noise.

9. Push the button with your other hand.

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You should be rewarded with a loud pop, and a flying film canister.

If your popper doesn't fire, try again. Check to see if you have a tight seal on the canister. If the cap is on loosely, or the hole for the cord is too large, your popper will not work well.

Also, check to see if you are getting a good spark. The sparking end of the lamp cord should be in the middle of the closed film canister. If it is too high or too low, it won't work as well.

The pop and flying canister are caused by a miniature explosion. When you warm up the drops of alcohol with your hand, it evaporates and turns into alcohol vapor, which is extremely flammable. It is so flammable that the small spark you make with the grill igniter will cause it to burn quickly. This tiny fire creates a lot of hot air that tries to expand. If the film canister is sealed well, the air can't escape because it is held inside by the seal, and the pressure builds up until the bottom of the film canister flies off with a loud pop.

10. Take your piezo popper sample apart to see how it was put together. Pay attention to how the wire of the lamp cord is attached to the grill igniter.

The short end is called the butt connector and is attached to the bottom end of the igniter, and the long wire should be lying on top of a thin silver wire along one side of the igniter. Refer to the diagram and instructions on the "A Film Canister Explosion" handout.

11. Now, put it together again following the instructions.

Remember to continue taping the grill igniter until all bare metal is completely covered. Use 2 layers of tape to make sure your igniter is well insulated. If you skimp on the tape, you may get a slight shock to the hand when you use the piezo popper.

Before the Meeting

1. Make sure you have one complete piezo popper kit for each girl, and check that they are in good condition.
2. You will need several rolls of black electrical tape. You can buy this at hardware stores, and even many supermarkets. The cheaper brands work as well as the more expensive ones.
3. Make sure you have a new 35 mm film canister for each girl and a few spares. Never reuse a film canister for a piezo popper.
4. Have **safety goggles** for each girl.
5. **You will need a large, open area** (large room or outside) to fire the poppers.
6. Observe fire safety rules. **Don't use the alcohol around an open flame.**
7. Test fire your popper again to see if it works.

Doing the Activity With the Girls

1. Tell the girls that they are going to build some thing that will produce a miniature explosion. Assure them that it's safe as long as they are careful and follow safety guidelines.
2. Show them your completed piezo popper and, particularly, the spark it makes. Someone will probably recognize it as a grill igniter. Tell them that it is a piezo electric grill igniter (pronounced pie-ee-zo, or pee-ay-zo).

Ask them: **"What do you think creates the spark? Where does this electricity come from?"** Tell them that **piezo electricity** means to make electricity by hitting or putting pressure on a crystal. There is a small crystal in the igniter and it gets hit when you push the button. That makes electricity.

3. Pass out the piezo popper kits. Have them look at the pieces and become familiar with each before building.
   - Have them look at the igniter, and locate the button, the silver point on the opposite (or butt) end, and the thin silver wire on the side.

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- Have them look at the lamp cord, locating the butt end connector and the long copper wire. The girls should look at the cut end of the lamp cord and notice the two strands of wire.
- Finally, the girls should check that the film canister seals well.

The girls can push the buttons, but warn them **not to touch the butt end or silver wire** when they do it. If they touch the metal parts, they might get shocked since that is where the electricity will flow when the crystal is hit.

Explain to the girls that they won't be able to keep the finished piezo poppers, but will have to return them when finished so others can use them.

If you are going to distribute the "Film Canister Explosion" sheet, so that the girls can follow your verbal instructions while looking at the sheet, pass them out now.

4. Go through the assembly instructions with the girls step-by-step.
   a) Push the "butt connector" on to the butt end of the igniter.
   b) Tape the exposed wire against the long silver wire on the side of the igniter.
   c) Make sure they use enough electrical tape to completely cover all bare wires.
   d) Have them punch a small hole in the center of the film canister lid with a ballpoint pen.
   e) Now, they should insert the lamp cord through the hole in the lid.
   f) Separate the ends of the lamp cord slightly, about 1/4-inch.
   g) Have them test it by pushing the button and watching for the spark. Check that each girl makes a good spark.

You will need to help them at times, and show them where to connect the wires as well as how to wrap the tape. Check that they have taped the wire well and that no metal is showing. Tell them they will get a slight shock if they don't do this right.

If there is no spark on a correctly assembled piezo popper, check to see if the wire at the end of the lamp cord is visible. If not, cut off a bit of the end of the lamp cord, and trim the insulation so that a small amount of bare wire extends from the end of the cord.

Be supportive and encouraging. You may have one or two girls who are nervous or unsure of their ability. Let them know they can do it, and it is OK to make mistakes. The idea is to keep trying until you figure it out.

Warn them that they may have a little trouble pushing the wire through the cap. That's normal. Encourage them to keep trying.

5. Pass out the safety goggles and move to your firing area.

6. Demonstrate how to prepare, and then fire your popper.

Ask the girls: **"Why did it pop?"** The alcohol evaporates in the canister, and is ignited by the spark. This is the same way the igniter would light a gas grill. The burning alcohol heats the air, which expands and pops the film canister.

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7. Go over the procedure with the girls again as you have them prepare their poppers.
   a) Have them put on their safety goggles or glasses.
   b) Make sure they are aware of where to "fire" their poppers, and to be careful that no one is in front of them when they fire.
   c) Put 2 drops (and only 2 drops) of rubbing alcohol in the bottom of the film canister.
   d) Have them seal the canister, with the cord pushed through the top to a length of about 1 to 1-1/4 inches.
   e) Let them hold the canister to warm it in their hand for a minute to help the alcohol evaporate.
   f) Holding the cord in the middle of one hand, while aiming the canister with the other hand, allow them to push the button, and fire the popper.

The eventual success of the girls is what is important. If necessary, replace the film canister or use another piezo popper. Reassure the girls that if it doesn't work, the equipment may have a problem and equipment can be fixed or replaced. They can check their equipment to figure out what the problem is, fix it, and keep trying.

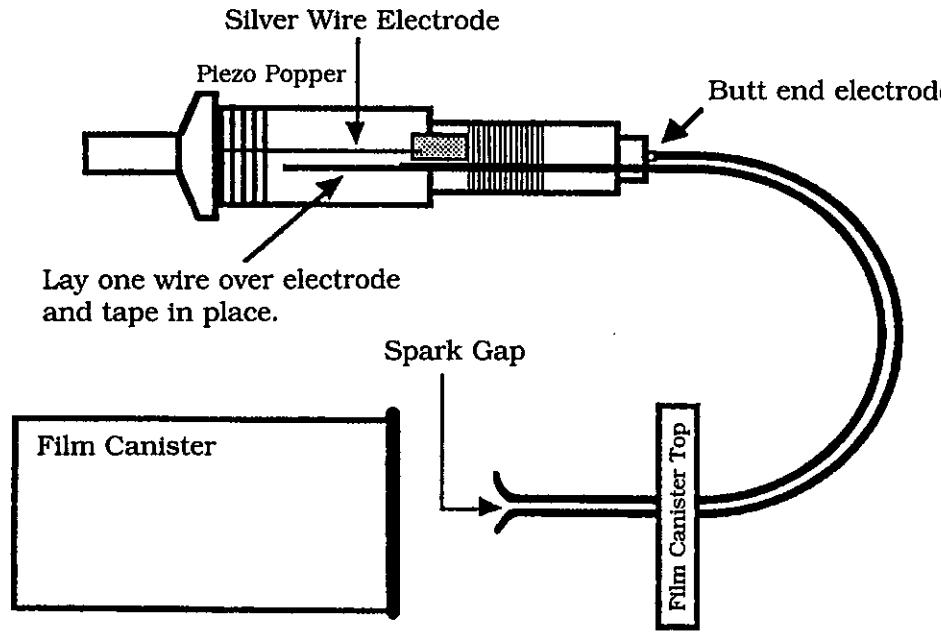
More to Explore

ICE Devices, a book published by the Institute for Chemical Education not only has information on how to make your own chemistry equipment, but also has a specific section on piezo poppers. Refer to the "Chemistry Show" section for addition information on the Institute for Chemical Education.

Piezo Popper Kits are available from:
Educational Innovations
151 River Road
Cos Cob, CT 06807
(203) 629-6049

A Film Canister Explosion

A film canister attached to a piezoelectric igniter, can be used to demonstrate the energy contained in two drops of a flammable liquid. Upon ignition, the film canister travels several feet.



To construct:

1. Push the "butt connector" of the wire assembly onto the butt end electrode of the igniter. Tape the long exposed bare wire against the long silver wire electrode of the igniter. Use electrical tape to completely wrap the exposed bare wires with electrical tape.
2. Punch a hole in the soft plastic cap of a film canister with a ball point pen. Insert the other end of the lamp cord through the top of the film canister as shown. Do not remove any of the wire insulation, but separate the two strands slightly, about 1/4 inch, to insure a proper spark gap.
3. Test by pushing the button of the piezoelectric igniter. If it is put together properly, you should see a spark jump across the spark gap at the end of the wire.

To Use:

1. While wearing safety glasses, add two drops of 91% or 99% isopropyl alcohol to the film canister. Cap, shake, and warm the canister in your hands. **Warning: to avoid a flaming missile, do not use more than two drops.**
2. Warn people that it makes a loud noise and that they should cover their ears.
3. Point it away from people and push in the button. It often travels over ten feet.

Acknowledgement:
"Micro Explosions" by Al Delfiner, The Chemistry Teachers' Club of New York, 1/93

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Star Party

Overview

This is an introduction to viewing the night sky. The girls will get basic information on how to plan a stargazing party, and how to use a StarFinder.

Big Idea

The girls will learn the basics of beginning stargazing, learn how to locate a number of stars and star patterns in the night sky, as well as reinforce the scientific processes of observing and questioning.

Estimated Activity Time

30 minutes to 1 hour

Materials Needed

Your VSC provides:

- ☐ 1 pre-assembled Edmund Star and Planet Locator
- ☐ 1 pre-assembled StarFinder
- ☐ Compass
- ☐ Red film (for flashlights)
- ☐ Edmund Sky Guide

Items you provide:

For each girl):

- ☐ Copy of StarFinder masters (on card stock) –3 pieces. Includes copy of StarFinder directions (back piece of StarFinder)
- ☐ Flashlight
- ☐ Tape
- ☐ Scissors

For each girl (optional):

- ☐ Copy of "Star Party Guidelines"

Safety

Observe normal precautions when using scissors, and working with the girls in limited light.

Clean-Up

Remove the tape used to attach red film to the flashlights, and save the red film for others to use.

How To Do It

Background Information

When a group of people get together to go star gazing, they have a star party. Amateur astronomy groups and others interested in astronomy often organize star parties. A star party sounds like fun and it should be!

Basic Star Party Guidelines

1. Plan to do your viewing as far away from city lights as possible. Light pollution from city lights makes it difficult to see stars.
2. Pick a night when there is a new moon. The sky will be darker without moonlight and you will see more stars.
3. Plan for a night with clear skies. Clouds and rain can ruin a star party. Have a backup date in mind, before you start.
4. You and the girls will need to lie down on your backs for easy viewing. Have lawn chairs or blankets available to cover the ground.

The important thing is to be comfortable. Dress for the weather. Have a light jacket and insect repellent handy in case you need it. You won't have as much fun if you are cold, wet or being bitten by mosquitoes.

5. Wintertime stargazing can begin as early as 7 p.m. Summer time stargazing must wait until 9 or 10 p.m.
6. Talk about what you hope to see before you go on your star party. Practice using your StarFinder. You may also want to talk with someone from a local astronomy club.

