ART to ZOO

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Great Explorations: *To the Ends of the Earth—and Beyond*

If you were invited to join the crew of the first major exploratory mission beyond our solar system, would you consider the offer? Never mind for now that our technology isn't at all up to the task yet. Just assume that you and your crewmates would cruise through the galaxy aboard a large and comfortable ship—one that's capable of spanning the vast reaches between planets with the ease of a luxury ocean liner hopping from one island to the next. ■ Of course, no matter how easy the ride, there are a lot of reasons *not* to go flying off on humanity's maiden voyage into the cosmos. And it's probably safe to say that most people would turn down the offer. Still, the idea of boldly going where no human has ever gone before; of being part of a mission of unprecedented discovery...it's enough to fire anyone's imagination. We may fear the unknown, but we're also fascinated with it. And that may be one reason why exploration has been such a dominant theme in human history.

Exploration also makes a great theme for *ART TO ZOO*. The impetus for this issue is a thought-provoking exhibit at the Smithsonian's National Air and Space museum called "Where Next, Columbus?". Like the exhibit, we've tried to present a variety of ideas designed to get students to think about exploration from a number of different perspectives. The activity called "Faraway Feelings," for example, focuses on the homesickness space explorers might feel on long journeys away from Earth. "Contact!" looks at the impact exploration has had on indigenous peoples. There's a geography game that introduces students to some of the important explorers various cultures have produced, an activity that looks at the pros and cons of space exploration, and suggestions for helping students learn about the history of exploration in their own community.

We think you'll agree that there's a lot to explore in this issue of *ART TO ZOO*—and that's as it should be! Good luck, and bon voyage.

Teacher Background

Riches, Religion, Power, and the Pursuit of Knowledge

Curiosity and a fascination with the unknown certainly give us a natural inclination to investigate our surroundings, but history proves that large-scale exploration usually doesn't occur just because we want to find out what's around the corner. We almost always have other motivations, most of which fall into one or more of the following categories:

☐ ***Trade***—From ancient times until about the mid-nineteenth century, trade was the number-one reason for exploration. Many trade expeditions were financed by a particular nation, kingdom, or empire seeking to either establish a trade route or locate an easier route. Some of the most significant exploratory journeys were "inspired" by valuable trade commodities such as spices, salt, silk, jade, and gold.

☐ ***Religion***—Certain religions, particularly Buddhism and Christianity, have also inspired exploration. Much of India and central Asia were explored nearly two thousand years ago by Chinese Buddhists on religious pilgrimages. And in the Americas, Christianity fueled European exploration as missionaries and others—Christopher Columbus among them—went about the business of bringing the word of God to indigenous populations.

Space Shuttle Endeavour. *Courtesy of NASA.*

☐ ***Territorial Expansion***—Nations and empires seeking to expand their boundaries, and hence their political power, have been responsible for much of the exploration that's occurred through the ages. Starting in the 15th century, Europeans launched an era of expansion and world exploration that lasted hundreds of years. In the 19th century, President Thomas Jefferson sent Lewis and Clark on an exploratory expedition that was meant, in large part, to facilitate U.S. acquisition of the vast western territories. And in the 1960s, the United States and the former Soviet Union competed in a "space race" that was motivated less by a desire to explore the mysteries of our solar system than by each nation's desire to gain political advantage over the other.

☐ ***Science***—Starting in the 18th century, a burgeoning interest in science set the stage for a new wave of exploration. Naturalists and others braved unknown dangers to explore some of the wildest regions of South America, Africa, the Arctic and Antarctica, and the surrounding seas. There was so much to learn that each trip had the potential of adding greatly to the storehouse of scientific knowledge.

Today, even though we've thoroughly mapped and charted the globe, scientific exploration is still adding to our understanding of the world—and of other worlds. In oceans, tropical rain forests, and other little-understood areas, scientists make new discoveries daily. And robotic explorers traveling to Venus, Mars, and other planets are revealing the secrets of the solar system.

A Double-Edged Sword

Thank an Explorer: The next time you sprinkle salt on your French fries, slip into a silk garment, or eradicate a mistake with a rubber eraser, consider the ways exploration has touched your life. For one thing, exploratory journeys have made many valuable and useful products—among them, of course, salt, silk, and rubber—available around the globe. Plus, the drive to explore has fueled the creation of new technologies that have eventually "trickled down" to the layperson's level. Every time you play a compact disc, for example, you're a beneficiary of advances in computer technology resulting from the space program.

Of course, one of the most obvious and on-going benefits of exploration is that it serves to increase humanity's collective understanding of life, the universe, and everything. Without this ever-increasing understanding, we might have gone right on believing that the world is flat.

