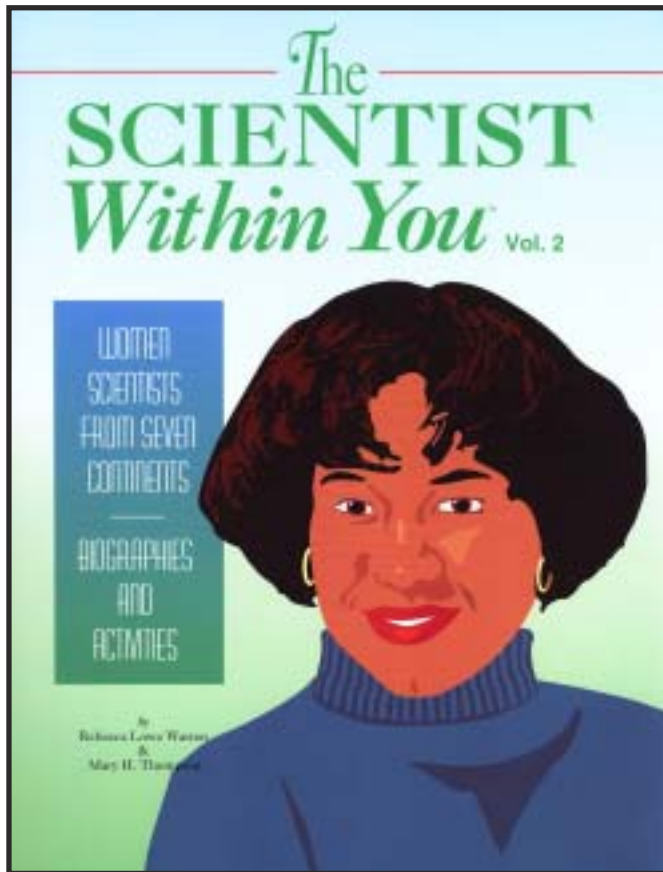


Sample Discovery Unit

Featuring Archaeologist Dr. Aslihan Yener



Included in this Sample Packet is one Discovery Unit on Dr. Aslihan Yener, an archaeologist from Turkey. Because Turkey is on the Asian continent the "Continental Summary" for Asia is included. Its format is the same for all the continents. For an example of "Bridging the Continents" we have chosen Venus Sahihi Pezeshk, a landscape architect living in Brazil, for her contributions towards global cooperation on environmental issues.

The Scientist Within You: Women Scientists from Seven Continents opens a world of possibilities. Written to help young people ages 10-15 discover science skills and history through hands-on experiments and activities inspired by the work of women scientists from around the world this second volume of **The Scientist Within You** series includes the following:

- Full biographies on 29 women scientists, mathematicians and engineers
- 24 Discovery Units offering extensive class activities, experiments, or projects
- 6 Bridging the Continents pages highlighting women whose work in science has intercontinental significance
- 7 Continental Summaries emphasizing an aspect of that continent's scientific history.

Women Scientists from Seven Continents is intended to celebrate the global successes of women in a variety of scientific fields. These women provide life stories and career images that positively impact girls' expectations of themselves and their performance in math and science. Each woman's enthusiasm may inspire both girls and boys to develop an interest in science that will be sustained throughout their educational experience.

This book may be purchased for **\$12.00** — less than 50% of its \$24.95 retail price. Volume one, **Experiments and Biographies of Distinguished Women in Science**, may be purchased at the sales price of **\$10.00**. If you wish to buy both books in **The Scientist Within You** series the price for the set is **\$20.00**.

Call 1-800-935-7323 or go to <http://www.scientistwithinyou.com>.

Tomorrow Belongs to the Children

Venus Sahihi Pezeshk — b. 1950

Global cooperation on environmental issues was the theme of the **United Nations Conference on Environment and Development** held in Rio de Janeiro, Brazil, in June 1992. Activities focusing on hopes for the future were a part of **Global Forum '92** which ran concurrently with this "Earth Summit."