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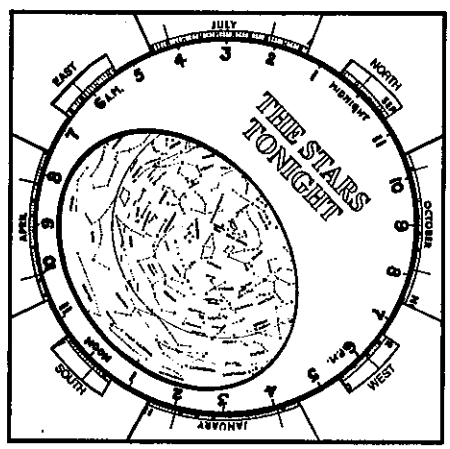
How To Use a StarFinder

A StarFinder will show you what stars and constellations will be in the sky each night, and where to look for them.

1. Find 'north', 'south', 'east' and 'west' on your StarFinder. Astronomers call these four directions **cardinal points**.

2. Hold your StarFinder by the 'south' point. Look at the top, north corner, and find where it says 'midnight' on the fixed circle. The numbers around the fixed circle are times. Find 6 a.m. by the 'east' point, and 6 p.m. by the 'west' point. You will be doing your stargazing during the hours shown on the 'north' half, so make sure you use this half of the fixed circle to locate your time.



3. Now look at the moveable circle. In the center of the moveable circle (not the oval opening) you will see the North Star (also called Polaris), as well as many different constellations and star patterns mapped out. The oval opening shows you what stars will be in the sky when you correctly line up the date and the time you will be stargazing.

If you look on the outer rim of the moveable circle, you will see all twelve months listed. As an example, now look at the month of July. Underneath the word 'July', you will see small marks and numbers that count by 5. Each of these small marks represents one day.

4. Practice setting your StarFinder. Suppose you want to go stargazing on July 15 at 9:00 p.m. To see a map of where the stars will be at that time, turn the moveable circle until the July 15 mark is lined up with the 9 p.m. mark. The oval opening will show you where the constellations appear in the sky at 9:00. Locate the Big Dipper. Hint: It is to the right of the North Star.

5. Now move the July 15 date to 10:00 p.m. This is how the sky will an hour later. The Big Dipper has moved slightly further to the west.

Constellations and stars rise in the east and set in the west, just as the Sun appears to do, because of the rotation of the Earth. The North Star is the only star that doesn't seem to move. Stars close to the North Star rotate around it, but never seem to rise or set.

6. Slowly move the July 15 mark from 10 p.m. until 6 a.m. and notice how the stars will change position throughout the night.

7. StarFinders are made to be viewed above your head. Set your StarFinder again back to 9 p.m. on July 15. Hold on the 'south' point with your thumb, and raise it over your head with the star map facing down towards you. Look up to see where the stars will be positioned in the sky.

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Imagine you are lying outside in a nice, comfortable lawn chair looking at the stars. Your feet are pointing south, your head is towards the north, and your StarFinder is over your head. When you look straight up, you are looking at the part of the sky called the **zenith**. To find the North Star, tilt your head back toward the north horizon. The Big Dipper will also be back, but to the right and toward the horizon. The constellation Scorpius (the scorpion) will be just above the southern horizon by your feet.

Once you learn how to set and use the StarFinder, it can be your guide to locating the stars in the night sky.

Use the Big Dipper as a starting point to find other stars. Pages 7 - 15 of the Edmund Sky Guide has pictures and directions on how to find constellations by using the Big Dipper as a starting point. Page 36 has both a star and constellation pronunciation guide.

8. Look for a dashed circle running through the head of Scorpius. This is called the **ecliptic**. As the Earth orbits the Sun, the Sun, Moon and the planets all appear to follow the same path through the sky. This path is called the ecliptic.

Follow the dashed ecliptic circle of your StarFinder.

You should see that it passes through parts of all 12 zodiac constellations, as well as a 13th constellation called Ophiuchus (off-ih-you-kuss). Planets will be found near the ecliptic in the sky, and sometimes can be found in these constellations.

9. Try using your StarFinder outside, even if you live in the city. Cover a flashlight with red film. You will need this to look at your star chart.

10. Pick a clear night, with few or no clouds, for viewing. Start your sky viewing by using your compass to locate "south".

If you don't have a compass, watch where the sun sets. This is west. Use a landmark to remember this direction. Later, face west and then point to the left. Turn to face the direction you are pointing to, and you will be facing south. The south is the most stable part of the sky and has the most stars.

11. Lie down, and get comfortable, placing your feet toward the south, and your head toward the north. The eastern horizon is to your left and the western horizon is to your right.

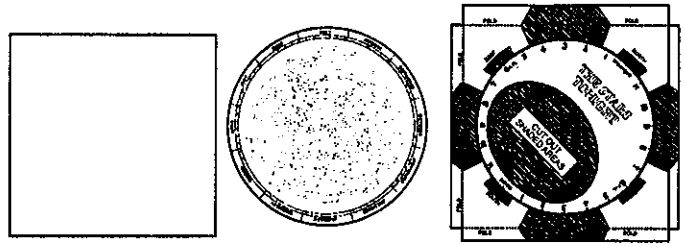
12. Place your thumb on the south point of your Star Chart, flip it over your head and see what stars you can find in the night sky.

If you can't find anything that's all right. Ask your Volunteer Science Consultant for help, or contact a local astronomy club for expert assistance.

How to Make Your Own StarFinder

1. Copy the StarFinder pattern on to card stock. You will need 3 pieces for each StarFinder - the back piece, the moveable star map and the fixed cover.

Regular paper is not heavy enough.



2. Cut out all three pieces. You will also need to cut out the shaded areas of the fixed cover piece.

3. Place the fixed cover facedown on your work area. Put the moveable star map also face down, but on top of the fixed cover. Then, put the back cover face-up on top of the star map.

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4. Fold the corner flaps over the back cover on the lines indicated, and tape to hold it in place.

5. Turn your finished StarFinder over. You should see the star map, and be able to turn it freely.

Before The Meeting

1. Find out if there is anything special to look for in the night sky during the upcoming days and weeks, as this may help you decide on a good night for the star party. This varies from season to season. A local astronomy club is an excellent resource if you can locate one.

   One source of current information is the Sky Almanac section of *Astronomy* magazine. Check your local library for this and additional resources. If you have Internet access, there are two excellent websites with sky charts, and information on stargazing. One is the website for *Astronomy* magazine, www.kalmbach.com/astro/astronomy.html. The other site is more user-friendly, and even contains articles on beginning stargazing. It's the site for *Sky and Telescope* magazine at www.skypub.com.

2. Pick a good date and location for viewing. Again, a local astronomy club can help you with this.

   If possible, pick a date that is near a new moon. You can locate information on when that will occur from the above websites, local astronomy clubs, or by following the almanac in your local newspaper. Look for special occurrences, such as a meteor shower. You may want to do some stargazing as part of a camping trip. Decide what your goal is and pick a good date.

3. Remember that you cannot control the weather. The best-laid plans can be ruined by an overcast sky or bad weather. Be prepared to cancel if necessary and have a back-up plan ready.

4. Make sure you have enough film and tape to cover everyone's flashlight. Pre-cut the red film to fit over the flashlights. It will need to be large enough so that no white light emerges.

You cover the flashlights with red film because red light doesn't interfere with night vision the way that bright, white light can. Bright, white light at a star party can make it difficult to view stars.

5. Make enough copies of the StarFinder masters on card stock, and make sure you have good scissors and tape. Directions on how to use a StarFinder are on the Star Finder handout at the end of this activity. Practice making one before the meeting.

Doing the Activity With the Girls

1. Have the girls plan their star party. Let them brainstorm what to do, and try to think of resources to support it. Give them guidance and support as needed.

Ask them: **"How would you find the North Star?"** Some of your girls may already know how to locate the North Star. If none do, move to the next question, and save this answer for a little later.

2. Have them name some of the constellations that they know. They will probably at least know the constellation that matches their astrological sign.

Ask them: **How would you find that constellation, or other constellations in the night sky?** Get a discussion going, but, ultimately, you guide them and then introduce the StarFinder.

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3. Have the girls construct their own StarFinders.
   a) Hand out the StarFinder copies, scissors, and tape.
   b) Have them cut out the 3 pieces – back-piece, movable star map, and fixed cover.
   c) When finished have them place the fixed cover face down. Then put the movable star map on top of the fixed cover, also face down. Finally they will need to put the back cover face up on top of the star map.
   d) Have them fold the corner flaps over the back cover on the lines indicated, and tape to hold it in place.

4. Have them find the **cardinal points**, the directions 'north', 'south', 'east', and 'west'

5. Show them how to set their StarFinder, by lining up the correct date with the time. Also show them how the sky will change slightly throughout the night by having them slowly advance the time by several hours.

6. Show them how to hold the StarFinder, by placing their thumb on the 'south' point, and raising it over their head with the star map facing towards them.

7. Show them the ecliptic where the zodiac constellations are found.

These constellations are familiar to teenage girls because of their connection to astrology and horoscopes. Emphasize that astrology is not a science. There is no scientific basis for the predictions in horoscopes, however, the constellations are real and occupy a specific place in the sky.

The imaginary line that can be drawn across the night sky where the constellations can be found is called the **ecliptic**. The sun moves along the ecliptic during the day, and the moon and planets can sometimes be found along it as well. The science of studying the night sky is called **astronomy**.

8. Have the girls complete their star party plans.

Hand out copies of the "Star Party Guidelines" to help the girls make their plans.

9. Have a great Star Party!!!

More to Explore

For those girls who are really excited about astronomy, let them know about some of the other resources mentioned in this guide. Help them contact a local astronomy club. Also, Edmund Scientific Company carries a wide range of astronomy books and accessories. Some materials of interest:

1. Edmund Sky Guide
   Available from:
   Edmund Scientific Co.
   101 E. Gloucester Pike
   Barrington, N.J. 08007-1380
   Customer Service (609) 573-6260

2. *Astronomy* Magazine
   Kalmbach Publishing Co.
   21027 Crossroads Circle
   P.O. Box 1612
   Waukesha, WI 53187
   Customer Service (800) 446-5489
   www.kalmbach.com/astro/astronomy.html

3. *Sky and Telescope* Magazine
   Sky Publishing Corp.
   P.O. Box 9111
   Belmont, MA 02178
   Customer Service (800) 253-0245
   www.skypub.com

Red film for use on the flashlights can be obtained from a number of sources. Theatrical film can be purchased from theatrical supply stores, but for many low power flashlights, red cellophane, available at craft shops and school supply stores, works very well, as do transparent plastic red report covers available at school supply and office supply stores.

NOTES

Star Party Guidelines

1. Plan to do your viewing as far away from city lights as possible. Light pollution from buildings and streetlights makes it difficult to see stars.

2. Pick a dark night with no moonlight, preferably a night with a new Moon. To do this, you need to find out when the new Moon is. Some calendars have this information. Also you can check the Weather Channel, astronomy websites, local newspapers (the almanac section), and local astronomy clubs for this information.