The Rest of the Story: But the history of exploration isn't exactly a fairy tale chronicle of benefits and enlightenment for all of humanity. In fact, for people living in regions "discovered" by technologically advanced societies, exploration has often had devastating consequences. Simply put, it has been the vehicle through which European and other explorers have undermined the cultures of indigenous peoples, introduced fatal diseases into their populations, and robbed them of the land that they and their ancestors had occupied for generations.

These tragic outcomes haven't always been intentional. Europeans didn't purposefully bring smallpox to the Americas, for example. But the history of exploration includes many unfortunate examples of blatant human rights abuses. All too often, indigenous peoples were viewed as "slave material"—and the territory they occupied was routinely claimed by exploring nations. (See "Contact!" on page three for an activity that focuses on the effects of exploration on indigenous peoples.)

This old engraving is an interesting representation of a first contact between Europeans and indigenous peoples. The latter are drawn to look like Greek athletes, and they're presenting European-style jewelry to the Europeans. Notice the Christian cross being raised in the background.

Modern Explorers: In-flight view of astronauts aboard the Space Shuttle Endeavour. Left to right—N. Jan Davis, Mark C. Lee, Mamoru Mohri (front); Curtis L. Brown, Jr., Jerome (Jay) Apt, Robert L. Gibson, Mae C. Jemison (rear). *Courtesy of NASA.*

Beyond the Cradle

"Earth is the cradle of humanity, but man cannot stay in the cradle forever."
Konstantin Tsiolkovsky,
Russian scientist, 1899

How would we behave if we managed to travel to another life-sustaining planet? Would our treatment of the life forms on such a planet repeat the mistakes of our exploratory past?

That, of course, is impossible to predict. But since we seem destined to explore our surroundings, we just might have the opportunity to find out one of these days. First, though, we'll have to find ways to overcome—or at least minimize—several serious obstacles to space travel.

Miles and Miles of Miles and Miles: One of the biggest impediments to space travel is the unimaginably huge distances between objects in the universe. Millions of light years can separate Point A from Point B, and right now we have no way of traversing distances of this magnitude. It's worth pointing out, though, that crossing vast expanses of ocean must once have seemed equally impossible—not to mention the prospect of landing on the moon.

Creatures of Earth: But for all of our dreams of soaring among the stars and discovering new worlds, human beings are like fish out of water when it comes to space travel. That's not to say that space exploration is a lost cause: Plenty of successful missions provide evidence to the contrary. Still, there's no getting around the fact that we humans, like all life forms on Earth, are adapted to the conditions of this planet—not to those of other planets, or of the vacuum in-between. So space travel naturally involves certain problems that we just aren't used to dealing with. Here are a few of the most serious problems space travelers face:

☐ ***Radiation***—Here on Earth, we have an atmosphere that screens out a lot of harmful radiation. Not so in space. Despite precautions taken to minimize radiation exposure, astronauts face a barrage of radiation from the sun and other high-energy sources, such as exploding stars. This increased dose of radiation may raise space travelers' risk of developing health problems later. For example, space shuttle astronauts are thought to be at a 3 percent greater risk of cancer than the general population.

One way to lessen radiation exposure would be to cut down on the time spent in space by developing faster methods of travel. Another might be to build spacecraft out of materials that could provide a more effective shield—while keeping the weight of the craft relatively low. But for now, radiation remains one of the most significant threats to space travelers.

☐ ***Weightlessness***—Although weightlessness always looks like fun in the movies, it has a number of negative side effects. Two of the most serious of these are muscle atrophy and the loss of calcium. The latter effect results in osteoporosis, or a weakening of the bones.

Exercise may help space travelers reduce muscle atrophy by creating a force against which muscles must move. However, it's not yet clear whether exercise in space can stop or slow down the osteoporosis process. And researchers aren't yet sure if calcium loss due to prolonged weightlessness can be reversed once space travelers get back to Earth.

☐ ***Micrometeoroids***—Tiny particles of dust and other space stuff—including human-made debris such as flecks of paint from satellites—can pack a surprisingly powerful punch. Moving through space at a tremendous speed, these *micrometeoroids* can damage a spacecraft if they hit one. In some cases, a collision with a micrometeoroid might even cause a spacecraft to explode.

☐ ***Psychological Impact***—The experiences of people who have spent long periods of time separated from familiar surroundings, such as researchers in Antarctica and Russian cosmonauts on long assignments, suggest that extended stays in space might have profound psychological effects on people. This isn't really surprising: Imagine what it would be like to be stuck in a completely foreign environment—unable to come and go as you please—and to be separated from your loved ones and all you've ever known by a tremendous void. Understandably, you might experience a severe sense of separation and isolation. You might also become irritable and have difficulty concentrating. Such emotional problems could have serious ramifications for missions that would require extended stays away from the Earth, such as a mission to Mars. (With current technology, a one-way trip to Mars would take between six months and a year.)