Artwork and essays by thousands of children from around the world were submitted in a contest on the environment*. Winning entries were published in the book **Tomorrow Belongs to the Children** which, in turn, was given to all Non-Governmental Organizations and world leaders attending the Earth Summit. * *Organized by an NGO, The Bahá'í International Community.*



In this photograph, Pezeshk is presenting a copy of **Tomorrow Belongs to the Children** to James Grant, UNICEF Executive Director.

Venus S. Pezeshk, then Director of the Bahá'í Environmental office in Brazil, coordinated activities relative to the **Earth Summit** and the **Global Forum**. A landscape architect with her own firm, Pezeshk has served as special advisor to the government of the new State of Tocantins. In view of the state's strategic position in the Amazon region, Pezeshk has assisted in the first initiatives for the establishment of an environmental policy. In 1990 she was honoured with the title of "Comendadora" for important services rendered the government of the State of Tocantins and awarded the Medal of Merit.

She has traveled extensively and photographically documented urban ecology throughout the world including Iran, Israel, Turkey, Egypt, Peru, Paraguay, Portugal and Spain.

Venus Pezeshk's advice to young people: *"Be steadfast in your ideas, sincere and pure in your heart desires, and loving with each other, to ensure a better tomorrow for all of us."*



An hourglass-shaped monument stands as a timeless symbol of the Earth Summit and the Global Forum.

Into the monument's hollow structure children from various countries poured soil from nations around the world. This act symbolized the international cooperation and unity required to establish world peace. Soil samples from other countries have been added yearly on World Environment Day bringing the total to 85 countries.

Enrichment Activity:

Select a theme (such as "Tomorrow Belongs to the Children") and organize a contest for children in your community. Entries can be artwork, essays, poems, drama, video, songs, etc. Ask a department in your local government to sponsor this event by providing an area to exhibit the winning entries. An elected official could present the awards. Notify the media. Coverage of the contest and presentation of awards will help increase community awareness of environmental issues.

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Tomorrow Belongs to the Children. Distributed through UNICEF.
Venus S. Pezeshk. **Letter,** May 24, 1995.

Asia is the world's largest continent covering 33% of the earth's land surface. To travel the perimeter of Asia, you would: trek the length of the Ural Mountains in Russia south to the Caspian Sea and west to the Black Sea; sail through the Bosphorus Strait south to the Suez Canal cutting through to the Red Sea; circle around the Arabian Peninsula, India, Burma, and Malaysia; tour through Indonesia, New Guinea, and the Philippines; and explore the shoreline of the East China Sea, and the Seas of Japan and Okhotsk before crossing through the Bering Strait to skirt the Arctic Ocean west to the Kara River.

When finished, you would have encircled 16,992,000 square miles, passed through deserts and arctic tundra, and caught glimpses of camels, monkeys, snakes, and bears — as well as reindeer, yak, and tiger.



Continental Summary

Asia and Science:

Asia's contributions to science and technology include wheeled vehicles, kiln-fired bricks, writing, the potter's wheel, silk, candles, tea, the wheelbarrow, and even paper. By observing that a carved piece of iron ore (lodestone) always pointed in the same direction, the Chinese constructed a compass. They developed movable type four centuries before Europeans and invented gunpowder to fuel weapons and fireworks.

Mesopotamia

From Mesopotamia come the multiplication tables and a series of measurements based on the number 60 e.g. 60 minutes in an hour and 360° in a circle. The Sumerians of Mesopotamia designed a calendar based on the phases of the moon and the Babylonians created the zodiac, a diagonal strip across the sky through which the sun, moon, and planets appeared to travel. Both Sumerians and Babylonians used fractions.

India

To India goes credit for the spinning wheel, cotton, the decimal system, and the idea that from nine different numeric symbols any number, no matter how large, could be written.

Islamic contributions to science

Transporting ideas and inventions between these cultures were Arab caravans connecting Baghdad with China and India. These travelers preserved the science of ancient civilizations and built centers of learning. Islamic mathematicians developed *aljabr*, or modern-day algebra; their scientists explained the refraction of light, as shown by rainbows; and their physicians used antiseptics, made sutures from animal intestines and silk, and understood how blood circulated throughout the body. By conducting experiments and making careful measurements, Islamic scientists modernized the scientific method.