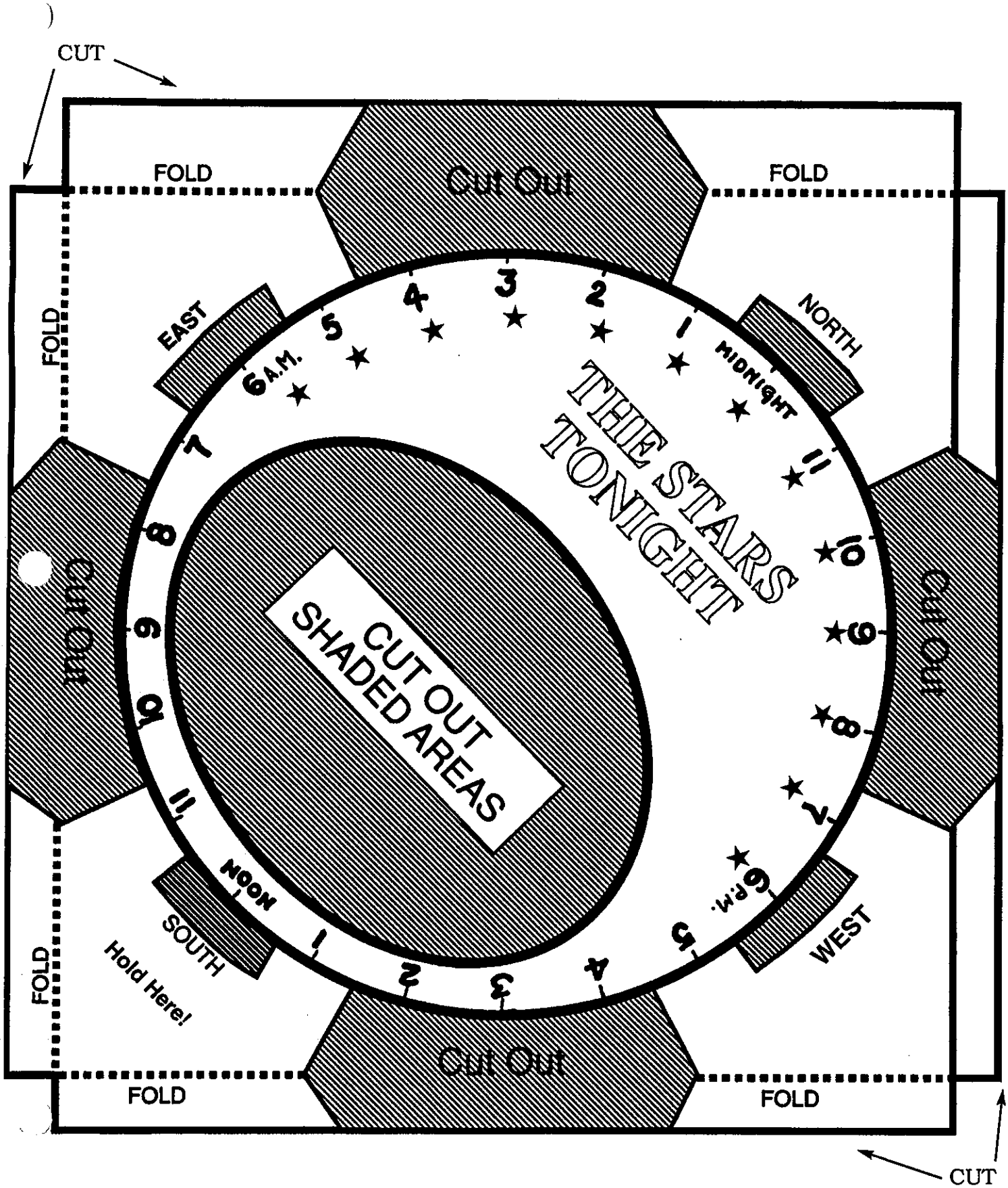
3. Plan to be comfortable outside. Bring something to lie down on so you can look up at the sky. This is just like when you sun bathe but leave the sunglasses at home. Will you need insect repellent or a light jacket?

4. Bright light will make it hard to see stars. Cover your flashlights with red film. Hold the film in place with tape.

5. What time are you going to have your star party? When does it get dark?

6. What can you see in the night sky? How can you find stars?

7. Hope you have good weather. Even professional astronomers have problems with overcast skies and rainy weather ruining their plans. You may want to have a back-up plan and a way to let everyone know if you have to cancel your star party because of bad weather.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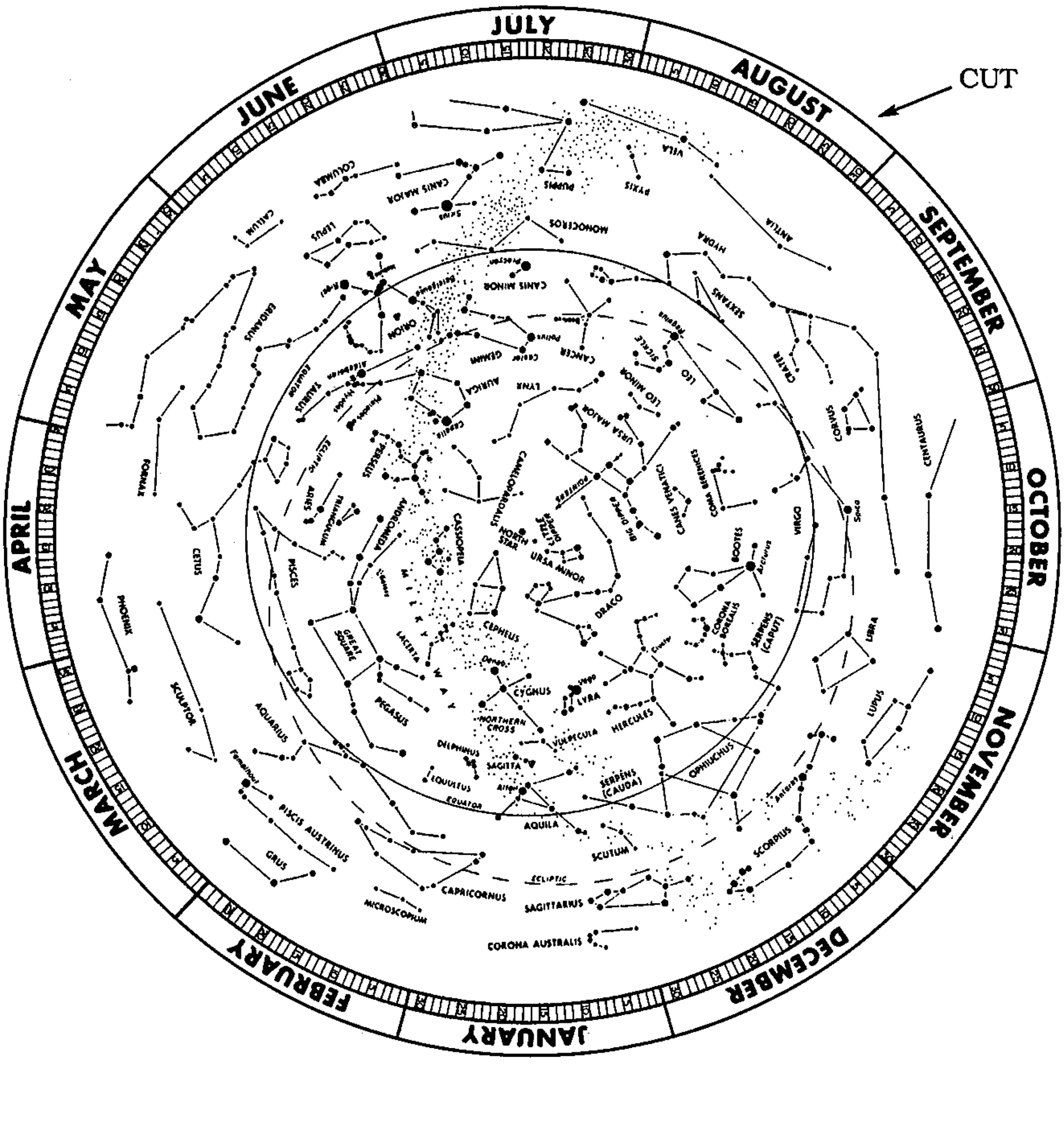
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ERIDANUS
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LEO MINOR
CORVUS
CENTAURUS
PERSEUS
URSA MAJOR
CAMELOPARDALIS
COMA BERENICES
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ANDROMEDA
CASSIOPEIA
NORTH STAR
LITTLE DIPPER
URSA MINOR
BOOTES
VIRGO
CETUS
PISCES
DRACO
CORONA BOREALIS
SERPENS (CAPUT)
LIBRA
PHOENIX
GREAT SQUARE
LACERTA
CEPHEUS
MILKY WAY
SCULPTOR
AQUARIUS
PEGASUS
CYGNUS
LYRA
HERCULES
LUPUS
NORTHERN CROSS
DELPHINUS
SAGITTA
VULPECULA
OPHIUCHUS
EQUULEUS
SERPENS (CAUDA)
EQUATOR
AQUILA
PISCIS AUSTRINUS
SCUTUM
SCORPIUS
GRUS
ECLIPTIC
CAPRICORNUS
MICROSCOPIUM
SAGITTARIUS
CORONA AUSTRALIS

CUT

StarFinder

Discovery Place, Inc.

Directions:
After assembling your StarFinder,

1. Turn the inner star circle until the correct date and month of the year is seen in the cutout circle that matches with the time of evening that you wish to stargaze. Example: Match January 15 on the inner star circle with the 7 P.M. mark on the top circle.
2. Go outside to a location where you can see an open sky (as far away from trees, houses and streetlights as possible).
3. Face the direction South (If you go out soon after sunset, you will still see the glow of sunset in your western sky. Stand so that west is to your right).
4. Hold your StarFinder so that your finger is on the word "South" on the chart. Raise the chart so that it is slightly above your head. On the chart, the word "North" will be pointed above your head and toward the direction that is behind you.
5. The stars that you see in the round cutout area should match with those in the sky.

NOTES

Create a Marketable Product

Overview

Guar gum is used to make slime and science toys which are sold in many stores. The girls will learn how to make guar gum slime and explore its potential as a product.

Big Idea

The girls will explore the connection between scientific discovery and business management of that discovery. It's not enough to create a marketable product, but to make it a successful product the girls will look at pricing vs. cost, and how packaging and marketing can turn it into a popular product.

Estimated Activity Time

30 - 45 minutes

Materials Needed

Your VSC provides:

- ☐Guar Gum
- ☐20 Mule Team Borax®
- ☐Safety goggles or glasses
- ☐1-ounce medicine cups
- ☐Slime-based toy or kit

Items you provide:

For each girl:

- ☐9-ounce clear plastic cup
- ☐Plastic spoon

Additional supplies:

- ☐1-cup measure (Ideally 1 for every 2-3 girls)
- ☐1 package of food coloring
- ☐Distilled water (1/2 cup per girl)
- ☐Resealable plastic sandwich bag (1-2 per girl)
- ☐Measuring spoons (optional – see Before the Meeting section)
- ☐Paper towels
- ☐Covering for tables (work area)

Safety

- Observe all chemical safety rules (Found in the "Chemistry Show" section.
- Be sure the girls wear safety goggles or glasses.
- **Borax is poisonous** and the borax solution should not be swallowed. See the container for further information. Contact poison control immediately if it is accidentally swallowed.
- Guar gum slime is safe to play with, but it can damage furniture and upholstery if mishandled.

Clean-Up

- Do not dispose of slime down the sink. Dispose of it in the trash.
- Cover the work area with plastic or paper to make clean up easier.
- The left over borax/water solution can be poured down the sink.
- Slime can go home inside a resealable bag or closed container. Spilled slime can be cleaned up with water.

How to Do It

Making Guar Gum Slime

1. Make a borax/water solution. To do this:
   a) Add 1 tablespoon of borax to 1 cup of distilled water.
   b) Mix well, but note that some of the borax may not dissolve. This is fine.

This makes enough for your whole troop to use. You can store the solution in a plastic 20-ounce soda bottle, but be sure to label the bottle: ***Borax/water solution - Poison - Do Not Drink!***

2. Pour 1/2 cup of cool or room temperature distilled water into a clear plastic cup.

Use only distilled water. Tap water does not always work and may result in a poor quality product. Hot water does not make good slime.

