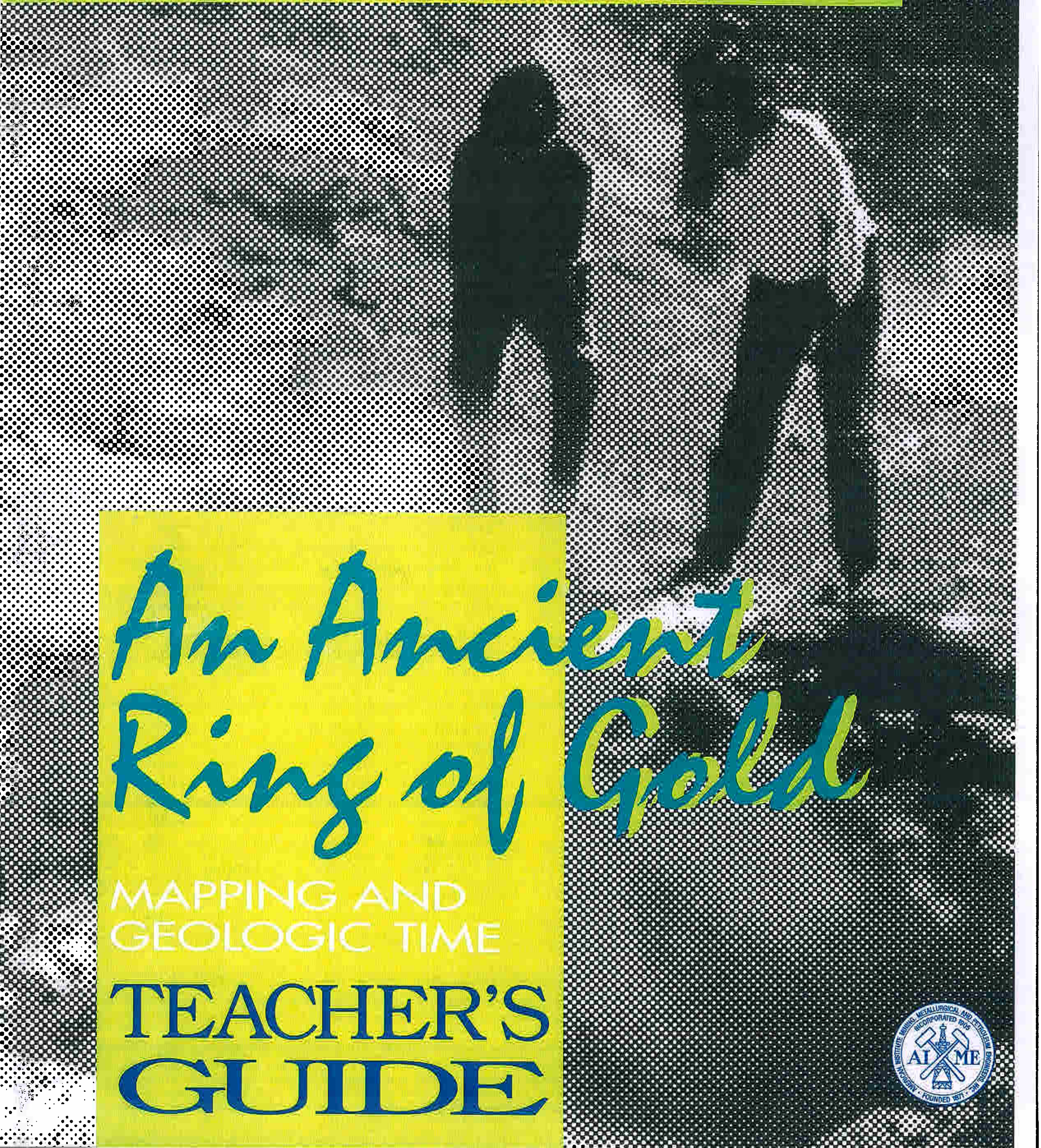
B

TRANSFORMATIONS
SCIENCE, TECHNOLOGY & SOCIETY



An Ancient Ring of Gold

MAPPING AND GEOLOGIC TIME

TEACHER'S GUIDE

Program Goals

- ▲ to enhance and enrich science instruction in Middle School classrooms
- ▲ to explore ways that technology takes scientific knowledge and applies it to meeting society's needs and solving society's problems
- ▲ to foster among students a spirit of inquiry, encouraging and developing their problem-solving skills
- ▲ to help create citizens who are cricital thinkers, prepared to make informed decisions about complex social/technological issues that will confront them in decades to come

1B AN ANCIENT RING OF GOLD

Mapping and Geologic Time

Gold has always had strong associations for people, as the video for this unit demonstrates. A visit to the largest gold mine in North America examines modern day gold prospecting technolgy. The topics for "An Ancient Ring of Gold," developed in this Guide, are

- ▲ Geologic Time
- ▲ Rock Formations
- ▲ Topographic Maps

Curriculum Connections: Earth Science, General Science; a social studies lesson on maps or on civilizations, such as the Ancient Egyptians or Incans, that valued gold

Summary of the Video

As Laurie recounts to the band what she did on her birthday, she proudly displays a gift—a gold ring that is a treasured family heirloom. The other members react to the magical word 'gold': AJ and Simone speak of its long-lived mystical and historical values, while Billy rhapsodizes about its economic value. The band's musings lead to their performing the song "Shine for Centuries."

