



### *What are meteoroids, meteors, and meteorites?*

#### Space Concepts:

- Meteoroids are pieces of comets, asteroids, and space dust moving in deep space.
- Sometimes a meteoroid is pulled into Earth's atmosphere. When it enters Earth's atmosphere, it is a meteor.
- Most meteors burn up in the atmosphere, but those that land on Earth are called meteorites.

**Vocabulary:** meteoroid      meteor      meteorite

**Read:** *Lots of Science Library Book #20.*

#### Activities:

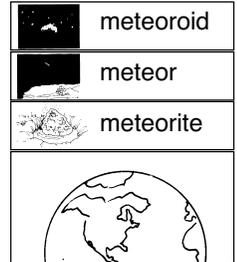
##### Meteor, Meteoroid, Meteorite – Graphics Organizer

**Focus Skill:** classifying

**Paper Handouts:** 2 sheets of 8.5" x 11" paper      a copy of Graphics 20A–D

**Graphic Organizer:** Make a Layered Look Book with 1" tabs. Turn the book so the fold is at the bottom. Glue Graphic 20A on the cover, 20B on the next tab up, 20C on the second tab up, and 20D on the top tab.

- ✍ On each tab, write/copy the name of the object, starting at the top: *meteoroid, meteor, meteorite.*
- ✍✍ Complete ✍. On each page, write clue words about each picture: *meteoroid – small pieces of comets, asteroids, or space dust; meteor – moves into Earth's atmosphere, friction causes fireball and tail effect; meteorite – reach Earth's surface, creates craters.*
- ✍✍✍ Complete ✍✍. Explain why the tail appears on the meteor. Research the Ahnighito, Hoba, or Great Barringer Crater. Write a short paragraph on the back of the Layered Look Book about the research.



##### Meteorites Make Craters

**Focus Skill:** drawing conclusions

**Activity Materials:** deep plastic pan or a sandbox      sand  
balls of various weights and sizes (steel ball, marble, billiard ball, etc.)

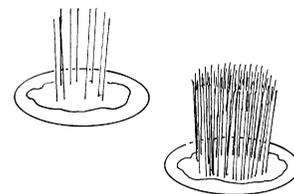
**Activity:** Fill the pan with sand. Drop one ball into the sand. Carefully remove the ball and look at the crater. Drop another ball and do the same. Compare the craters. Try dropping the balls from different heights.

**Discuss the Activity:** What size crater did the small ball make? What size crater did the large ball make? What size crater did the heavy ball make? What size crater did the light ball make? What can you conclude about crater size in relation to the various sizes of balls?

## Meteors Spread Out – Observation Activity

**Focus Skill:** explaining a concept

**Activity Materials:** uncooked spaghetti modeling clay or dough flat plate



**Activity:** Flatten the clay on the plate so that most of the plate is covered. One by one, stand pieces of spaghetti vertically into the clay, covering the plate. The spaghetti represents dust particles in a meteor shower as they enter Earth's atmosphere. Look down on the plate full of spaghetti.

**Discuss the Activity:** What do you see? The spaghetti pieces should look like they are spreading out from the center of the plate. How does this illustrate the appearance of a meteor shower from Earth? **Possible answer:** Although meteors travel in parallel paths, as they burn up they appear to spread out from a single point.

## Timeline

**Paper Handouts:** Space Timeline Book a copy of Graphic 20E

**Graphic Organizer:** Glue Graphic 20E to the correct page in the Space Timeline Book.



## Experiences, Investigations, and Research

Select one or more of the following activities for individual or group enrichment projects. Allow your students to determine the format in which they would like to report, share, or graphically present what they have discovered. This should be a creative investigation that utilizes your students' strengths.



1. Observe the night sky, watching for a "falling star" or meteor. Keep track of your observations, noting if more meteors are seen after midnight or before.



2. Obtain the dates of possible meteor showers in your area and mark your calendar. Plan an observation party.



3. Investigate how the Great Barringer meteor crater in Arizona was named and why it should be called the Great Barringer meteorite crater. Note that all meteorites are named after a geographic location. Meteorites belong to the owners of the property on which they fall. Meteorites that fall on government property in the U.S. belong to the Smithsonian Institute.