3. Measure 1/4 teaspoon of guar gum. Now, gently sprinkle a small amount of that guar gum across the surface of the water in the plastic cup.

Don't dump the guar gum in at one time or you'll get lumpy slime.

4. Stir to mix in the powder. When it's mixed, sprinkle more guar gum over the surface and stir again. Keep repeating until all the guar gum is mixed into the water.

You may have a few lumps but that is OK. Also, it is normal to have a thick layer of gelled guar gum collect on the handle of the spoon.

Be patient. This can take a few minutes.

After all the guar gum is added, stir well to dissolve.

5. Add one or two drops of food coloring for colored slime.

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The natural color of guar gum slime is a slight greenish yellow.

If you want thicker slime add more guar gum; if you want thinner slime, use less.

6. Using the medicine cup, measure 7.5 ml (3/4 teaspoon) of the borax solution. Add the borax to the dissolved guar gum and stir, continuing to stir until it thickens to a nice slimy consistency.

7. Pour the slime into your hand and play with it.

Guar gum slime feels wet, and holds together well. It behaves differently than the gluep the girls may have made as Junior Girl Scouts.

8. Store your slime in a resealable, plastic sandwich bag or a closed container.

The slime will last for several weeks if it is refrigerated. Be aware, though, that guar gum slime will get moldy within a week if left at room temperature.

Guar gum is a natural product made from the seeds of a type of bean plant grown in India for livestock feed. It has five to eight times the thickening power of starch, and is a common ingredient in food and cosmetics, and often an ingredient of ice cream.

When borax is added to the guar gum solution, it cross links the long guar gum molecules and holds them together to make slime. These cross links are easily broken apart and put together again, which is why the slime behaves the way it does.

Before the Meeting

1. Practice making the slime.
2. Think through how you want to do the activity with your girls. If you want to allow the girls to make their own packaging or advertising for the "product", you may need extra materials such as markers, cardboard or other items. Note: these supplies are not listed in the Materials Needed section of the activity.
3. Make sure you have safety glasses or goggles for all your girls and cover the work area to make clean up easier.
4. Make copies of the Guar Gum Slime Recipe for the girls to use if you wish.
5. You may choose to pre-measure the ingredients before the meeting, preparing one medicine cup with 3/4 teaspoon of the borax solution, and another medicine cup with 1/4 teaspoon guar gum.

Doing the Activity With the Girls

There are many different ways a leader can do this activity with girls. The following is one possible approach. Be creative and develop the activity along lines that interest your girls.

1. Start with a discussion about fund raising. Have the girls discuss fund raising activities they have done in the past, such as cookie sales, car washes, or selling crafts. For each idea, have the girls break down how much work was done (girls hours spent) and how much money was spent on materials. Compare this to the amount of money that was made.

After looking at all of the costs, and all of the labor hours involved, as well as the money made, ask them: **"Did the fund raiser turn a good profit?"** You can guide this response by also asking, **"What is 'a good profit'?"**

Don't spend a lot of time on a long cost analysis. After you set the stage by getting them to think about what is involved in making a profit, move to step 2.

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2. Introduce a possible new product idea for fund raising - slime. First, have the girls make the slime and play with it.
   a) Remind the girls to wear safety goggles and review the "Chemistry Safety Guidelines" before you begin. The guidelines are located in the "Chemistry Show" section, and are printed on a single page that can be duplicated and used as a handout.
   b) Give each girl a 9-ounce cup, and have them add 1/2 cup of distilled water to it.
   c) Distribute a medicine cup containing 1/2 teaspoon of guar gum and a plastic teaspoon to each girl. Instruct them to only place a small amount of the guar gum on the surface of the water, and stir thoroughly. Have them continue this until all of the guar gum has been added and mixed to the water. **Make sure they do not add all of the guar gum at once.**
   d) Have them add 1 or 2 drops (and no more) of food coloring to the mixture if they want to color their slime.
   e) Now have them add one medicine cup of borax solution (7.5 ml or 3/4 teaspoon of the solution) to the guar gum mixture and stir until the mixture thickens. **Remind them that this is a chemical solution and is poisonous if swallowed.**

Have paper towels available to clean up spills.

Ask them: **How much do you think it will cost to make a batch of slime?** Give them information as they need it. Have them guess and/or figure as much as possible out by themselves. Again use your judgment as leader. Remember the idea is to have fun while learning.

3. Let them play with their slime for a while.

Here are some figures to share with them:
1/4 teaspoon of guar gum costs around 2-1/2 cents.
1/2 cup of distilled water costs around 2 cents.
Resealable sandwich bags cost around 2 cents each.
Borax costs less than 1/10 of a cent.

The total cost of materials to make the slime is less than 7 cents to make 1/2 cup of slime.

4. Bring out the slime-based toy or kit. Have them compare the costs and profit of this product as they had done with their own slime.

Here are some examples of questions for your girls: **How much does the product sell for? What other costs are there besides materials?** Have them consider the costs of:

Attractive packaging - **Do people buy stuff that looks boring?**
Advertising - **How will people know about your product?**
Product tie-ins - **Will official Teenage Mutant Ninja Turtle Ooze sell better than plain slime?**
Marketing - **How do you sell it?**
Distribution - **Where is it sold?**

If you have or find an example of glow-in-the-dark slime, the glow agent is a chemical called zinc sulfide. It is **phosphorescent**, which means it absorbs light energy from a bright area and then releases it slowly later on. This released energy is the glow you see in a dark room.

5. Your girls could design an ad campaign, develop a product name, or design a container or other packaging for their product. They might even want to actually sell some as a fundraiser. Let your girls use their imaginations. They may even actually develop a new product using guar gum.

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More to Explore

An expansion of this activity would be to compare guar gum slime to gluep and deciding which would make the better product. Note: Junior Girl Scouts made gluep in the World of Today and Tomorrow Dabbler Leader Guide.

If you want to compare guar gum slime to gluep as a product, here is a cost breakdown to make 1/2 cup of gluep.

1/4-cup Elmer's Glue® costs 16 cents
Tap water - consider it free
Borax costs less than 1/10 of a cent
Resealable plastic sandwich bags cost around 2 cents each.

The total cost of an equal sized batch of gluep would be around 18 cents.

Guar Gum Slime Recipe

Materials Needed:

1. Guar Gum
2. Borax/water solution - **Poisonous**
3. 1 cup measure
4. Measuring spoons
5. 1-ounce medicine cup
6. Plastic spoon
7. 9-ounce clear plastic cup
8. Food coloring
9. Distilled water
10. Resealable bag or container for slime

How To Do It:

1. Measure 1/2 cup of distilled water into the clear, plastic cup.
2. Measure 1/4 teaspoon of guar gum powder.
3. Don't add the guar gum to the water all at once or you will get lumpy slime. Sprinkle a small amount of the powder on the surface of the water, and stir until it's thoroughly mixed. Keep repeating until you have mixed in all of the guar gum powder. Mix well to dissolve all the powder.
4. Add one or two drops of food coloring to the mixture if you want colored slime. Do not add more food coloring or you may end up coloring your hands when you play with your slime.
5. Use the medicine cup to measure 7.5 ml (3/4 tsp.) of borax/water solution. Add the borax/water solution to the guar gum mixture. Stir until your slime thickens.
6. Play with your slime. Store it in a resealable plastic sandwich bag or a closed container so it doesn't dry out. Your slime will keep longer if you keep it in the refrigerator.

NOTES

Baby Bird Kite

Overview

The girls will make a miniature version of a classic "Eddy Bird" kite using easy to get materials.

Big Idea

The girls will explore design properties of a kite and how they affect flight. This kite can be easily modified by changing the length of the tail. The girls will see how changes in the tail affect its stability, and its ability to fly.

Estimated Activity Time

1 hour

Materials Needed

Your VSC provides:

- ☐Kite and reel pattern

Items you provide:

For each girl:

- ☐Plastic grocery bag or other shopping bag - recycle code 2 HDPE (Have extras on hand in the event of mistakes)
- ☐Sharp scissors (for every 2 girls)
- ☐Tape (for every 2 girls)
- ☐Two 7-3/4" long plastic straws
- ☐Copy of "Kite Tail/Kite Body" pattern on thin cardboard or posterboard
- ☐Copy of "Cardboard Kite Reel" pattern on thin cardboard or posterboard
- ☐Copy of "Baby Bird Kite Instructions"
- ☐Copy of "A Brief Guide to Safe and Sure Kiting" (optional)

Additional supplies:

- ☐Several rolls of crochet thread
- ☐Permanent markers
- ☐Pieces of thin cardboard or posterboard (for kite reels) to make additional patterns. (Cardboard should be no thicker than the backing piece on a legal pad, and should be able to be cut with scissors.)

Safety

Observe normal caution when using scissors. Review and follow safe kiting guidelines.

Clean-Up

Dispose of trash. Save cardboard patterns for others to use if they are in good condition.

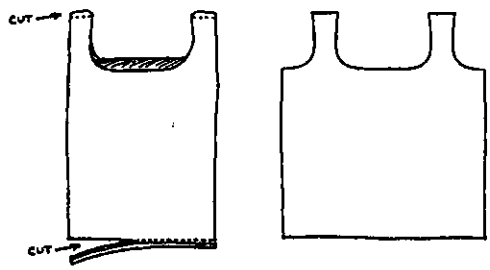
How to Do It

Background Information

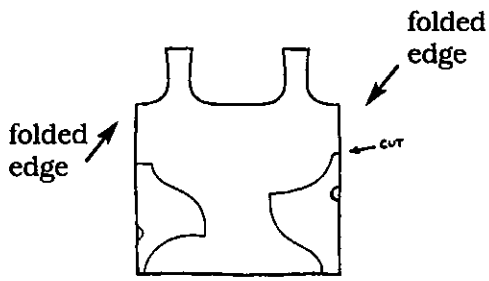
"Eddy" kites were first patented in 1897 by William Eddy of New Jersey, and were based on an old Malaysian design. They were used for weather and other scientific research. Leland Goy of Arizona modified the Eddy kits by adding a tail by to create an "Eddy Bird" kite.

A classic "Eddy Bird" kite was miniaturized and simplified to create the "Baby Bird" kite. This kite uses plastic straws as kite sticks and can be made from plastic grocery bags, and is intended to be a simple, basic kite.

1. Cut off both the sealed edge of the plastic bag and the sealed edges of the handles. Smooth out the bag so it lies flat, pulling out the folded sides.



2. Place the long edge of the kite body pattern along the folded edge of the bag as shown in the drawing below. Trace around the pattern with a permanent marker to draw cutting lines. Remove the pattern and carefully cut out the kite body. When finished, unfold your kite body.



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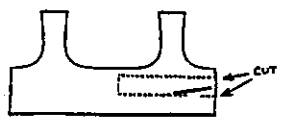
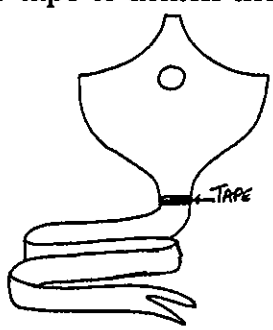
3. Now take the part of the bag you have remaining, after cutting out the kite body. Place the kite tail pattern on that bag section with the short end on the fold of the bag. Trace the pattern and cut it out.

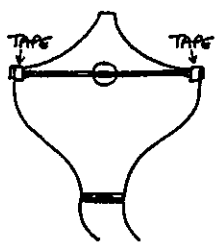


The tailpiece should be twice as long as the tail pattern.

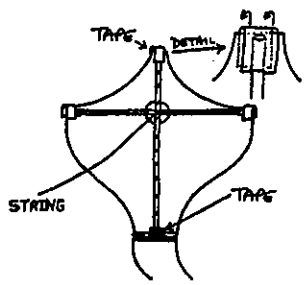
4. Use clear tape to attach the kite tail to the body.