Alchemists

Women supervised the perfume industry in Mesopotamia. These perfumers were early chemists who developed the techniques of distillation and extraction to create aromatic substances used in cosmetics, religious ceremonies, and medicines. From the second millennium BC comes the name of **Tapputi-Belatekallim**, a woman chemist who was the female overseer of the palace. **Keng Hsien-Seng**, ninth century A.D., and **Li Shao-Yum**, 12th century, were Chinese alchemists whose elixirs earned them widespread reputations including a summons to Keng to appear before the emperor.

Empress Zoe of Byzantium (d. 1050) converted her residence into a chemistry laboratory where she developed ointments and perfumes.

Women Scientists

Healers: From 4,600 B.C. to 2,000 B.C. in lower Mesopotamia, there were no restrictions on women's participation in the healing arts. During the Middle Ages, women studied at the medical school in Baghdad. Royal women **Julia Anicia** and the **Empresses Eudocia** and **Pulcheria** studied medicine and natural sciences with scholars at court. Women practiced medicine in 16th-, 17th-, and 18th-century Turkey. Called *hekime*, the list of women physicians includes **Mevlana Ramazan**, **Sinan Yahudi**, and **Kari Hakime**. In late 19th century Japan, medicine became the first professional field open to women. During the early 1900s, **Drs. Saneya Haboub** and **Adma Abu Shadid** were the first women doctors practicing in Lebanon. One-third of the physicians practicing in present-day Turkey are women.

Women continue to play important roles in science in Asia. This unit will feature **Dr. Aslihan Yener** (Turkey), **Zdenka Samish** (Israel), **Dr. Pham Thi Tran Chau** (Vietnam), and the **Mullick family** (India).

Continental Facts:

- Mt. Everest (29,023') in the Himalayas is the highest peak in the world.
- The shore of the Dead Sea (-1,310') between Israel and Jordan is the lowest place on dry land in the world.
- In China over 300 million people live in the Yangtze River basin.
- The Republic of the Philippines is a group of 7,107 islands.
- Indonesia has 167 active volcanoes.
- Over 600,000 domestic camels roam the Gobi in Mongolia.

Continental Curiosities:

- The musk deer of eastern Asia grows a pair of curved tusks.
- The giant panda is a strict vegetarian.
- Olive trees can live longer than 1,000 years.
- Siberia's Lake Baikal holds 20% of all the fresh water on earth. Its hydrothermal vents and mysterious tides support unique life forms including translucent shrimps and snails, large mushroom-shaped sponges, and the nerpa — the only freshwater seal on earth.

Exploration Questions:

- How many countries are there in Asia?
- How many time zones does Russia have?

Enrichment Activities:

- Construct an *abacus* and use this device to add, subtract, multiply, and divide — or to calculate square roots.
- Invite a spinner to demonstrate how a spinning wheel works.

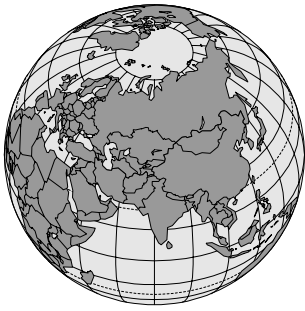
Add notes here:

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Archaeologist Dr. Aslihan Yener discovered a bronze Age tin mine and ancient mining village in southern Turkey.



Discovery Unit No. 8

Dr. Aslihan Yener
Archaeology

DIGGING UP HISTORY Project

Time-line:

- 1946 - Dr. Aslihan Yener is born in Turkey.
- 1952 - Dame Kathleen Mary Kenyon excavates the biblical site of Jericho.
- 1969 - Archaeologist Dorothy A. E. Garrod dies. Her field work included sites in England, Palestine, Bulgaria, and Lebanon.
- 1983 - Hannah Marie Wormington receives the Distinguished Service Award of the Society for American Archaeology.

Key points:

- ☛ An archaeologist makes careful observations at an excavation site, writes exact descriptions of all artifacts, and creates a theory that explains all findings.
- ☛ In 1989 archaeologist Dr. Aslihan Yener discovered a Bronze Age tin mine and ancient mining village in southern Turkey.
- ☛ Her discoveries prove that tin mining was a well-developed industry in that location.
- ☛ In the DIGGING UP HISTORY Project students will use archaeological techniques to conduct a dig.