4. Compare and contrast the two types of meteoroids: cometary meteoroids (particles shed from comets), and asteroidal meteoroids (microscopic to large particles of asteroids).



5. Use the Internet to discover what micrometeorites are and where they are found.



6. Make a table recording the name, location, size, weight, and composition of famous meteorites.



 7. Read and discuss *Call Me Ahnighito* by Pam Conrad.   

 8. Read an excerpt from “The Rime of the Ancient Mariner” by Samuel Taylor Coleridge. Do you think seeing a meteor shower may have inspired him?   

The upper air burst into life!  
And a hundred fire-flags sheen,  
To and fro they were hurried about!  
And to and fro, and in and out,  
The wan stars danced between.  
And the coming wind did roar more loud,  
And the sails did sigh like sedge;  
And the rain poured down from one black cloud;  
The Moon was at its edge.

 9. Using an Internet Search Engine, research meteoroids, meteors, and meteorites.

# Great Science Adventures



## *Lots of Science Library Books*

Each *Lots of Science Library Book* is made up of 16 inside pages, plus a front and back cover. All the covers to the *Lots of Science Library Books* are located at the front of this section. The covers are followed by the inside pages of the books.

### **How to Photocopy the *Lots of Science Library Books***

As part of their *Great Science Adventure*, your students will create *Lots of Science Library Books*. The *Lots of Science Library Books* are provided as consumable pages which may be cut out of the *Great Science Adventures* book at the line on the top of each page. If, however, you wish to make photocopies for your students, you can do so by following the instructions below.

To photocopy the inside pages of the *Lots of Science Library Books*:

1. Note that there is a "Star" above the line at the top of each *LSLB* sheet.
2. Locate the *LSLB* sheet that has a Star on it above page 16. Position this sheet on the glass of your photocopier so the side of the sheet which contains page 16 is facing down, and the Star above page 16 is in the left corner closest to you. Photocopy the page.
3. Turn the *LSLB* sheet over so that the side of the *LSLB* sheet containing page 6 is now face down. Position the sheet so the Star above page 6 is again in the left corner closest to you.
4. Insert the previously photocopied paper into the copier again, inserting it face down, with the Star at the end of the sheet that enters the copier last. Photocopy the page.
5. Repeat steps 1 through 4, above, for each *LSLB* sheet.

To photocopy the covers of the *Lots of Science Library Books*:

1. Insert "Cover Sheet A" in the photocopier with a Star positioned in the left corner closest to you, facing down. Photocopy the page.
2. Turn "Cover Sheet A" over so that the side you just photocopied is now facing you. Position the sheet so the Star is again in the left corner closest to you, facing down.
3. Insert the previously photocopied paper into the copier again, inserting it face down, with the Star entering the copier last. Photocopy the page.
4. Repeat steps 1 through 3, above, for "Cover Sheets" B, C, D, E, and F.

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Note: The owner of this book has permission to photocopy the *Lots of Science Library Book* pages and covers for classroom use only.



## **How to assemble the *Lots of Science Library Books***

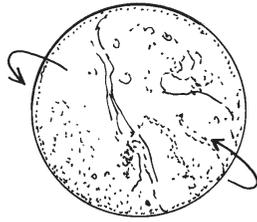
Once you have made the photocopies or cut the consumable pages out of this book, you are ready to assemble your *Lots of Science Library Books*. To do so, follow these instructions:

1. Cut each sheet, both covers and inside pages, on the solid lines.
2. Lay the inside pages on top of one another in this order: pages 2 and 15, pages 4 and 13, pages 6 and 11, pages 8 and 9.
3. Fold the stacked pages on the dotted line, with pages 8 and 9 facing each other.
4. Turn the pages over so that pages 1 and 16 are on top.
5. Place the appropriate cover pages on top of the inside pages, with the front cover facing up.
6. Staple on the dotted line in two places.

You now have completed *Lots of Science Library Books*.