As the song ends, Laurie is discovered in the northeastern Nevada desert. She is visiting the Newmont Gold Company and talking with a team of modern-day gold prospectors. Phyllis Halvorson, a geophysicist, shows Laurie how she uses the technology of satellite photography and advanced tools such as the magnetometer and gravity meter to decide which desert sites look most promising for finding gold. She also tries to give Laurie a sense of the vast passages of time that are part of a geological timetable. Then Brad Leach, a geologist, takes Laurie out to one promising site and demonstrates how he collects samples and makes observations.

The samples are sent to Todd Wakefield, a geochemist, who explains how he interprets the data of the rock analysis and plots the results on a map.

The three team members discuss the importance of teamwork in reaching their final conclusion—whether a particular gold deposit is big enough to make it worthwhile to dig a mine.

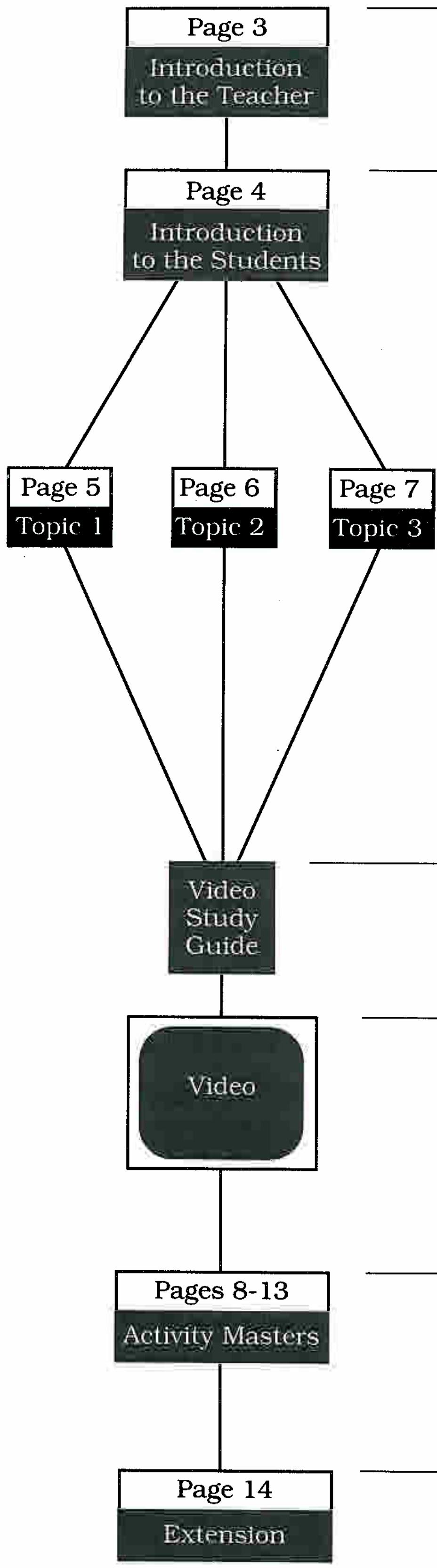
The theme song for this unit is "shine for Centuries":

Moonlight shines in mystery
Diamonds shine so cold
Sunlight sparkles in the sky
But nothing shines like gold.

This ring will shine for centuries
Or longer, so I'm told
So tell me that you love me, please
And wear my ring of gold.

True love is pure and precious
It can't be bought or sold
So tell me that you love me, please
And wear my ring of gold.

Suggestion for Using Unit B: "An Ancient Ring of Gold"



Here you will find additional background information on the science and technology presented in "An Ancient Ring of Gold"

This section gives you material for introducing "An Ancient Ring of Gold" to your students, including a statement of the purpose of the unit; suggestions for connecting the unit to students' experience; definitions of key concepts and terms; and directions for the Video Study Guide (see below).

These pages focus on the three topics in "An Ancient Ring of Gold": Geologic Time, Rock Formation, and Topographic Maps. Each page furnishes options for introducing the topic to students and a wide array of ways for students to respond to the topic, including labs that are carried out through the Activity Masters.

Choose any of the topics as your focus, depending on where you are in the curriculum.

You can use the video guide (Activity Master 1) to focus students' attention on and check their comprehension of the video.

Running time for the video is 16 minutes. You may want to preview the video and choose a Stop Point for conducting a discussion, carrying out an activity, or making a comprehension check. The video may also be show straight through.