Where Do We Go From Here?

Assuming we manage to overcome current limitations to space travel (and some people believe we just might—after all, technology does have a way of catching up with our aspirations), the universe would obviously offer endless opportunities for exploration. But whether or not we *should* pursue our ambitions to explore is a serious point of contention.

Those against increased space exploration point out that our travels in space have been expensive so far. They feel that, in light of the many problems here on Earth, the amount of money spent on space travel is an impractical use of limited funds. Many people are also worried about the effects of exploration on other planets and potential life forms. Considering our less than sterling example here on Earth, it's not difficult to understand why.

Others feel that we have much to gain from space exploration. The possibility of finding life elsewhere in the universe, say some exploration proponents, is reason enough to pursue the final frontier. But they point to other reasons as well. For example, minerals that are rare or unavailable on this planet might be plentiful elsewhere. And space travel could eventually lead to the discovery of planets suitable for settlement. This, claim some supporters, could eventually ease the pressure of overpopulation and pollution here on Earth.

Lesson Plan

Step 1: Pathfinders

Objectives:

☐ name several explorers of the past
☐ describe the routes these explorers followed
☐ discuss the motivations of each explorer

Materials:

☐ map on Pull-Out Page
☐ large map of the world

Subjects:

☐ history, geography

Here's a fun way for students to bone up on their geography skills while learning about several notable explorers of the past.

Procedure:

Part A—The Who, What, Where, and Why of Exploration

1. Make a list of the following explorers and put the list where everyone can see it: Ibn Battuta, Christopher Columbus, Hernando Cortés, Charles Darwin, early Chinese explorers, Lewis and Clark, David Livingstone, the Vikings.
2. Hand out copies of the explorer trivia (next page) and divide the class into small groups. Have the kids in each group work together to figure out which group of statements goes with which explorer. (For more advanced students, you might want to take the statements out of their groups of four and mix them up.) Discuss the answers (below, right).
3. Solicit the students' ideas about why exploration occurs. Use the background information under "Riches, Religion, Power, and the Pursuit of Knowledge" (on page 1) to discuss the main motivations behind most major exploratory efforts. Then ask the students what they think motivated the explorers you listed earlier. (Remind the students that some exploratory journeys of the past had more than one motivation. For example, Columbus's journeys were seen not only as a way to facilitate trade with Asia, but also as a way to gain political advantage over Portugal. And Columbus himself felt it was his responsibility to expose indigenous people to Christianity.)
4. Ask students if exploration is still going on today. If so, where? (Significant exploration is still underway in Antarctica, tropical rain forests, oceans, and space.) What are the motivations behind such explorations? (Most current exploration is carried out for the sake of adding to scientific knowledge. However, as the "space race" of the 1960s proved, political advantage is still a powerful motivator.)

Part B—Exploratory Pursuits

1. Students will again be working in groups. Make one or more copies of the map on the Pull-Out Page for each group.
2. Explain that each of the "trails" shown on the map (dotted line, dashed line, and so on) is a rough representation of the route taken by one of the explorers (or groups of explorers) listed earlier. Have the students work in their groups to figure out which route represents which explorer. Discuss the answers (see the legend, top of page 3).
3. Tell the students that they will have a chance to test their geography skills by playing Exploratory Pursuits, a question and answer game based on the explorers' routes portrayed on the map. Explain that each group will work as a team.
4. Assign each team one of the explorers and have the teams use the map, as well as a more detailed classroom map, to come up with five or more *geographical* questions pertaining to that explorer. (For example, the group working with Ibn Battuta might ask, "Which sea did Muslim explorer Ibn Battuta cross several times?" [the Red Sea].)
5. Have the teams write their questions on slips of paper. (Tell them to write the answers on a separate piece of paper and to keep track of them.) Collect all of the questions and put them into a bag.
6. To play the game have each team, in turn, pick a question out of the bag. (If a student picks one of his or her group's own questions, have the student choose another.) Give the team time to confer on the answer and to identify the area in question on a large classroom map. Score five points for each correct answer, an additional five points for each correctly identified area, and zero points for incorrect answers. If an answer is incorrect, give the next team the option of answering it correctly (for five points) or of choosing a new question from the bag.
7. After the teams have been through all the questions, have them add up their scores to see which team deserves the title of "Grand Explorers."
8. Have the students add other explorers' routes to the Pull-Out Page map by researching the travels of people such as Marco Polo (Asia), the Polynesians (the Pacific Ocean and its islands), Vitus Bering (Siberia), Robert O'Hara (Australia), and others.