Supplies:

- ✓ A “dig” for each crew — prepared in advance (See instructor's guide.)
- ✓ Archaeological tools — toothpicks, brushes, measuring tape or ruler, spoons, string, and tape for each group of archaeologists.
- ✓ “Dump site” with sieve, colander, or framed wire mesh
- ✓ Grid Map instruction sheet and blank paper for each crew
- ✓ Daily Field Report Form for each student — one for each day dig is conducted (page 71)
- ✓ Sacks to store artifacts
- ✓ Final Site Report for each student (page 72)

- ✓ *The Scientific Gazette* for each student

Steps — in advance:

1. Prepare digs. (See instructor's Guide.)

Steps — today:

1. Point out southern Turkey on a map or globe.
2. Share highlights of Dr. Aslihan Yener's life and work.
3. Begin the DIGGING UP HISTORY Project.
4. Write Daily Field Report.
5. Clean-up dig site.

Steps — other dig days:

1. Continue the DIGGING UP HISTORY Project.
2. Write Daily Field Report.
3. Clean-up dig site.

Steps — final dig day:

1. Write Final Site Report.
2. Add Dr. Aslihan Yener's name and a memento to the world map.
3. Distribute *The Scientific Gazette*.

For next time:

- Introduce the next scientist.

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Biography of DR. ASLIHAN YENER

b. 1946

Born in Turkey

Becoming an archaeologist was not Aslihan Yener's childhood dream. An American of Turkish descent, she was born in 1946 in Turkey. Her family moved to New Rochelle, New York, when Aslihan was six months old. In 1964 she entered Adelphi College in Garden City, New York, planning to be a chemistry major but transferred to Robert College, renamed Bosphorus University, in Istanbul, Turkey, to study art history. Roman ruins along Turkey's coastline fascinated Yener as well as the buried pre-Roman structures and artifacts. She returned to New York to complete a doctorate in archaeology at Columbia University.

The Bronze Age and Anatolia

By 1980 Dr. Yener was back in Turkey and was a member of the faculty of Bosphorus University. The Bronze Age (about 3000 BC to 1100 BC) captured Yener's imagination. During this era, bronze, an alloy stronger than its elements — copper and tin, was used in the production of tools, weapons, and numerous objects ranging from hair pins to swords and statues. Copper was mined in the Middle East but tin, according to clay tablets left by the neighboring Assyrians, was imported from mines in Afghanistan 1,000 miles away. Dr. Yener set out to explore potential mining sites in ancient Anatolia, present-day Turkey, to learn if tin had been mined in the region and not imported from Afghanistan.

850 mines

Dr. Yener began her research in the mines of the snow-capped Taurus Mountains of southern Turkey. She scaled peaks, discovered ancient mine shafts, and unearthed bronze-age treasures. In one 6-square-mile area, Yener and her colleagues discovered 850 mines. Silver in these mines was evident but tin was not.

In 1987 a friend suggested that Dr. Yener

take her search to Kestel, 60 miles north of Tarsus. The mines at Kestel measured more than two miles with shafts about 2' wide — too narrow for most adults to enter. Children ages 12 to 15 years old may have worked in these mines.

The ancient mining village

For four summers Yener and her colleagues excavated these 4,500-year-old mines. They discovered little tin. But in 1989 one of her students discovered some stones on a hill opposite the mine. Yener investigated the site and discovered 50,000 tools scattered over a small area. In 1990 she returned to the site to excavate what proved to be an ancient miners' village. Called Goltepe, the slag found in crucibles, the vessels used to melt ores or metals, contained such a high percentage of tin that Dr. Yener concluded it was mined and smelted (melted) locally.

Further tests revealed that Goltepe was occupied from 3290 B.C. to 1840 B.C. Several hundred people lived at the site. While the mine at Kestel produced about 5,000 tons of ore during its 1,000 years of operation, the neighboring mining village of Goltepe smelted that tin at relatively low temperatures. Tin mining was apparently a well developed industry in the area at the beginning of the bronze age (about 3000 BC).