The first blackline master is the Video Study Guide for "An Ancient Ring of Gold". The other masters give students hands-on opportunities in the form or activities and labs.

This final section includes suggestions for science fair projects and research topics, ones that build on concepts explored in "An Ancient Ring of Gold" Also listed are related resources for interested students to pursue, including book titles and organizations to contact

ANCIENT RING OF GOLD: An Introduction for the Teacher

"An Ancient Ring of Gold" uses modern-day gold prospectors and their technological tools as a springboard for examining how rocks are formed, realizing the vast amounts of time involved in these processes, and seeing some of the ways in which maps can be used to express geological information.

Below is a fuller explanation of and additional information about concepts presented in the video and developed in this Guide.

How has the accepted geologic age of the earth—at least 4.5 billion years old—been determined?

The oldest fossil-containing rocks are about 3.5 billion years old; the Morton Gneiss in Minnesota is part of this ancient layer. However, evidence points to the earth's being much older than 3.5 billion years. Calculations based on the decaying rates of the radioactive isotopes Uranium-238 and Uranium-235, or on the lead isotopes derived from the decaying of these isotopes, have yielded various estimates: not older than 5.5 billion years, no more than 6 billion years, older than 6 billion years.

Another estimate comes from the study of meteorites. Because of chemical similarities between meteorites and rocks on Earth, it is generally assumed that meteorites and Earth have a common origin and were formed as solid objects at about the same time during the evolution of the Solar System. These estimates make the earth about 4.5 billion years old.

Thus, the working hypothesis is that the earth is **at least** 4.5 billion years old.

What is the significance of a rock formation and how is it named?

For convenience, geologists group together rock beds that adjoin and possess similar or related features, including fossils, into a single, more conspicuous unit—a formation. Once the component beds of each formation have been described and the formation given a name, the information is published for use by all geologists. Formation names—*e.g.*, the Wingate Sandstone—are typically two words. The first is most often taken from a nearby geographic feature or locale, while the second indicates the principle rock type or mixed rock type.

How is gold deposited?

Gold commonly occurs in combination with a host of other metallic elements. More than a third of the gold produced in the United States is the byproduct of mining other metallic ores.

These deposits are the result of molten rock from the Earth's core intruding into surface rocks. This intrusive released a hot, mineral-rich solution into the surrounding rocks. As the solution cooled, the minerals crystallized, filling cracks or pores in the rock. Since different minerals crystallize at different temperatures and pressures, they crystallize at different distances from the molten rock. This creates mineral zones around the intrusive.

How is gold found?

One way to discover gold is to look for molten rock that has cooled to form granite. Because of its high iron content, granite can be located using magnetic maps or by using tools such as a magnetometer, which detects weak magnetic fields in crystalline rock. Granite also shows up on gravity maps or by using a gravity meter, since granite is denser than surrounding rocks.

Prospectors have long relied on the fact that gold is often associated with certain other minerals. For example, gold and magnetite often occur together in ore veins. When they weather out of eroding rock, both minerals commonly occur in the same "placer" deposits (ore deposits that have chipped off the end of a protruding vein and have been washed into canyons or stream beds). As they pan for gold, the prospectors look for the easily spotted magnetite ("black sand"), knowing that the same sediment could contain grains or nuggets of gold.

ANCIENT RING OF GOLD: An Introduction for Students

Introducing the Unit

Present the goals of "Ancient Ring of Gold" to students:

- ▲ to learn about modern-day gold prospectors and the technology they use to choose sites for new gold mines;
- ▲ to explore how rocks are formed;
- ▲ to get a sense of the huge amounts of time involved in the evolution of the earth and its rock formations;
- ▲ to see how different maps can represent different information about what is on top of and below the earth's surface.

They should not feel, however, that they are responsible for memorizing the technological processes and tools described in the video.

Connecting the Unit to Students' Experiences

Initiate a discussion about the value of gold to people. Some points to cover include the following:

- ▲ gold in myth and legend (King Midas)
- ▲ the part gold and golden objects played in many ancient civilizations;
- ▲ the part gold has played in human history (Medieval alchemists' search for the philosopher's stone, which turned lead to gold; the Conquistadores' ruthless search in the New World for El Dorado, the city of gold; California Gold Rush of 1849);
- ▲ the ongoing symbolism of gold, more than any other valuable minerals or precious stones, as something of the highest value and durability.

Key Concepts and Terms

Students will be exploring and extending their understanding of the words listed below (in bold face) by topic area. You might write these words on the board and briefly discuss them to determine which are familiar to your students.

Topic: Geologic Time

- ▲ **Geologic time** refers to the age of Earth and is expressed as at least 4.5 billion years old because the best estimates range from 4.5 to over 6 billion years.
- ▲ Geologic time is divided into three subdivisions:

  Eras: These are the major subdivisions. Each era has a set of typical plants and animals, and each begins and ends with an important geological activity—such as mountain building or climatic change.