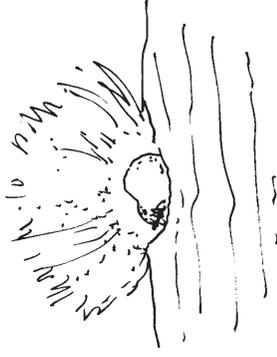
**What do we know about Pluto?**



*Lots of Science Library Book #18*



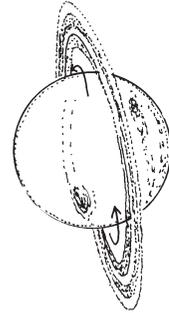
**What are meteoroids, meteors, and meteorites?**



*Lots of Science Library Book #20*



**What do we know about Neptune?**



*Lots of Science Library Book #17*



**What are comets?**



*Lots of Science Library Book #19*





Although a meteorite may look like an ordinary Earth rock, scientists analyze meteorites to gain a better understanding of the universe.



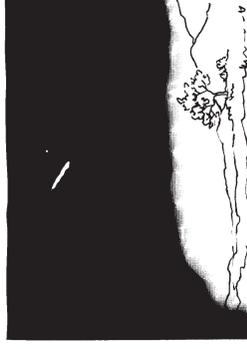
Meteoroids are small pieces of comets, asteroids, or space dust moving through space.



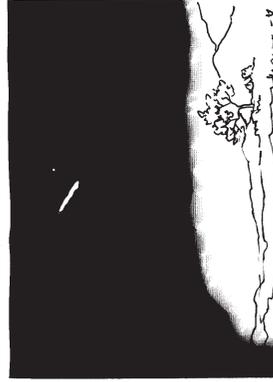
Scientists believe that about 100 giant craters around the world were created by huge meteorites. The Great Barringer Meteor Crater is located in Arizona. It is about 560 ft deep and about 4,150 ft wide (171 m deep and about 1,265 m wide).

The largest known meteorite was found in Africa in 1920. It was about 9 feet by 8 feet (2.74 m x 2.4 m) weighing over 60 tons (59 tonnes). This meteorite was named Hoba. The hole created by a meteorite when it lands is called a crater.

Friction between a meteor and the Earth's atmosphere causes the meteor to burn up, producing the effect of a bright fireball with a trail of light.



When a meteoroid moves into Earth's atmosphere, it is called a meteor.



Sometimes meteorites break apart when they land. Admiral Robert Peary discovered the Ahnighito meteorite in Greenland in 1894. Within seven miles of this location, two smaller meteorites were found.



During a meteor shower or storm, meteors travel in parallel paths. From Earth, the meteors appear to spread out from one point in the sky.



On average, 10 meteors can be seen every hour in the night sky. When several dozens of meteors are seen in an hour, it is called a meteor shower. If thousands of meteors are seen in an hour, it is called a meteor storm.

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Most meteors burn up completely before reaching the ground. However, if one is big enough to reach the Earth before it burns up, it is called a meteorite.



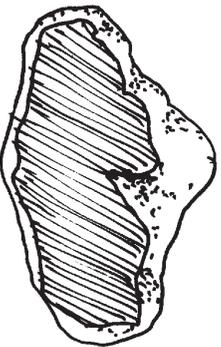
8 Lots of Science Library Book #20

The composition of all three meteorites was the same, indicating they were once part of a larger piece. Eskimos used parts of the meteorite for making spears, knives, and needles.



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There are three main types of meteorites: iron meteorites, stony meteorites, and stony iron meteorites.



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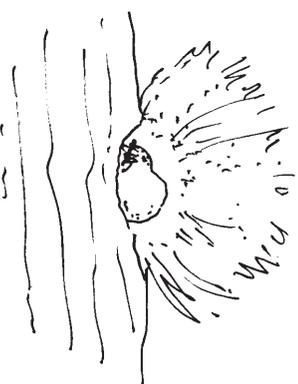
On a clear night, sometimes we see what looks like a star falling down. This is commonly called a “shooting star” or a “falling star.” Actually, it is not a star. It is a meteoroid being pulled into the Earth’s atmosphere by gravity.