5. Now, tape the plastic straws in place. Put the horizontal straw in place first, taping the ends securely to the kite body.

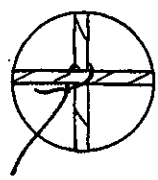


Then attach the vertical straw the same way.



The horizontal straw should be under the vertical straw at the point where they cross, at the cut out circle.

6. Prepare your kite string. Cut out a six-inch kite reel for your string from cardboard, using the included pattern.
7. Tape the loose end of the crochet thread to your reel, and wrap the thread around it. Count out about 100 complete wraps. This should give you around 50 feet of string which should be enough.
8. To attach your string to the kite, turn the kite over and place it straw-side down on your work area. Thread the string from the front side (the straws are on the back) through the middle hole. Go back around the straws where they cross and bring the thread back through the middle hole again. Tie it securely in a square knot. This way of attaching your string to the kite is called a **single leg bridle**.



9. Review the "A Brief Guide to Safe and Sure Kiting" sheet, and practice flying your kite. It works best in a light-to-moderate, and steady, wind.

Before the Meeting

1. Read "A Brief Guide to Safe and Sure Kiting". It covers kite safety rules, flying tips, and background information. Make copies and distribute to the girls.
2. Locate a safe place for the girls to practice flying their kites.
3. It is ideal to have one roll of tape and pair of scissors for every two girls. The scissors need to be sharp enough to cut the plastic easily. Try to have at least 2 balls of crochet thread.
4. Check your local library to get some books on kites and kiting.

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Doing the Activity With the Girls

1. Hand out the instruction sheet. Cadettes and Seniors can make this kite very easily by simply following the sheet. Let the girls work on their own. If the girls make mistakes they can easily correct them without losing much time. It is more important that they do the activity by themselves, rather than produce a perfect kite on the first try.

The girls will need to take turns wrapping the crochet thread around the reel. This will be the most tedious part of making a kite. Having more than one roll of thread will help this go smoother.

2. Have the girls fly their kites before they make modifications. Make sure to review kite safety rules before flying.

Kites can be modified by making the tail longer or shorter. Tails can also be different shapes, or placed in different locations. They can be fringed, tapered, or forked. The type of bridle that attaches the string to the kite can also be changed. Look at kite books for ideas, or have the girls use their imaginations.

Kites fly because of **Bernoulli's principle**. According to Bernoulli's principle, the air moves more slowly underneath a flying kite, and faster over it. The slower air underneath pushes up and lifts the kite against gravity. As long as the lift provided by the slower air is greater than the downward pull of gravity, the kite will fly. Different kite designs can improve the lift from moving air, or change the weight of the kite. The weight of the string also adds to the weight of the kite. A small kite, such as the Baby Bird, is very sensitive to being too light or too heavy.

More to Explore

Margaret Greger has written 2 excellent books on kite flying, <u>Kites for Everyone</u>, and <u>More Kites for Everyone</u>. Local kite shops are also a good source of materials and information if you want to explore making other kinds of kites.

A Brief Guide to Safe & Sure Kiting

KITING, we call it now-the serious, involving, adult art, science and sport of flying and making kites. People are starting to recognize the values of kiting as a creative challenge for all ages, as fresh as all outdoors and not energy consuming.

The lore of the kite begins with its origin over 2,000 years ago in China and continues through its role as the ancestor of the airplane. Kites have been used to ward off evil, deliver love messages, raise banners, drop propaganda leaflets, catch fish, spy on enemies, send radio signals, measure the weather, photograph the earth, tow vehicles, advertise politicians and lift passengers into the sky.

Today-all over the world-growing numbers of impassioned adults fly kites every week of the year. Over 500 kite shops in the United States alone cater to the enthusiasm, and an equal number of festivals draw crowds annually in cities large and small. Festival skies are filled with a United Nations of kites, what *Time* magazine called a "sociocultural anthology of man's immemorial urge to fly."

Though kites are easy to make or buy, they are only superficially trivial. You can now find kite curricula on the university level. Dozens of kite clubs thrive around the world. To fly a kite is to risk addiction.

When to Fly

There's a certain kind of day that gives a kiter a case of kite finger itch. That's when the trees are a-jiggle against a clean blue sky, flecked at times by clouds on the move. It might be a day in early spring. Or it could be summer, fall or winter. The stereotype of kiting as a springtime thing is on its way out. A kiter picks a *day*, not a season. Enjoy the spontaneous appeal of kites.

Depending on your kite, typical good-flying weather provides steady winds in a range of 5-15 miles per hour. (Yes, there is such a thing as *too much* wind.)

Where to Fly

Some fliers will spend considerable time traveling to reach a favorite kiting spot. Beaches are an example, for their usually steady winds. A wide open hillside (on the windward side) is ideal, but avoid the crest, where the hill itself makes the air turbulent. Anywhere that you can find a few clear acres may serve you well. Trees and buildings create turbulence within a distance of three times their height. Schoolyards, parks and farmlands are likely candidates for kite flying. Less obvious are rooftops, parking lots on Sundays and old abandoned airfields.

What to Fly

In these times, it's a great comfort that kites can still be found for about a dollar. Thus kiting is still one of the most accessible of sports. More pleasing is the fact that kites are available in ever-increasing variety and quality.

The sport thrives on having no standardized rules or equipment. Once of paper, leaves or silk, kites today are usually made of space-age plastics, such as Mylar® or Tyvek®, or of durable synthetic fabrics, notably ripstop nylon. Fiberglass rods now take the place of wooden sticks. Line is apt to be tough, braided nylon or polyester wound on a sophisticated reel.

Yet the most avid kiter will not spend as much as some people sink into skiing togs, a golf club membership or a sailboat. A durable kite is a high-value investment in family recreation. Even the stunning handicrafted kites that are an art form-and often treated so in galleries-will show their colors best when they hang in the sky.

To Build or to Buy

Another option open to the enthusiast is making your own kite. You may first become enraptured by commercial models. In fact, few kiters are weaned from them entirely. But many people are soon tempted to make something with their own hands. There's special gratification in building one's own bird and setting it flying. Some artists have found in kites a medium of creative pression unlike any other.

In getting started, your only problem may be deciding on a kite. It's impossible to recommend one type of kite over another, since each has its own personality. Discovering them will be your personal delight.

Getting Ready

Most kites on today's market require minimum assembly and are very easy to fly. But you can prevent some problems if you check out your kite indoors before flying it. Look first for balance and proper bridling. A well-balanced kite will be equal in weight from side to side, will have a symmetrical shape and frame, and when suspended from its towing point will rock gently and find a balance rather than flip all the way to one side. A kite's bridle should position the kite's leading edge about 15 degrees higher than its trailing edge when hung from the towing point.

Most adjustments should be made after flying. The bridle is the first thing to check if your kite is not behaving. The two most common bridling defects are unequal leg lengths, and excessive shortness. Kites with tails can be adjusted by lengthening the tail for a strong wind, shortening it for a light one.

In a light wind, you may want to increase your kite's angle of attack by lowering its towering point. In a strong wind, you can spill more air by raising the hitch.

When you head for the field, take a repair kit with such things as tape, a knife and something for tails (crepe paper streamers or rags). See that your line is wound on some kind of reel or winder. Even a tin can is better than a fumble-thumbs ball of string. Beware the new ball when you reach e end of the line, which is rarely tied to the core!

How to Launch

The launch is the most difficult part of flying any kite. It will help if you have a friend walk your kite out about 100 feet from you. The wind will be at your back and in the face of your helper and your kite. Have your friend hold the kite lightly by the center sticks. If there is a tail on the kite, extend it fully on the ground in front of the kite.

When you are ready and you feel the wind is right, signal your assistant to release the kite while you hold the line taut. *Do not run!* Running is the worst way to launch a kite and prevents you from seeing it and coordinating your actions to it. Let the wind work for you. Just keep tension on the line by reeling in slowly (if necessary) or, if the kite pulls well, by letting the line out smoothly, in sections, allowing the kite to rise after each release. In this way it will gain altitude easily. If the wind is sluggish, you can "pump" the line to spur lift. Once the kite is up above the ground turbulence, it should settle nicely into the steady upper breezes.

If you find no wind, your alternatives are: (1) use a lighter kite; (2) make a "high-start" launch, even further from your assistant, such as 200 to 500 feet; (3) accept the conditions with grace: there will be another day.

As you practice launching, you'll soon learn ways to do it without a helper. You will work your kite right off your hand and into the sky.

Very large kites always require help, along with extra skill and caution. Usually they should be tied down before launching.

How to Fly

Keep an eye on your kite as it flies. Some kites are so stable they can be tied off, while you have a picnic. Other kites are less predictable, but none should be left completely untended.

If your kite starts to dive, release tension on the line and the kite will usually right itself.

In a tangle with another kite, move toward the other flyer. The tangle will "walk" down the lines to hand's reach, where you can undo it.

There's a difference of opinion about altitude. Some want their kites high, to the point of invisibility. Others want to see and manipulate their kites. Then there are the kiters who simply fly no farther than they're willing to wind the line back in.

Experience will bring you proficiency. That's especially true for maneuverable kites-fighters (one line) and stunters (two lines). Stunters are the sport's new wave, dancing through the sky, in patterns or freestyle, sometimes choreographed to music. One caution: maneuverables must be handled with respect because they are space-consuming and people-threatening as they swoop over terrain. They should not be flown in crowded areas or over the heads of other people.

Exercise caution at all times. People have been killed flying kites, but only from real foolishness. In the U.S., the Federal Aviation Administration has a single regulation governing kites under five pounds in weight: No person may operate a kite in a manner that creates a hazard to persons, property, or other aircraft.

How to Land

To land a kite without crashing, slack the line or "walk down" the kite, letting a friend reel in the line while you walk toward the kite with the line under your arm. Or, you do the reeling while your friend does the walking.

When winding in your line, keep a *light* tension on it. Too much tension can crush your reel-too little loosens the line and tangles it on the reel. Often it's better to bring down the kite by pulling in the line hand-over-hand and winding the line up off the ground, rather than by winding the kite down by its line.

For More About Kites

New enthusiasts can hasten their immersion in the sport through reading. Top choice for a comprehensive book is *The Penguin Book of Kites* by David Pelham. There are a number of other good texts about kites, but some of the best are out of print, so visit your public library as well as kite or book stores.

To become an all-out member of the kiting family, the quarterly journal *Kite Line* is indispensable. One journal feature is the Kite Lines Bookstore, a mail order source of nearly every kite book in print. The colorful, award-winning magazine is located at P.O. Box 466, Randallstown, MD 21133-0466, USA.

Kite Lines recently expressed a philosophy that kiters are repeating: *Kites make the world seem smaller and the sky seem bigger.* May you find this secret and many others for yourself as you explore this ancient pastime and modern sport.

The Kite Lines Safety Code

The Four Nevers of Kite Flying

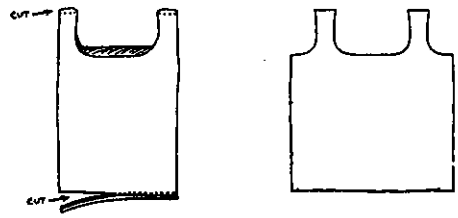
1. Never fly a kite in wet or stormy weather, and keep your line dry.
2. Never fly a kite near electric power lines, transmission towers, or antennas. (If you lose a kite on a line, call the utility company.)
3. Never fly a kite with wire or anything metallic in its line.
4. Never fly a hard-pulling kite without wearing gloves.