  Periods: The older eras are subdivided into periods, which are also separated by important events, such as the beginning of a particular animal species.

  Epochs: The Cenezoic Era, which extends to modern time, comprises shorter subdivisions called epochs.

Topic: Topographic Maps

- ▲ A **topographic map** shows the changes in height and depth of a given land area. It may include human-built features.
- ▲ Changes in elevation are indicated by **contour lines**. A contour line connects points on the land that have the same elevation above sea level.
- ▲ Geologists also use **geologic maps**, which indicate the various rock formations found over a given land area and may include the ages of the rocks as well.

Topic: Rock Formation

- ▲ A **rock formation** is a group of adjoining rock beds that share related features, such as the kinds of fossils the beds contain or the principal kind of rock(s) found in the bed.
- ▲ The earth's core is so hot that the rock - forming material is liquid, or **molten**.
- ▲ Sometimes molten rock pushes up, **intrudes**, into rock beds near the surface. These **intrusives** eventually cool, and the minerals in them crystallize to form deposits that may contain **ore**.
- ▲ One clue to finding gold is to find molten rock that has cooled into granite, which has a high iron content and is thus **magnetic**. A **magnetometer** can detect and measure the presence of weak magnetic fields in crystalline rocks.
- ▲ Granite is also **denser** than surrounding rocks, and differences in rock density produce slight changes in the **gravitational field**, changes that can be detected by a **gravity meter**.

VIDEO STUDY GUIDE

To focus or direct students' viewing of the video, distribute Activity Master 1, the Video Study Guide. You might have your students work individually, or small groups could each be responsible for a particular section of the Study Guide. Allow time—stopping the video at various points or after the video is over—for students to discuss their responses.

ANCIENT RING OF GOLD: Geologic Time

Introducing the Topic: Options

▲ To impress on students the huge amount of time involved, use a metaphor similar to the one in the video: Ask them to imagine standing on the shore and looking out at the ocean, thousands of miles of water stretching in all directions, and to contrast this with a drop of water—the length of a single human life compared to the length of time the earth has existed

▲ Materials needed per lab group: **Activity Master 2; paper, scissors, markers, fasteners, etc. (to make a calendar).** Tell students that each group will be creating an unusual calendar: It will compress Earth's 4.5-billion-year history into a single year. The calendar begins on January 1, one second after midnight, when Earth forms from gases, and ends at midnight, December 31. The various important events and dates to be "celebrated" are listed on the Activity Master. After students have made their calendars and answered the questions on the sheet, have them share/discuss the results; encourage them to ponder how difficult it is to conceive of such huge amounts of time.

Answers: 1. 4.5 billion ÷ 365=12,328,767.12; 2. 4 hours; 3. example: Dinosaurs didn't last, almost as if they got too large to survive; 4. 160,000,000; 159,910,000 more years.

STUDENT INVOLVEMENT: OPTIONS

Indicates an activity that would take less than a class period.

Indicates an activity that could take most of a class period.

Indicates an activity that would go beyond the class period.

Discuss the Video

Video Guide notes can be used to help students answer these and other straightforward questions:

▲ What example does Phillis give Laurie to help her realize how long 35 million years is?

Has her look at mountains 50 miles way and says line of sand represents the length of her life.

▲ How do the band members react to the idea of gold?

AJ/Simone: has magic powers, gives eternal life, was worshiped—even though isn't useful; Laurie: sentimental value of ring, never rusts or tarnishes, lasts forever; Billy: its worth in money.

▲ A gold ring is often used to symbolize purity and eternity. Why?

Gold formed millions of years ago and it doesn't rust or tarnish, so it is a good representation for something lasting forever, never changing.

Discussion/Writing Assignment: Eternal Life

Ask students to respond to these questions: Would you like to be as old as the gold found in the earth? as old as Earth itself? If yes, would you want to stay the same—like gold—or change and evolve—like Earth? Explain your choices.

Activity: Of Time and Names

Assign three student teams one of the three eras—Paleozoic, Mesozoic, and Cenezoic. Have them use classroom or library reference books to find the Greek meanings of the era names as well as the origin of each component period/epoch. Students could also study the principal features delineating each period/epoch to come up with alternative names. Allow time for teams to present the results of their work to the class.

Activity: Making a Mega-Timeline

The groups in this activity could be within a class or involve several classes. Give students the opportunity to visualize and explore geologic time using a physically larger medium. Have them measure the largest space available at your school—gym, playground, football field—to see how long a time line, made from butcher paper or adding-machine paper, could be. This length determines the scale (years to inches). Each group takes a certain time span, using the events listed on Activity Master 2 as a starting point. Since they have more space to play with, they can use a geology or history textbook to add dates and events. Students should complete their time lines in class and then have a ceremony—to connect all the sections and to string the line up.

Homework: Millions and Billions

Give each student a sheet with 2500 question marks on it (50 rows of 50). Have them calculate how many sheets they need to produce a million "questions"; a billion "questions." Using the width of 1" of their textbook pages, how thick a stack of papers would they need for each?