2 Lots of Science Library Book #20

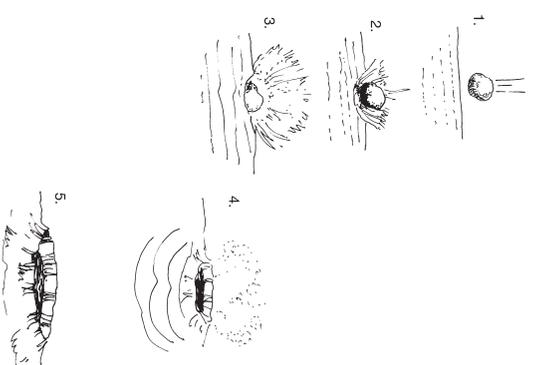
Rub your hands together quickly. The movement of your hands rubbing against each other creates heat. This is called friction.



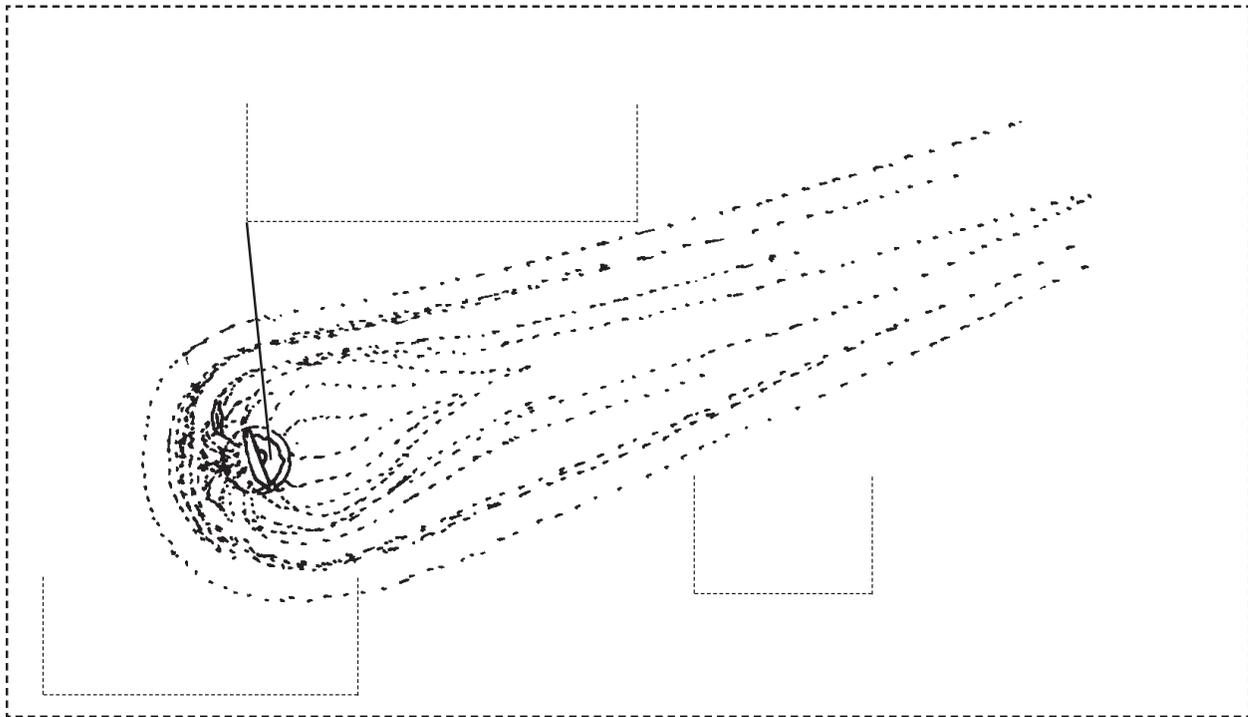
4 Lots of Science Library Book #20



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Timeline 19B

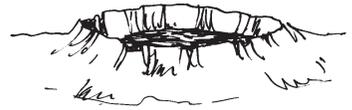
In 1949, American astronomer Fred Whipple described comets as "dirty snowballs."

A smaller version of the comet diagram from 19A, showing the nucleus, coma, and tail. It is enclosed in a dashed rectangular border.

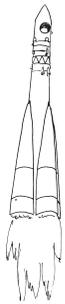
Timeline 19C

English astronomer, Edmund Halley (1656-1742) correctly calculated that the comet he saw in 1682 would reappear in 1758.