Five Things to Avoid while Kite Flying

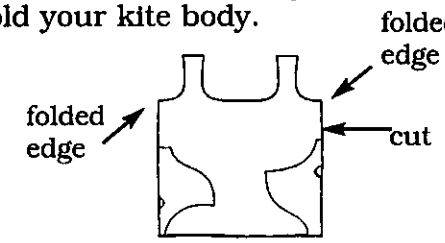
1. Public streets and highways – Don't fly a kite in or over them.
2. Air traffic patterns.
3. Bystanders in your kite's line of attack – especially when flying maneuverable kites.
4. Rocky, bumpy, or obstacle-filled fields – they can trip you up.
5. Trees – but if you do lose a kite to a kite-eating tree, loosen the line and let the wind fly it out.

Baby Bird Kite Instructions

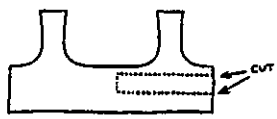
1. Cut off both the sealed edge of the plastic bag, and the sealed edges of the handles. Smooth out the bag so it lies flat, pulling out the folded sides.



2. Place the long edge of the kite body pattern along the folded edge of the bag, as shown in the drawing below. Trace around the pattern with a permanent marker to draw cutting lines. Remove the pattern, and carefully cut out the kite body. When finished unfold your kite body.

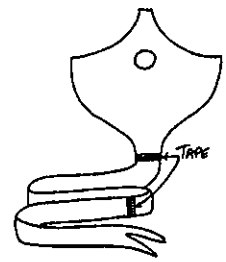


3. Now take the part of the bag you have remaining, after cutting out the kite body. Place the kite tail pattern on that bag section with the short end on the fold of the bag. Trace the pattern and cut it out.

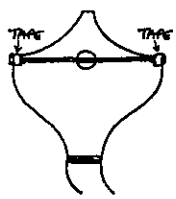


The tailpiece should be twice as long as the tail pattern.

4. Use clear tape to attach the kite tail to the body.

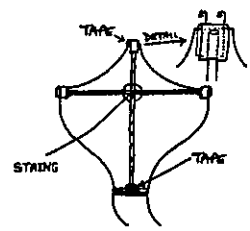


5. Now, tape the plastic straws in place. Put the horizontal straw in place first, taping the ends securely to the kite body.



The horizontal straw should be under the vertical straw at the point where they cross, at the cut out circle.

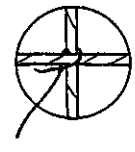
Then attach the vertical straw the same way.



6. Prepare your kite string. Cut out a six-inch kite reel for your string from cardboard, using the included pattern.

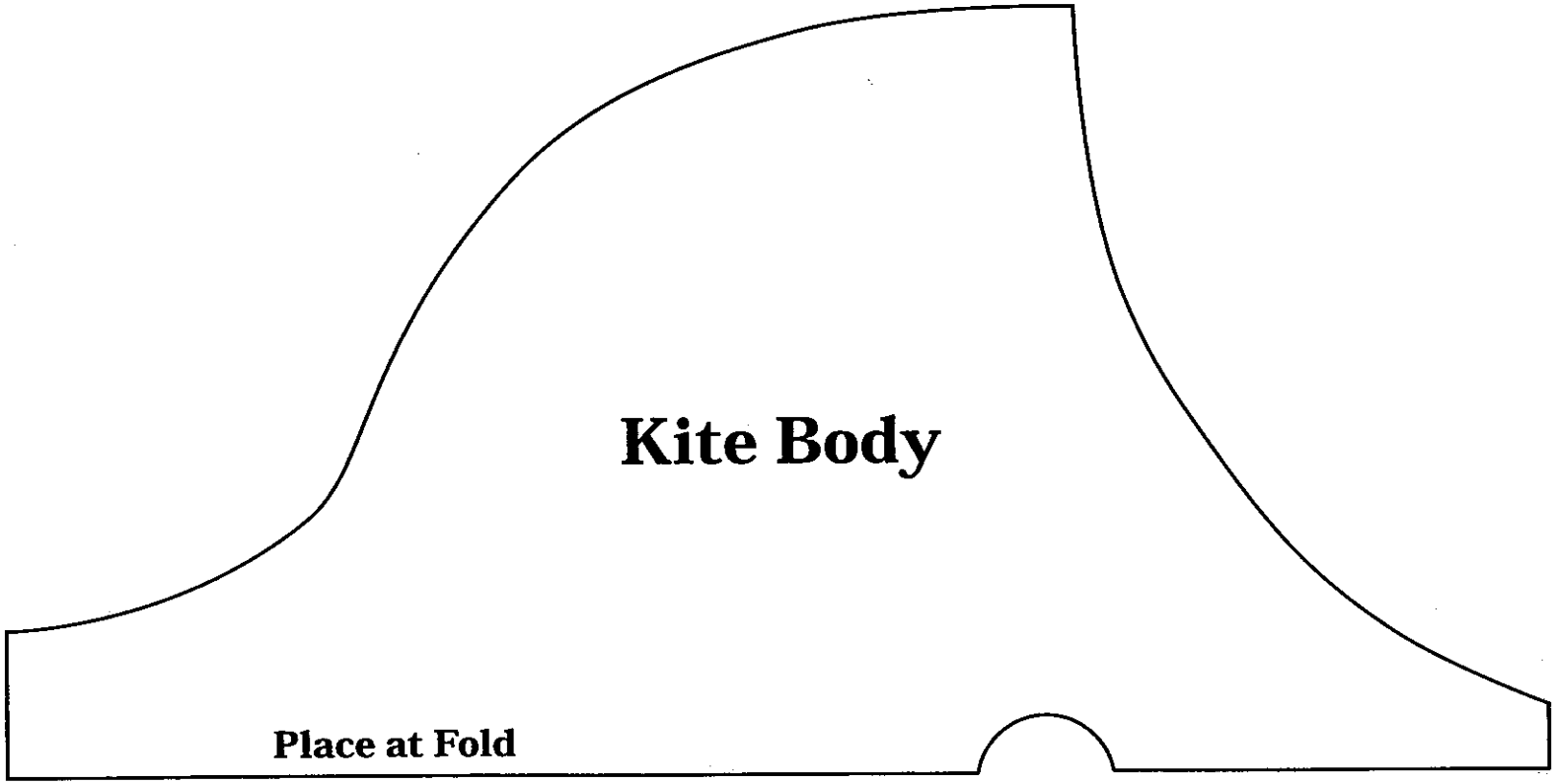
7. Tape the loose end of the crochet thread to your keel, and wrap the thread around it. Count out about 100 complete wraps. This should give you around 50 feet of string which should be enough.

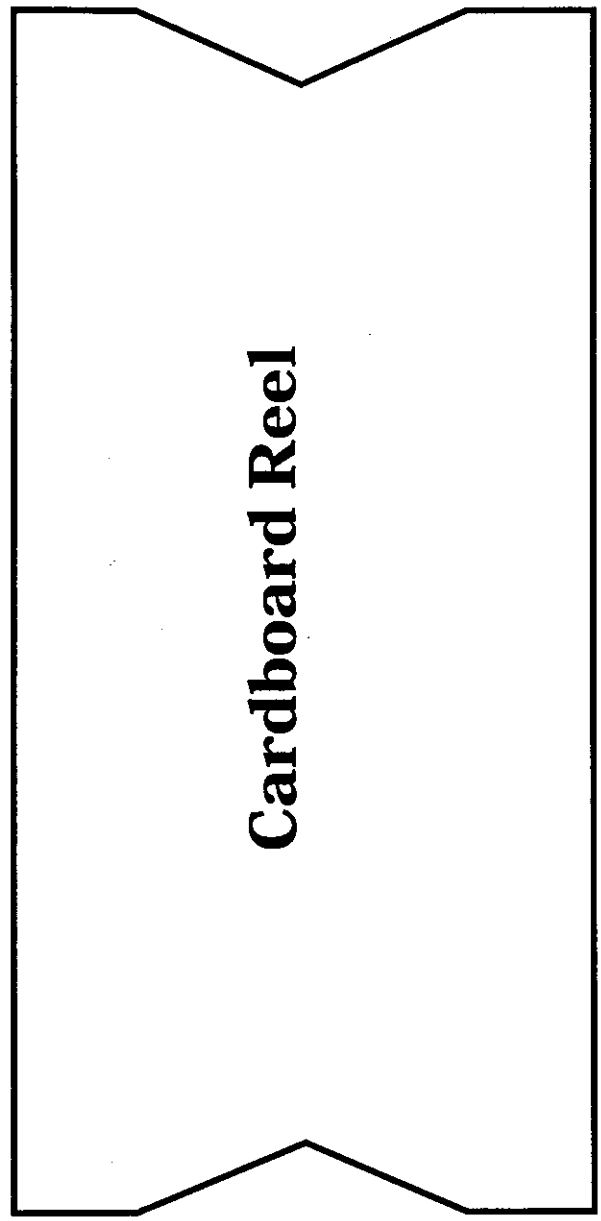
8. To attach your string to the kite, turn the kite over and place it straw-side down on your work area. Thread the string from the front-side (the straws are on the back) through the middle hole. Go back around the straws where they cross and bring the thread back through the middle hole again. Tie it secure ly in a square knot. This way of attaching your string to the kite is called a **single leg bridle**.



9. Review the "A Brief Guide to Safe and Sure Kiting" sheets, and practice flying your kite. It works best in a light to moderate, and steady, wind.

Kite Tail




Cardboard Reel

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Chemistry Show

Overview

This activity contains instructions for six different chemical demonstrations. These activities are simple and fun. Older girls can learn three or more of these and put on a chemistry show for younger Girl Scouts. Each activity is written up separately.

Big Idea

Girls will gain a better understanding of the chemistry behind the demonstrations through the process of explaining it to others. When the girls successfully do a science show, it will also increase **their** confidence in their ability to do science. It will also allow them to provide positive role models for the younger girls who watch them perform.

Estimated Activity Time

1 hour for the hands-on activities. This does not include practice and preparation time for the show.

Materials Needed

Your VSC provides:

- ☐Sodium polyacrylate
- ☐Goldenrod copier paper
- ☐Washing soda
- ☐Magic sand
- ☐Bamboo skewers
- ☐Scotchguard™ spray
- ☐Heat-sensitive paper

Items you provide:

- ☐Facial tissue
- ☐Tall, clear, plastic 10-ounce cups
- ☐Newspaper
- ☐2 rubber bands
- ☐Plastic spoons
- ☐Small cups
- ☐Copy of "Chemical Safety Guidelines" and "Super Science Showmanship Tips" for each girl
- ☐Copy of "Disappearing Water Trick", "Skewer a Balloon","Waterproof Tissue", "Mystery Sand","Goldenrod Paper", and "Touch-It Heat Sensitive Paper" for each girl

Safety

- Review the "Chemistry Safety Guidelines" and "Minimum Safety Guidelines for Chemical Demonstrations" before the meeting.
- Wear safety goggles or glasses.
- Check the MSDS sheets included with the chemicals and look for any cautions on product containers or boxes.
- Avoid breathing the sodium polyacrylate powder, and remind the girls to keep the chemical away from eyes, noses, and mouths. Have them wash hands thoroughly after using.
- Washing soda is strongly alkaline. Keep out of eyes and do not ingest.

Clean-Up

- Cover the work area with paper or plastic to make clean up easier.
- Do not put sodium polyacrylate down the drain, as it could clog pipes. Throw it out in the trash.
- Pour excess water off of the magic sand, and let it dry to be used again.
- Washing soda solution can be disposed of down the drain.
- Save the bamboo skewers and heat-sensitive paper to use again.
- Throw goldenrod paper and facial tissues into the trash.

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How to Do It

Instructions for each of the six activities are written up separately on sheets for the girls to use. Follow the instructions on those sheets, as the girls will, to learn how to do the activities.