Rewriting history

The mine at Kestel and the crucibles at Goltepe have forced archaeologists to rethink old theories. Anatolians were not merely importers of tin but providers of this element necessary for the production of bronze. This new information changes the economic, political, and social picture of the Bronze Age in the Middle East.



Instructor's Guide:**The DIGGING-UP HISTORY Project****Background Information:**

In excavating their "digs," students use archaeological techniques: the use of the tools calls for patience and measuring skills; the grid map (page 70) encourages careful observations; the Daily Field Report (page 71) requires exact descriptions; and the site report (72) allows students to create a hypothesis that explains their findings. The length of time spent on this project may be from an hour to several weeks. Distribute a new daily field report for each day spent on this project.

The metric system for measurement is being used in this unit since it forms the basis for nearly all scientific observation and is the standard for archaeological measurement.

Instructions:**In Advance**

Prepare dig sites.

- ✓ The "dig" site, into which objects are buried, may be a sandbox, a section of garden, a produce or cardboard box, or a book box. Size of each dig should be at least 20 centimeters square.
- ✓ Objects in each "dig" should have some relationship to each other. Possibilities are:
 - A broken flower pot whose pieces are excavated and reassembled by student archaeologists. (Omit a piece or two.)
 - A broken coffee mug, crumbled paper, whittled-down pencil . . .
 - Fish bone, broken stick, orange peels, egg shells, pieces of burnt wood, crushed tin can . . .
 - Styrofoam plate, pieces of plastic fork, paper wrapper, drinking straw . . .
 - Used candle, broken pair of scissors, ripped garment or shreds of cloth, a bead, chipped button, rusty zipper . . .
- ✓ Compact the dirt or mix with water allowing time for the soil to harden before student archaeologists patiently tackle the dig with

"picks and mini-shovels." Feel free to add pine needles, leaves, petals etc. to the dirt.

- ✓ Give students the opportunity to make a "dig" for the instructor.

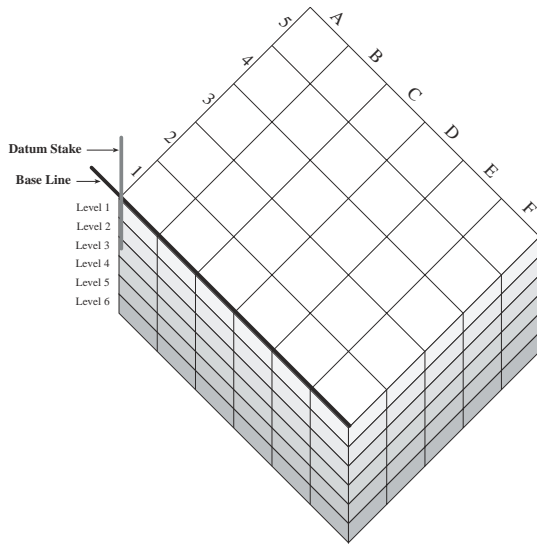
Conducting the Dig

1. Distribute "digs" and archaeological tools to individuals or groups.
2. Establish a "dump site" where archaeologists bring the dirt from their digs and sift it to insure that no item goes undetected.
3. Instruct each group to select a "dig" name.
4. Distribute the Grid Map Instruction Sheet and blank paper. The grid pattern is a set of 5 cm. squares (30 cm squares if the dig is a sandbox or garden plot). Students select and mark their **base line** on their dig. From the far left of this line, measure the squares and stretch pieces of string across the "dig." Use tape to secure string ends to the sides of the dig's container. If using a sandbox or garden plot, use sticks to mark the grid and connect markers with string.
5. Place a stick securely into the ground at the beginning of the base line. This is the **datum stake** and will be used to calculate depth (level) of the artifact. Each level is 5 cm deep (30 cm in the large dig)
6. Distribute a new Daily Field Report each day of the dig. Students remove one level of dirt, one grid at a time, across the entire surface of the dig. This method of excavation is called **vertical-face**. Any finding (even if it is a tip of something) is recorded on this field report with its location and level recorded. After the first level is removed, students should proceed to the 2nd level, and so on until the excavation is completed. (The method for measuring depth is shown on the Grid Map Instruction Sheet.)
7. Students label all artifacts (dig name, grid unit, and level) and store in sacks.
8. Clean-up after each dig session.