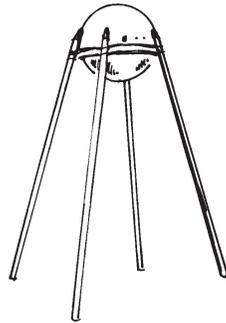
A line drawing of Edmund Halley's head and shoulders. He is looking towards the right. A comet tail is shown extending from the right side of the frame towards the center, pointing towards him. The entire illustration is enclosed in a dashed rectangular border.



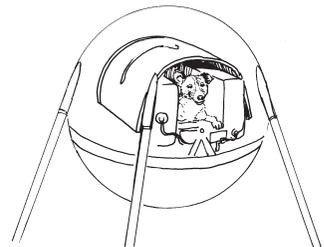
In 1894, Admiral Robert Peary discovered the Ahnighito meteorite in Greenland.



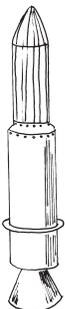
A Russian scientist Konstatin Tsiolkovsky (1857-1935) first developed theories that led to the multi-stage rocket.



In October 1957, the USSR launched *Sputnik 1*.



In November 1957, the USSR launched *Sputnik 2* with the first living animal aboard, a dog named Laika.



In January 1958, the U.S.A. launched their first satellite, *Explorer 1*.



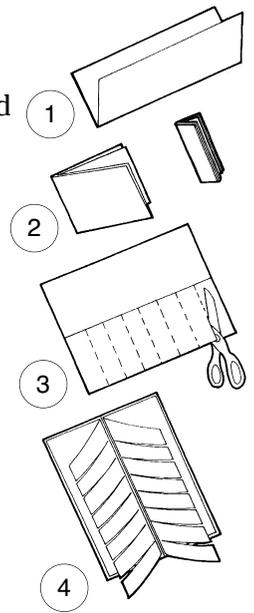
In January 1961, the U.S.A. sent Ham, a chimpanzee in a *Mercury* spacecraft. Ham returned safely.



In April 1961, Yuri Gagarin of the USSR became the first man to orbit Earth in the *Vostok 1*.

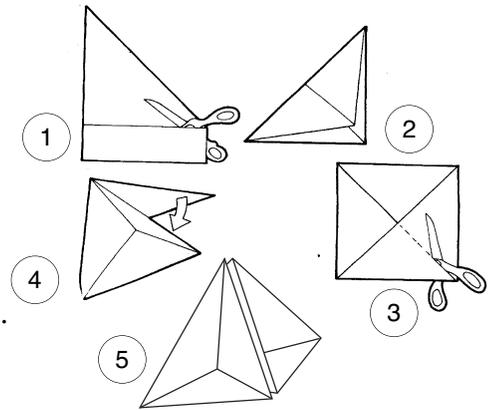
## Vocabulary Book

1. Take two sheets of paper and fold each sheet like a Hot Dog.
2. Fold each Hot Dog in half like a Hamburger. Fold each Hamburger in half two more times and crease well. Unfold the sheets of paper, which are now divided into sixteenths.
3. On one side only, cut the folds up to the Mountain top, forming eight tabs. Repeat this process on the second sheet of paper.
4. Take a sheet of construction paper and fold like a Hot Dog. Glue the back of one vocabulary sheet to one of the inside sections of the construction paper. Glue the second vocabulary sheet to the other side of the construction paper fold.
5. Vocabulary Books can be made larger by gluing them "side-by-side."



## Pyramid Project

1. Fold a sheet of paper into a Taco.  
Cut off the excess tab formed by the fold.
2. Open the folded taco and refold it the opposite way, forming another taco and an X fold pattern.
3. Cut up one of the folds to the center of the X and stop. This forms two triangular-shaped flaps.
4. Glue one of the flaps under the other flap, forming a pyramid.
5. Set the Pyramid up on one end or glue two or more together to make a diorama.



## Layered Look Book

1. Stack two sheets of paper and place the back sheet one inch higher than the front sheet.
2. Bring the bottom of both sheets upward and align the edges so that all of the layers or tabs are the same distance apart.
3. When all tabs are an equal distance apart, fold the papers and crease well.
4. Open the papers and glue them together along the Valley/center fold.