Answers: 400; 400,000; depends on paper stock, but roughly 250 sheets = 1" so 400=1.6" and 400,000=16,000' or 133.33 feet.

ANCIENT RING OF GOLD: Topographic Maps

Introducing the Topic: Options

▲ As a brief introduction, explain the meaning of **topographic map** and **contour lines** (presented on Guide page 3). On the board, draw a "puddle" with densely packed contour lines and one with widely spaced lines. Ask students to explain which represents a steep mountain, which stands for a gentle hill, and why.

▲ After defining **topographic map** and **contour lines** (presented on Guide page 3), have students meet in brainstorming groups to determine why such maps would be useful to these people: a group planning a hike or a bicycle trip; highway planners; real-estate developers. When students discuss their brainstorming results, responses should show why such people would want to know the locations of features such as mountains, hills, and bodies of water, and why changes in elevation would be important.

▲ Materials needed: **variety of maps—topographic, geologic, city (showing streets), world (with different scales and projections), U.S. (*e.g.*, showing relief, culture, drainage basins), globe.** Have students identify the data each map presents and tell how the map scale helps in interpreting and displaying that data. Then ask them to brainstorm uses for each map.

STUDENT INVOLVEMENT: OPTIONS
Indicates an activity that would take less than a class period.
Indicates an activity that could take most of a class period.
Indicates an activity that would go beyond the class period.

Discuss the Video

Video Guide notes can be used to help students answer these and other straightforward questions:

▲ What tools does Phillis Halvorson use to determine promising sites for gold deposits? How do these help her?

Satellite maps "give clues of what's going on at the surface of the earth"; magnetometer measures magnetic forces in Earth, which can lead to gold at edges of instrusives; gravity meter measures variations in Earth's gravity—helps tell what kind of rocks are below surface.

▲ What does Brad do when he visits a promising site? What kind of map does he show Laurie?

Looks for faults and marks on map, take rock samples and notes location; topographic map.

Activity: Your Hometown

Materials needed: **A U.S. Geological Survey topographic quadrant map that includes your school and, if possible, enough surrounding land to contain students' homes.** These maps are available from the USGS (see Guide page 13 for address) and sometimes from local tourist information centers or camping supply stores. Provide one map per lab group, and prepare questions for students to answer about the map, such as these: How far north of the equator (latitude) is the upper right corner of the map? How far west of the prime meridian (longitude) is the upper right corner? What is the contour interval? Find your school on the map—between what two contour lines is it located? If sea level rose 100 feet, would your home be below or above water? What is the elevation of your home?

Activity: Reading a Topographic Map (Activity Master 3)

Have students work in pairs to complete the sheet, and allow time afterward for discussion of responses.

Answers: 1. 20′; 2. 1600′; 3. southwest—less steep; 4. line should be due east/west intersecting both peaks, 1.75 mi.

Activity: Crazy Contours

Invite students to make topographical "maps" to scale of familiar objects: a sneaker, iron, donut, thimble. Have them exchange maps to figure out one another's objects.

Activity: Topography and Geology (Activity Master 4, 2 pp)

Materials needed: **scissors, tape.** NOTE: This activity assumes students have good topographic map skills.

Answers: 1. 48,000 (4000x12); 2. 1100 ft.; 3. 10,000 ft.; 4. granite; high—granite contains iron; high—granite is very dense; 5. steep contour gradient=sudden change in slope; 6. upstream—near fault.

Homework: Map Math

Most of the topographic maps published by the U.S. Geologic Survey have a scale of 1:24,000 (inch to inch). How many feet does 1 inch represent on this map? Other USGS maps have scales or 1:250,000 and 1:500,000. About how many miles does one inch equal on each of these maps?

Answers: 2000 feet, 4 miles, 8 miles.

ANCIENT RING OF GOLD: Rock Formations

Introducing the Topic: Options

▲ Materials needed: **granite sample, mineral sample (*e.g.*, halite).** For a quick introduction, display the samples, and ask students to compare the two. Explain that a mineral is pure, made up of only one kind of material; the speckles in the granite are the individual component minerals.

▲ NOTE: This activity requires set-up time; results may take a few days to fully occur. Materials needed: **5 glasses, boiling water, 5 strings weighted at one end with paper clips, powdered alum, borax, epsom salts, copper sulfate, sodium hyposulfite.** Show students how crystals grow by doing this as a demonstration or lab activity. Explain that when minerals develop slowly from molten rock, they form crystals. Begin by mixing as much alum as you can into half a glass of boiling water. Drop the string into the solution, hanging the unweighted end over the side. As the solution cools, have students note the diamond-shaped crystals clinging to the string. Perform this experiment with the other minerals, and ask students to observe the differences in the crystals.