The activities are:
1. Disappearing Water Trick
2. Skewer a Balloon
3. Waterproof Tissue
4. Mystery Sand
5. Goldenrod Paper
6. Touch-It Heat Sensitive Paper

Before the Meeting

1. Practice all the activities and make sure you can do them.
2. Make sure you have safety goggles for all the girls.
3. Test the goldenrod paper to make sure it turns red when the washing soda solution touches it. Not all brands will work. See the shopping list at the end of this activity.
4. Review the "Minimum Safety Guidelines for Chemical Demonstrations", and summarize the parts that directly relate to these activities for the girls.

Doing the Activity With the Girls

1. Start the activity by doing a chemistry show for the girls, and demonstrating all the activities.

Give only a brief explanation after you demonstrate each activity. Review the "Minimum Safety Guidelines for Chemical Demonstrations" with the girls.

2. Put the materials for each activity at different stations throughout the meeting area. Let the girls move from station to station, read the instructions, and explore each activity independently.

3. After they have mastered the activities, review the "Super Science Showmanship Tips" with the girls.

4. Have them work as one large group, or in smaller groups, to put together their own science show. Help them find an audience to perform for.

The following are more detailed scientific explanations of what is happening in each of the following activities, and some suggestions on doing them.

Disappearing Water Trick

Sodium polyacrylate works because of **osmosis**. Osmosis occurs when a liquid moves through a membrane from an area of higher concentration to an area of lower concentration. (Remember your high school biology?)

Sodium polyacrylate has sodium ions inside of it. The water moves inside to dilute the sodium and the sodium polyacrylate then swells up and turns into a gel. When you add salt to the gelled sodium polyacrylate, all of a sudden you have more sodium outside of the gel, causing the water to flow back out, and the gel to shrink back down.

If the girls use too much sodium polyacrylate, it will be hard for it to turn to slush when the salt is added. In this case, they will have to add lots of salt before anything will happen.

Skewer A Balloon

Polymers are very long chains of molecules. Have the girls try to imagine a molecule that looks like cooked spaghetti. That is a good way to visualize what rubber molecules look like.

Waterproof Tissues and Mystery Sand

Regular sand and paper fibers are chemicals which mix well and attract water. Another name for chemicals that mix well with water is **hydrophilic**.

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Scotchguard™ and silicone are chemicals that don't mix with water. Chemicals that repel water are called **hydrophobic.**

Touching the mystery sand with your fingers will cause it to lose its effectiveness over time.

Goldenrod Paper

If you want a hands-on activity for your troop to do with the younger girls, use a baking soda and water solution to turn the paper red.

Baking soda and lemon juice are very safe to use with younger girls, however still follow all of the safety guidelines, and have the girls wear goggles.

Washing soda is used for the demonstration because it turns the paper red instantly. Baking soda also works, but works slower because it is a weaker base.

Touch-It Heat Sensitive Paper

Many different products use temperature sensitive dyes and liquid crystals. Lots of color change toys are based on this technology, as well as color changing shirts, cosmetics and jewelry.

Other Resources

Sarquis, M. and J., *Fun with Chemistry: A Guidebook of K-12 Activities from the Institute for Chemical Education*, Institute for Chemical Education, Madison, WI, Volumes 1, 1991, and Volume 2, 1993.

Jacob, A. and Direen, G., SPICE: *Student-Presented Interactive Chemistry Experiences*, Institute for Chemical Education, Madison, WI, 1992.

Kids and Chemistry
Available from:
American Chemical Society
11155 16th Street, NW
Washington, DC 20036
(800) 227-5558

The Institute for Chemical Education
Can be contacted at:
Department of Chemistry
University of Wisconsin-Madison
1101 University Avenue
Madison, WI 53706-1396
(608) 262-0381

Where to get the chemicals

Sodium polyacrylate
Goldenrod Paper
Magic Sand
Heat Sensitive Paper

Educational Innovations, Inc.
151 River Road
Cos Cob, CT 06807
(203) 629-6049

Washing Soda	Look for it in the laundry section of a grocery store

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CHEMISTRY SAFETY GUIDELINES

Some things to remember while you are doing chemistry

When doing hands on science, there are some rules you must follow. This kind of learning is different from other subjects. If you don't follow the rules, you may end up hurting yourself or others.

Safe Behaviors

1. **Wear Safety Goggles**
   Keep them on your eyes all the time, if your adult leader says you must wear them. Wearing them around your neck or on top of your forehead does not with count. You only have two eyes, so protect them.

2. **Detect Odors Safely**
   Hold the container 3 inches in front of your nose and wave the fumes toward your nose your hand. Some strong smells can bring tears to your eyes!

3. **Wash All Spills Immediately**
   Avoid getting the materials on your skin, unless the instructions say do to so. If you spill something on your skin wash it with water immediately and tell the adult leader.

4. **No Running, Pushing or Shoving**
   Horseplay could break expensive equipment, spill solutions, or hurt someone!

5. **Clean Up Your Mess**
   Make sure all equipment and work areas are cleaned properly. Follow the instructions for the activity to see where you should return supplies. Dispose of waste material as you are instructed.

6. **Get Help**
   Always ask an adult for assistance if an accident happens.

7. **Eating**
   No eating or drinking during the experiment. Never taste anything during a laboratory activity.

8. **No Unauthorized Experiments**
   Follow the directions on the instruction sheet. Ask the activity leader before you try your own idea!

9. **Tie Back Long Hair**
   This is especially important when you are working around an open flame.

Great Behaviors

1. **Listen Quietly to All Directions**
   Ask questions if you are unsure. Do not begin doing what the instructions say until you are given the go ahead. Read all instructions before beginning the lab and listen to your adult leader.

2. **Collect and Record Data and Observations**
   Taking notes of what you do and and see will help you remember what you have learned.

3. **Think "How Come.....?"**
   Doing hands-on science is more than just fooling with equipment. Try to understand what you see going on by explaining it to yourself or your group.

4. **Watch Closely What Happens**
   Some experiments happen quickly. Look for unusual or unexpected changes.

Minimum Safety Guidelines for Chemical Demonstrations

ACS Division of Chemical Education

Chemical Demonstrators *Must*:

1. know the properties of the chemicals and the chemical reactions involved in all demonstrations presented.
2. comply with all local rules and regulations.
3. wear appropriate eye protection for all chemical demonstrations.
4. warn the members of the audience to cover their ears whenever a loud noise is anticipated.
5. plan the demonstration so that harmful quantities of noxious gases (e.g. NO_2, SO_2, H_2S) do not enter the local air supply.
6. provide safety shield protection wherever there is the slightest possibility that a container, its fragments, or its contents could be propelled with sufficient force to cause personal injury.
7. arrange to have a fire extinguisher at hand whenever the slightest possibility for fire exists.
8. **not** taste or encourage spectators to taste any non-food substance.
9. **not** use demonstrations in which parts of the human body are placed in danger (such as placing dry ice in the mouth or dipping hands into liquid nitrogen).
10. **not** use "open" containers of volatile, toxic substances (e.g. benzene, CCl_4, CS_2, formaldehyde) without adequate ventilation as provided by fume hoods.
11. provide written procedure, hazard, and disposal information for each demonstration whenever the audience is encouraged to repeat the demonstration.
12. arrange for appropriate waste containers for and subsequent disposal of materials harmful to the environment.

Super Science Showmanship Tips

1. Practice your demonstrations until you are comfortable doing them.

2. Practice what you are going to say by doing the demonstration with a friend before you do a show.

3. Before your show, put your demonstrations and props together in the order you need them. This way you don't have to stop in the middle of your show to find something.

4. Smile, be upbeat, talk clearly and look your audience in the eye. Be confident and in charge.

5. If you make a mistake, don't worry or let it get you down. You know more about your demonstrations than your audience does. Just say something must have gone wrong with your materials and go on to the next demonstration.

Disappearing Water Trick

Did you ever wonder how magicians make water disappear? One way they do it is to use a chemical called **sodium polyacrylate**. Sodium polyacrylate (trade name Waterlock) is used in super absorbent disposable diapers and to keep plants moist. It was developed by NASA to clean up liquid spills in space.

Materials Needed:
2 identical Styrofoam coffee cups
1 teaspoon of sodium polyacrylate
Water

How to do it:

1. Put 1 teaspoon of sodium polyacrylate on the bottom of one of the Styrofoam cups.
2. Fill the other cup with water.
3. Quickly have a member of the audience look into the "empty" cup. Ask "Is the cup empty?"

   Because the white powder blends into the white bottom, the powder is not easy to see. Unless the person is looking very closely, they will not see the powder. Give them a quick look and don't let them touch the cup.
4. Hold the 2 cups at shoulder height. Pour the water from one cup into the cup with the sodium polyacrylate.

   The sodium polyacrylate will absorb all the water in just a few seconds.
5. Wait until the water and sodium polyacrylate have gelled. Then turn the cup upside down.

   It looks like the water disappeared when nothing spills out. The sodium polyacrylate and water gel stay stuck in the cup.
6. Show the audience what happened to the water. Tell them the chemical you used is used in baby diapers and was first invented to be used in space.

Why it works:
A **space spin-off** is when something was invented for space travel but becomes something that is used all the time here on earth. Super absorbent baby diapers are one example. Cordless tools, modern athletic shoes and Teflon-coated cookware are just a few others.

Sodium polyacrylate is made from starch and has the unusual property of absorbing lots of water quickly. It absorbs pure water best. If salt or other chemicals are present, the sodium polyacrylate releases the water.

Add salt to your gelled sodium polyacrylate. What happens? It should turn to slush. This is because of a process called osmosis. Have you studied about osmosis in school?

Skewer a Balloon

Can you put a bamboo skewer through a balloon without popping it? You can if you know your chemistry.

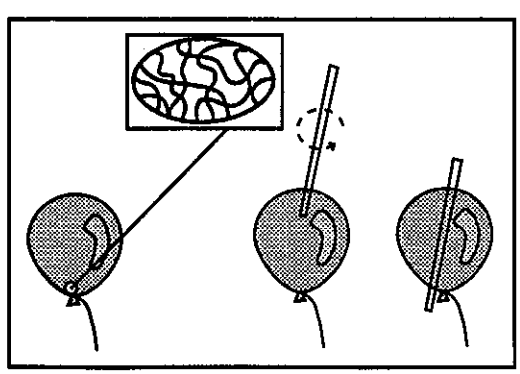
Materials Needed:
1. Several inexpensive 8 or 9-inch round balloons.
2. Bamboo skewer
3. Small amount of vegetable oil

How to do it:
1. Inexpensive balloons with thick blobs of rubber on the end work best.
2. Rub a small amount of vegetable oil on the bamboo skewer to lubricate it before you do the demonstration.
3. Blow up the balloon to its full size. Let some of the air out. Make sure the balloon is small enough for the skewer to go completely through it. Tie the balloon closed.
4. Look for the thick spot of rubber at the end of the balloon. Hold the balloon firmly and push the skewer into this thick spot with a twisting motion. Keep pushing until it pops through. Continue pushing the skewer through the balloon. Push the skewer out again at the thick spot near where you tied the knot. **Remember to use a twisting motion**. These thick spots at the ends are the only two spots you can poke a hole into a balloon and it won't pop.

   If your balloon popped, you may need to practice some more or you might have better success with a different brand of balloon. Cheap balloons work better because they have thicker blobs of rubber on the ends.
5. To show the balloon can pop, take the skewer out and poke the balloon on the side where it is thin. It should pop easily.

Why it works:
When balloons are made they have thicker spots of rubber at both ends. When a balloon is blown up, the thick spots at the ends don't stretch much, but the sides stretch a lot and are under stress.