Final Dig Day

1. Prepare Final Site Report.

Grid Map Instruction Sheet

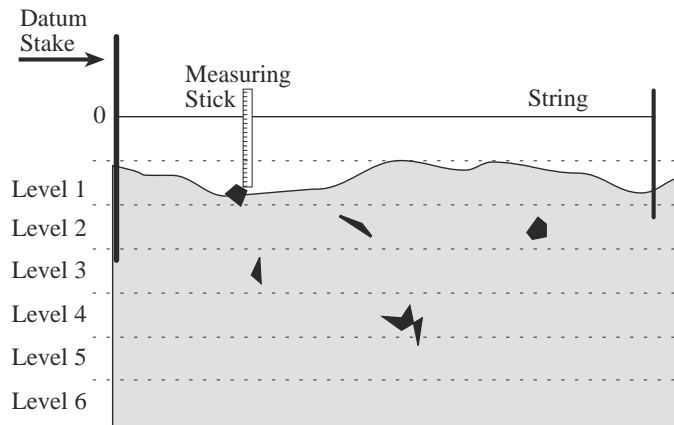


A grid map, like a travel map, tells you your location. Archaeologists create a grid map of an excavation site so they can work together (“Let’s excavate unit E2 on level 3 today.”), share information (“The bone needle was found at B5 Level 5 but the bone button at B3 Level 2.”), and accurately record their findings.

The diagram to the left shows an excavation site measuring 30 cm. long x 25 cm. wide x 30 cm. deep. Each cube is 5 cm. long x 5 cm. wide x 5 cm. deep. The bottom line is the **base line** for the dig. The left corner of this line becomes the **datum point** from which you measure the squares. The **datum stake** is pounded in here.

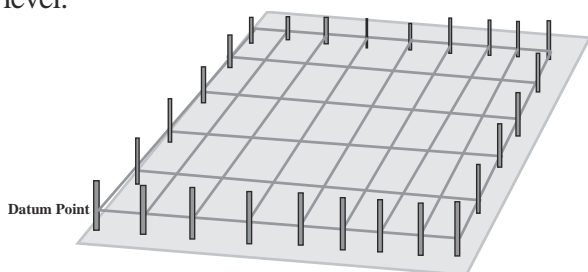
To determine the depth of an artifact, choose a place on the datum stake. This will be the zero point for measuring. Measure the distance on the Datum Stake from the zero point to the ground level. This is measurement A. After finding an artifact, stretch a string attached at the zero point and level to the ground. Measure the distance from the string to the artifact. This is measurement B.

$$B - A = \text{depth of artifact}$$



Each crew should draw its own grid maps — one for each level — marking the location of various finds. Excavating should be done one level at a time.

Below a garden plot dig has been staked out. To the right is a grid drawn on paper. The crew should draw a grid for each level of the dig. Be sure to mark the scale of the grid and indicate the level.



	A	B	C	D	E	F	G	H
5								
4								
3								
2								
1								
	Level _____							

The Scientific Gazette

Archaeology

Dr. Aslihan Yener

Discovery leads to re-examining Bronze Age history



An American of Turkish descent, Aslihan Yener was born in 1946 in Turkey.

Imagine you are an archaeologist. You look carefully through mud, dirt, and sand, explore caves, or search underwater for objects called “artifacts” that tell you what life was like hundreds, if not thousands, of years ago. You are not a treasure hunter but a scientist who makes careful observations at an excavation site, writes ex-

act descriptions of all artifacts, and creates a theory that explains all of the findings. The artifacts you discover may support an existing theory or may, like Dr. Yener’s discoveries, rewrite history.

In the early 1980s Dr. Yener decided to explore mining sites in Turkey (called Anatolia in ancient times) to learn if tin had been mined in the region during the bronze age. She:

- scaled peaks,
- squeezed through mine shafts,
- unearthed treasures, and
- discovered a Bronze Age tin mine and an ancient mining village in southern Turkey.