▲ Materials needed per lab group: **package of 3-2-1 Jello, hot water, pan.** Direct students to prepare this dessert. As it cools and settles into three layers, have them hypothesize why this happens (density differences). Connect this action to molten rock cooling as it moves upward. This lab can be done in opaque cups to show how core-sampling is done. Students discover how the layers settle by inserting a clear straw into the cooled jello

STUDENT INVOLVEMENT: OPTIONS
△ Indicates an activity that would take less than a class period.
▲ Indicates an activity that could take most of a class period.
⧗ Indicates an activity that would go beyond the class period.

△ Discuss the Video

Video Guide notes can be used to help students answer these and other straightforward questions:

▲ How do the band members react to the idea of gold?

AJ/Simone: has magic powers, gives eternal life, was worshiped—even though isn't useful; Laurie: sentimental value of ring, never rusts or tarnishes, lasts forever; Billy: its worth in money)

▲ What does Brad do when he visits a promising site?

Looks for faults and marks on map, take rock samples and notes location.

▲ What does Todd do?

Sends rock samples to lab, interprets data, plots on map.

▲ What decision does the exploration team have to make once they've found gold?

Is there enough to make it economical to put in a mine?

△▲ Group Discussion Possibilities

▲ AJ says gold "doesn't do anything." Do students agree that gold is pretty but useless? (Uses to consider are as dental fillings; in electronics, since it is an excellent conductor; to keep spacecraft cool in space by reflecting sunlight.)

▲ Tell students that rocks are often described as "pages of the earth's past." Ask why this is an effective metaphor. (Possible examples: rocks are in layers/sheets; fossils are like book illustrations; rocks can be "read" to find out what has happened to the earth)

▲ Activity: Gold in Modern Technology

Write to the Bureau of Mines (address is on Guide page 13) for this movie, available for free rental in 16mm film or VHS cassette.

▲ Activity: Mineral Resources in the U.S.

Point out that the United States is richly endowed with a wide array of minerals. Have students divide up into investigative teams, using classroom or library reference sources to find the answers to these questions: What are the three kinds of coal deposits found in the U.S.? What minerals are found in Alaska? in Illinois? in central Colorado? in western Texas? in California? etc.

Or, you could have students identify or find out what mineral resource(s) are closest to their town. How does this resource contribute to the local economy? Students could present their information in a brochure or poster, which they might later present to the Chamber of Commerce or to the town library.

VIDEO STUDY GUIDE

This guide is designed to help you get the most out of the video for "An Ancient Ring of Gold." Look over the questions below before you watch the video. Use the space under the questions to take notes. What does the video tell you in answer to each question?

1. How do the band members react—at the beginning and end of the video—to the idea of gold?

   A.J.

   Simone

   Laurie

   Billy

2. What tools does Phyllis Halvorson, a geophysicist, use to determine promising sites for gold deposits? How do these tools help her?

3. What example does Phyllis give Laurie to help her conceive of how long 35 million years is?

name: ______________________ class: ________ date: __________

VIDEO STUDY GUIDE, continued

4. What does Brad Leach, the geologist, do when he visits a promising site? What kind of map does he show Laurie?

5. What does Todd Wakefield, the geochemist, do?

6. What decision does the exploration team have to make once they have actually found gold?

7. What parts of the video did you like best? Why?

name: ______________________ **class:** ________ **date:** __________

MAKING AN EARTH LIFE CALENDAR

Make a calendar that fits all of Earth's history into one year. Use the events listed below as "holidays" to be celebrated. (The dates are approximate, of course, but use them as if they were exact dates.) Your calendar begins just after midnight on January 1, when the Earth is "born," and ends at the present—at midnight on December 31. When will each of your holidays occur?

After you finish your calendar, answer the questions below the chart

EVENT	YEARS BEFORE PRESENT
Earth forms	4,500,000,000
Earth cools– earliest fossil– containing rocks	3,500,000,000
Great swamps form in America and Europe	570,000,000
First fish appear	480,000,000
First reptiles appear	340,000,000
First dinosaurs appear	230,000,000
First mammals and birds appear	200,000,000
Rocky Mountains begin to be raised up	130,000,000
Dinosaurs die out	70,000,000
Gold forming in Nevada	35,000,000
First modern humans appear	90,000

1. Show how you figured out the scale of your calendar— how many Earth years are represented by each day?__________
2. The earliest humans appears about 2,000,000 years ago. How many hours before midnight, December 31, would that be? (Round to the nearest hour.) ________
3. People often refer to unsuccessful or outlandish ideas and objects as "dinosaurs." Why do you think that is?