A skewer or long needle will pass through the unstretched rubber molecules easily at the ends. However, when you poke the side of the balloon, stress on the stretched rubber molecules is too much and the balloon breaks.



Waterproof Tissues

Can a tissue hold water? It can if it is coated with Scotchguard™. In this demonstration you pour water into a regular tissue and water into a Scotchguard™ treated tissue. The Scotchguard™ treated tissue will not let the water run through.

Materials Needed:
1. Scotchguard™ spray
2. 2 facial tissues
3. Clear plastic, tall 10-ounce cups
4. 2 rubber bands
5. Newspaper

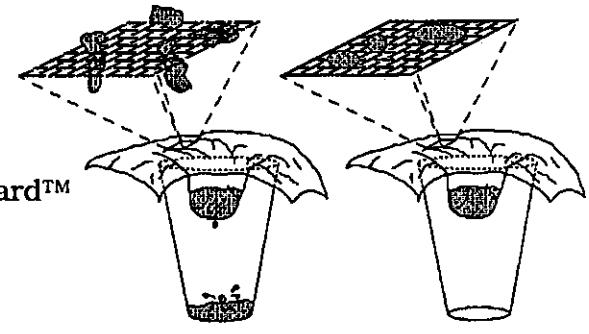
How to do it:
1. Cover your work area with newspaper to protect it. Lightly spray both sides of a tissue with Scotchguard™. Let it dry completely.
2. Fill one cup with water.

   Take a second cup and cover the top with a plain untreated tissue. Push the center of the tissue into the glass to form a pocket. Use a rubber band to hold the tissue in place.

   Cover the top of the third cup with the Scotchguard™ treated tissue. Form the pocket as before and hold it in place with a rubber band.
3. Pour a small amount of water into the pocket of the plain tissue. Water runs right through it. Carefully pour a small amount of water into the pocket of the Scotchguard treated tissue. The water should stay in the tissue.
4. Eventually, the water will leak through after several minutes. If the demonstration doesn't work perfectly the first time, keep practicing. Check:
   * Did you coat the tissue with enough Scotchguard™? Sometimes two coats of Scotchguard™ work better.
   * Did you wait for the Scotchguard™ to dry completely?
   * Did you pour the water into the pocket gently? Have the cup sit on a flat surface and don't shake it or move it around.

Why it works:
The tissue is made of paper fibers which like and attract water. When you pour water into a regular tissue, water is attracted to the paper fibers and runs right through small holes in the tissue.

Scotchguard™, however, doesn't like water and repels it. When the tissue is coated with Scotchguard™, the water is repelled before it can reach the paper fibers. Eventually, the water will leak through the small holes in the tissue between the paper fibers, but the Scotchguard™ slows this down a lot.



Mystery Sand

How would sand behave if it was covered with Scotchguard™? This is what mystery sand is like. Put some in water and see what happens.

Materials:
1. Mystery Sand (also sold as Magic Sand in toy stores)
2. Clear plastic, low 9-ounce cup
3. Spoon

How to do it:
1. Put water into the cup until it is half-full.
2. Use a spoon to sprinkle and then pour a small amount of mystery sand into the water. The sand will float on the top and then sink to the bottom.

   The sand sticks together and will form underwater towers and other patterns.
3. Reach in with your fingers or use a spoon and remove some of the mystery sand from the water. It should be dry with just a few beads of water caught on it.
4. After you are done pour off the excess water from the mystery sand. Blot the sand with a paper towel and let it dry so it can be used again.

Why it works:
Mystery sand is a very smooth sand which has been dyed and covered with a silicone coating similar to Scotchguard™.

Regular sand likes and attracts water, which is the reason sand gets wet easily. The silicone coating sticks to the sand but doesn't like water and repels it. When sand is covered with this silicone coating it also repels water.

When you put mystery sand in water, the best way it can try to avoid water is to stick to itself. This is why it behaves so strangely and forms clumps in water.

Goldenrod Paper

If you want to make mysterious red writing appear and then disappear you need to use goldenrod colored copier paper and some household chemicals.

Some goldenrod paper is colored with a natural spice called **turmeric**. Turmeric is also a natural acid-base indicator like litmus paper. Turmeric turns red around bases and golden yellow when it is around acid.

Materials Needed:
1. Goldenrod paper
2. Cotton swab
3. Small cups
4. Lemon juice
5. Washing soda
6. Spoons

How to do it:
1. Before the demonstration, pour lemon juice into a small cup. Fill a second small cup with water and add 1/4 teaspoon of washing soda. Stir to dissolve the washing soda. Label each cup so you know what is in it.
2. Dip a cotton swab into the washing soda. Write on a piece of goldenrod paper with the wet swab. The paper should turn red where the washing soda solution touches it.
3. After a minute, try to make the red writing disappear by rubbing over it with a cotton swab dipped in lemon juice. It may take a few seconds for the red color to fade. If your red writing won't fade, your washing soda solution is too strong. Add more water to dilute it and try again.

Why it works:
Every chemical can be put into one of three categories. It will be either an acid, a base, or it will be neutral if it is not an acid or a base.

Acids have a sour taste and make baking soda fizz. Examples of acids are vinegar, lemon juice, tang, and soda pop.

Bases have a bitter taste and are slippery feeling when wet. Bases are excellent cleaners. Examples of bases are baking soda, washing soda, soap and antacids.

The turmeric used to color the goldenrod paper is called an **indicator chemical**. When it is wet with a base it turns red. When it is wet with an acid it turns golden yellow. When both an acid and a base wet turmeric, whichever is the strongest will determine what color the turmeric turns.

The goldenrod paper turns back to golden yellow when the lemon juice becomes stronger than the washing soda solution. If the washing soda solution is stronger, it will stay red.

Touch-It Heat Sensitive Paper

Have you ever wondered how mood rings worked? Some chemicals called liquid crystals and a few dyes change color when their temperature changes. Touch this paper and see what happens.

Materials Needed:
1. Touch-it heat sensitive paper

How to do it:
1. Pick up a piece of the paper and hold it pressed between your hands. Wait a few seconds and take your hands away. Did the paper change color? If it didn't hold it again for a longer time.
2. Put the paper close to your mouth, but not touching, and blow on it. The color should change where the warm air touched it.
3. If you are demonstrating this to a group, have them pass the paper from one person to another. See if they notice the color change as the paper warms up.

Why it works:
Touch-it heat sensitive paper is coated on one side with a dye that is sensitive to temperature. Each dye has a cool temperature color and a warm temperature color. (White is also a color.)

When the paper is at room temperature it is the cool color. The warmth of your body is usually enough to heat up the paper to change it to its warm color. This is easier to do in a warm room than a very cold one. When the paper cools again, it will change back to the cool color again.

Material List for *Science Activities*

Piezo Popper

Tub contents:

- ☐15 Piezo Popper kits in a 2-gallon bag
- ☐20 eye droppers in a quart bag
- ☐1 fully assembled piezo popper
- ☐Safety goggles or glasses

You provide:

- ☐Copy of "A Film Canister Explosion" sheet for each girl
- ☐3-4 rolls of black electrical tape
- ☐1 bottle of 91% or 99% isopropyl alcohol (rubbing alcohol)
- ☐1 package of ballpoint pens
- ☐35mm film canisters (as many as you can get)
- ☐Scissors (1 pair for every 3-4 girls)

Star Party

Tub contents:

- ☐1 pre-made Edmund Star and Planet Locator
- ☐1 pre-made StarFinder
- ☐1 compass
- ☐1 large sheet of red film
- ☐1 Edmund Sky Guide

You provide

For each girl:

- ☐Copy of StarFinder masters (on card stock) – 3 pieces
- ☐Flashlight
- ☐Tape
- ☐Scissors

For each girl (optional):

- ☐Copy of "StarFinder" directions
- ☐Copy of "Star Party Guidelines"

Create a Marketable Product

Tub contents:

- ☐1 bottle of Guar Gum
- ☐1 box of 20-Mule Team Borax® in a 2-gallon bag
- ☐1 Glow Factory Slime Kit in a 2-gallon bag
- ☐1 sleeve medicine cups in a gallon bag
- ☐Safety goggles or glasses

You provide:

For each girl:

- ☐9-ounce clear plastic cup
- ☐Plastic spoon

Additional supplies:

- ☐1-cup measure (Ideally, 1 for every 2-3 girls)
- ☐1 package of food coloring
- ☐1 gallon of distilled water (1/2 cup per girl)
- ☐Resealable plastic sandwich bags (1-2 per girl)
- ☐Paper towels
- ☐Paper or plastic table covering
- ☐Measuring Spoons (optional)

Baby Bird Kite

Tub contents:

- ☐Kite and reel patterns in a gallon bag

You provide:

For each girl:

- ☐Plastic grocery bag (or other recycle code 2 HDPE bag) (Have extras on hand)
- ☐Sharp scissors (for every 2 girls)
- ☐Tape (for every 2 girls)
- ☐Two 7-3/4-inch plastic straws
- ☐Copy of "Kite Tail/Kite Body" pattern on thin cardboard or posterboard
- ☐Copy of "Cardboard Kite Reel" pattern on thin cardboard or posterboard
- ☐Copy of "Baby Bird Kite Instructions"
- ☐Copy of "A Brief Guide to Safe and Sure Kiting"

Additional supplies:

- ☐Several rolls of crochet thread
- ☐Permanent Markers
- ☐Pieces of thin cardboard or posterboard (for extra kite reels and kite bodies) (Cardboard should be thin enough to cut with scissors and no thicker than the back of a legal pad.)

Chemistry Show

Tub contents:

- ☐1 bottle of sodium polyacrylate
- ☐1 ream of goldenrod paper in a 2-gallon bag
- ☐1 box washing soda in a 2-gallon bag
- ☐1 bag of magic sand in a quart bag
- ☐1 bag bamboo skewers
- ☐1 can Scotchguard® spray
- ☐30 sheets of heat sensitive paper in a manila envelope

You provide:

For each girl, for each show:

- ☐2 identical Styrofoam cups
- ☐Water
- ☐Plastic spoon
- ☐Several inexpensive 8- or 9-inch round balloons
- ☐Small amount of vegetable oil
- ☐1 Box of facial tissues
- ☐3 Tall 10-ounce clear plastic cup
- ☐2 Rubber Bands
- ☐Newspaper
- ☐1 clear, low, plastic 9-ounce cup
- ☐Cotton Swab
- ☐Small cups
- ☐Lemon Juice
- ☐Copy of "Chemical Safety Guidelines" and "Super Science Showmanship Tips" for each girl
- ☐Copy of "Disappearing Water Trick",
  - ☐"Skewer a Balloon",
  - ☐"Water Proof Tissue",
  - ☐"Mystery Sand",
  - ☐"Goldenrod Paper", and
  - ☐"Touch-It Heat Sensitive Paper" for each girl

Bridging the Gap
Science Activities
Troop Leader Survey

Today's Date: _____ Number of Girls Participating: _____

1. Approximately how long did you spend on each of the following activities?

Piezo Popper	**_____ minutes**	**Baby Bird Kite**	**_____ minutes**
Star Party	**_____ minutes**	**Chemistry Show**	**_____ minutes**
Create a Marketable Product	**_____ minutes**		

2. What activity did you or your girls enjoy the most, and why?

3. What activity did you or your girls like the least, and why?

4. Were your girls interested in exploring any of the activities further? ☐Yes ☐No

5. Which one(s)?

6. What did you do to fulfill that interest?

7. What can we do to make this more successful for your girls?

Thank you for your help and for your opinions!!!

Please return all forms to: _____

_____

_____

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We encourage you to visit our website at www.bridginggap.org. *Let us hear from you!*