Tests conducted on the slag found in the crucibles from the mining village have proven that tin mining was a well developed industry in Anatolia. This new information changes archaeological theories about the Bronze Age in the Middle East.

Meanwhile, Dr. Yener tackles new questions.

- Did children work in the tin mines?
- Whose job was it to smelt the tin?
- Who first thought of making bronze?

Fun Facts:

- ◆ Metal workers in ancient times used iron from fallen meteorites to make weapons and tools.
- ◆ In Israel archaeologists discovered a 12,000-year-old skeleton wearing a sea-shell headband.
- ◆ In the 1960s an archaeological crew excavated a submerged sailing vessel in waters off the coast of southern Turkey and determined it was a 3,000-year-old shipwreck.

April 23 is
Children’s Day
in Turkey.

Fun to do at school:

Find **The Terra Cotta Army of Emperor Qin** by Caroline Lazo and read about the colossal discovery of seventy-five hundred 2,000-year-old life-size clay figures buried at Emperor Qin’s tomb site.

The Turkish alphabet has 29 letters.

Fun to Read:

The Archaeology Handbook: A Field Manual and Resource Guide by Bill McMillon provides a comprehensive introduction to archaeology including travel agencies specializing in archaeological tours, archaeological sites and museums, field schools, and organizations that assist in placing volunteers. Who knows — your next family vacation may be spent excavating a cave in France.

Agriculturist Grace Ngemukong Tima from Cameroon, Africa, believes that "God never created anybody without a purpose. All we need to do is to find out what each person has an aptitude for, and develop it." These words express the authors' sentiments: **Women Scientists from Seven Continents** reflects our pride in women's accomplishments and our hope for every student.

The lives of these women scientists span a time-line from 1868 to the present. Their fields of work range from microbiology to astrophysics. On each continent these women have collected valuable data, conducted ground-breaking experiments, and shared their discoveries with fellow scientists and appreciative communities.

The lives and work of the women in this book provide both information and inspiration.

From Africa:

Dr. Letitia Eva Obeng — Ghana — Hydrobiology
Dr. Symphorose A. Tarimo Nesbitt — Tanzania — Entomology
Grace Ngemukong Tima — Cameroon — Agriculture

From Antarctica:

Dr. Mary Alice McWhinnie — Biology
Dr. Irene Carswell Peden — Electrical Engineering
Dr. Roseli Ocampo-Friedmann — Microbiology

From Asia:

Dr. Aslihan Yener — Turkey — Archaeology
Zdenka Samish — Israel — Food Technology
Dr. Pham Thi Tran Chau — Vietnam — Biochemistry
Mullick Family — India — Medicine

From Australia:

Dr. Joan Freeman — Physics
Dr. Isobel Bennett — Marine Biology

From Europe:

Lise Meitner — Germany — Atomic Physics
Dr. Eva Cudlínová and Irena Hanousková — Czech Republic — Landscape Ecology
Dr. Marie Vasilievna Klenova — Russia — Marine Geology

From North America:

Mildred Bennett — United States — Mathematics
Dr. Lenora Moragne — United States — Nutrition
Maria Elena Diaz — Mexico — Water Biology
Dr. Helen Sawyer Hogg — Canada — Astronomy

From South America:

Dr. Ana Aber — Uruguay — Environmental Science
Sonia Alconini — Bolivia — Archaeology
Dr. Emilie Snethlage — Brazil — Ornithology

Women Bridging the Continents:

Dr. Sara C. Beck — Astrophysics	Rachel Carson — Marine Biology
Christine Graves — Scientific Writing	Dr. Esther Pohl Lovejoy — Medicine
Venus Pezeshk — Landscape Architecture	Yasmin Sequeda — Engineering

The Scientist Within You series comes in two volumes. This is volume two. It will not be reprinted. In order for more people and programs to be able to utilize this resource the cost has been dropped more than 50%. You can learn more about this offer by visiting <http://www.scientistwithinyou.com> or calling 1-800-935-7323. You can also download a sample of volume one: **Experiments and Biographies of Distinguished Women in Science**.