   ____

   ____

4. According to the chart, for how many years did dinosaurs exist? ______________ Use the chart to figure out how many more years modern humans must exist to be as successful as the dinosaurs:

   ____

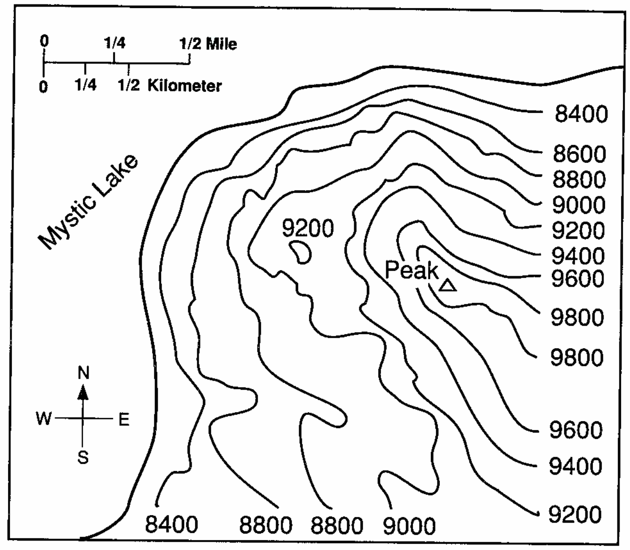
name: ______________________ class: ________ date: __________

READING A TOPOGRAPHIC MAP

A topographic map shows the position and elevation of land features by using contour lines. Each contour line connects points of equal elevation above sea level.

This is a a topographic map of Imaginary Mountain. Use the map to answer the questions below

TOPOGRAPHIC MAP



1. What is the contour interval, the difference between each line on the map? ________________

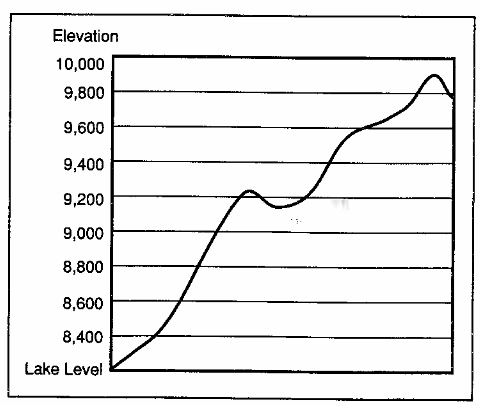
2. Approximately how high is the mountain peak above the surface of the water in Mystic Lake? ____________

3. You want to climb Imaginary Mountain. Which would be the easiest climb, coming up from the northwest or from the southwest? Why? ____

____

4. On the right is a cross section of Imaginary Mountain. Draw a line on the topographic map above showing the east-west path of this cross section. What is the distance the cross section makes from east to west?

____



name: ______________________________ class: _________ date: ___________

TOPOGRAPHY AND GEOLOGY

You are familiar with topographic maps and the contour lines they use to indicate points of equal elevation. When geologists explore sites, they use topographic and geologic maps, which show the type of rock over an area of land. Geologists take samples from outcrops, areas of exposed rock. They also look for sudden changes in the slope of an outcrop or in the type of rock. These changes may indicate a fault. All of this data can help geologists get a sense of what the rocks look like below the surface.

Cut around the diagram on page 2 of Activity Master 4, and fold along the dotted lines. Tape the triangular tabs under the end panels to form a block shape. The sides of the block show how the rocks look below the earth's surface. The top of the block is a topographic map. Use this block to answer the questions below.

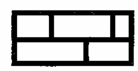
DIAGRAM KEY

Contour interval = 20 feet

Scale: 0 2000 4000

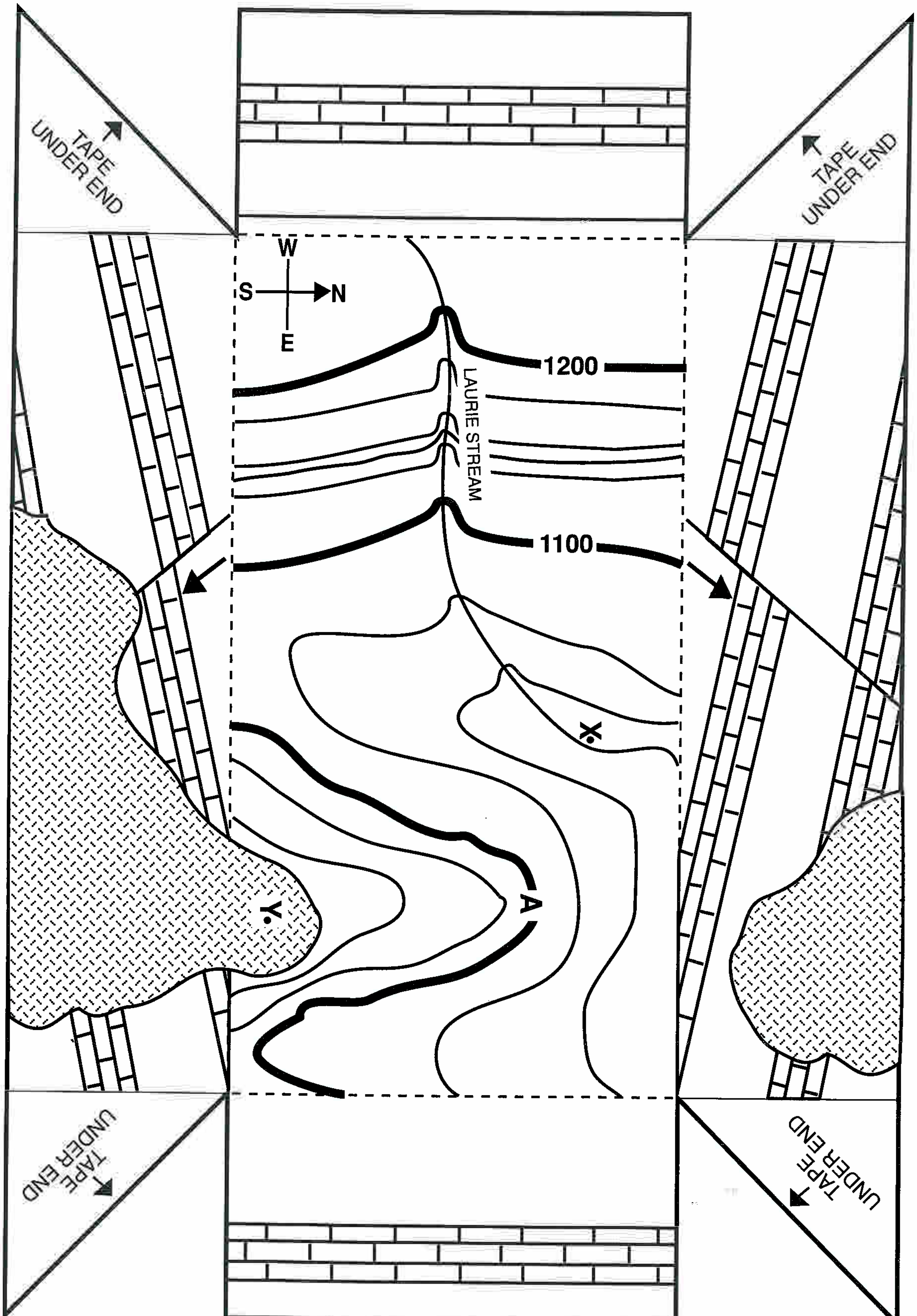
1 inch = 4000 feet

 = Granite

 = Limestone

1. How many actual inches does one inch on this block represent? __________
2. What is the elevation for contour line A? __________
3. What is the distance from point X to point Y? __________
4. What kind of rock outcrop is found at point Y? __________
   Would you expect a magnetic high or low here? Why?
   ____
   Would you expect a gravity high or low here? Why?
   ____
5. Find the fault on the side of the model. What evidence can you find for this fault on the topographic map?
   ____
6. Records show that prospectors found gold in Laurie Stream at point X in the 1800's. Where is the likely source of this gold?
   ____

name: __________ **class:** __________ **date:** __________



name: ______________________ class: __________ date: __________

ANCIENT RING OF GOLD: Extension

Interested students may wish to pursue ideas and concepts raised by this unit. You could direct them to the suggestions and resources listed on this page.

Possible Research Topics

- ▲ Find out the locations of the major gold fields in the U.S. Research the basic geology of each gold field area; does the area exhibit features you would expect to find associated with gold formation?
- ▲ What is the current price of gold? How has the price changed over the last five years? What has caused it to fluctuate?
- ▲ Talk with a jeweler to find out the difference between 10-, 14-, 18-, and 24-karat gold jewelry.
- ▲ Interview a geologist from a nearby college or university to find out about the geologic history of your region.

Suggested Science Fair Projects

- ▲ What is the effect of temperature on copper sulfate crystal growth?
- ▲ In the production of rock candy, what is the significance of the saturation of the solution?
- ▲ Explore the efficiency of a solar collector under different weather conditions.
- ▲ Compare and contrast the crystalline structure of Group I and Group II ions.
- ▲ What is the effect of electrical conductivity in crystals?

Resource Center

Books to recommend:

Dinosaur Dig by Kathryn Lasky (Morrow, 1990). Includes geological history.

Fossils by Roy Gallant (Watts, 1985)

From Map to Museum: Uncovering Mysteries of the Past by Joan Anderson (Morrow, 1988)

Gold and Other Precious Metals by Charles Coombs (Morrow, 1981)

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How Do They Find It? by George Sullivan (Westminster, 1975)

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Organizations to contact:

EROS Data Center
U.S. Geological Survey
Sioux Falls, SD 57198
(information on satellite imagery, aerial and space photography)

Newmont Gold Company
Public Relations
1700 Lincoln Street
Denver, CO 80203

Office of Public Information
Bureau of Mines
Department of the Interior
2401 E Street NW
Washington, DC 20241

Public Affairs Office
U.S. Geological Survey
12201 Sunrise Valley Drive
Reston VA 22092
(might ask for list of Mineral Investigations Resource—MR— or Geophysical Investigations—GI—maps)

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