Answers:

1-4—the Vikings; 5-8—David Livingstone; 9-12—Ibn Battuta; 13-16—Christopher Columbus; 17-20—early Chinese explorers; 21-24—Lewis and Clark; 25-28—Hernando Cortés; 29-32—Charles Darwin.

Legend:

- *Lewis and Clark*
- *Hernando Cortés*
- *Charles Darwin*
- *Christopher Columbus*
- *The Vikings*
- *Ibn Battuta*
- *David Livingstone*
- *Early Chinese Explorers*

Extend the Activity!

Centuries of exploration have given us a complete picture of the Earth, in terms of its overall topography. But many of the details concerning how our planet "works" and how its various components fit together are as mysterious as ever. Fortunately, many scientists and other modern-day explorers are working to change that.

To help your students understand that the Earth is still being explored, have them search for current events stories of scientific research and discoveries. Remind them that research is currently being conducted in poorly understood areas such as tropical forests, oceans, and Antarctica.

Have the students put together a bulletin board display of the news stories they bring in. Afterwards, lead a discussion on some of the ways current exploration differs from that of the past. Among other things, your discussion could focus on technological advances and on the fact that women now play a bigger role in exploration.

Step 2: Contact!

Objectives:

☐ define *indigenous*
☐ describe some of the dilemmas posed by the first contact between explorers and indigenous peoples
☐ discuss some of the ways exploration has affected indigenous peoples
☐ describe possible reactions to a first contact with alien explorers

Subjects:

☐ history, social studies, art

What happens when people from completely different cultures meet for the first time? In this activity your students can learn about one such encounter, and about how contact between two different civilizations can affect both of them.

Procedure:

1. Read the following statement: "Indigenous peoples had been living in the New World for many generations by the time Columbus set sail in 1492." Then have the students work in small groups to come up with a definition of the word, *indigenous*.
2. Discuss the students' definitions and come up with a class definition of the word.
3. Have the students close their eyes. Tell them to imagine what it might have been like to be an indigenous Caribbean Islander watching Columbus's ships approaching their shore. Have them keep in mind that neither they, nor anyone in their tribe, has ever seen Europeans before. Ask for their reactions, then have them imagine that they're one of Columbus's sailors, approaching the lush New World and seeing its indigenous inhabitants for the first time. Discuss their reactions to this experience as well.
4. Have two different student volunteers read the accounts of a first encounter given under "A Close Encounter." (One student could read the prospector's part and the other could read the New Guinean's part.) Explain that these quotes are adapted from real interviews with people who experienced a first contact situation in the 1930s, when Australian gold prospectors came upon a tribe of indigenous people in New Guinea.
5. Explain that, throughout history, encounters between indigenous peoples and explorers have probably occurred hundreds of times. When such encounters occurred, there was probably tremendous surprise, confusion, fear, and uncertainty. People's perception of the world was suddenly changed. For example, many indigenous people encountering Europeans for the first time probably never knew that other people even existed. Such a revelation can be difficult to adjust to, because it changes our understanding of the world and can challenge our basic beliefs.

A CLOSE ENCOUNTER

Gold Prospector: When we looked out into the valley for the first time, it was quite obvious that there was a huge population of people. We could see their garden patches. Then we saw people standing on a little hill, watching us approach. I'm sure they could tell from the way we looked that we weren't the enemy, and that we were not going to hurt them.

New Guinean: When the white men came to our land, we had never seen such a thing. We knew nothing then of the outside world. We believed we were the only living people. So we didn't know where these people had come from. Were they our ancestors from the place of the dead? Did they come from the ground? The sky? The water? We were confused.

Gold Prospector: We didn't know a word of their language. We had no interpreters. The only thing we could do is to talk in hand signals to them.

New Guinean: It was hard to try and talk with these white men. They spoke a strange language. We made signs with our hands and also made noises to try to communicate.

Gold Prospector: We found gold in the area. We didn't become millionaires or anything like that, but we did make a very, very good living. We were able to pay the natives well for everything.

New Guinean: Things weren't clear then, but we know now that the white men made money from the gold that came from our ground. Before the white men came, we knew nothing of money, or even what it looked like. Each man in our village was his own boss. But this ended when the white people came.

6. Have students write essays from the point of view of one of the indigenous Caribbean Islanders Columbus took back to Spain. Explain that their essays should try to answer questions such as the following:

☐ How did it feel to leave your homeland?

☐ What was it like to see a part of the world you never knew existed? (You might want the kids to do some research to find out what Spain was like in the late 15th century.)

☐ How did the Europeans treat you?

7. Have students share their essays, then ask them how they think they'd react if aliens landed on the Earth and contacted humans for the first time. How might such an encounter change life on Earth?

Extend the Activity!

Divide the group into pairs. Have one student in each pair play the role of an alien explorer from Planet X. Have the other student play the role of the chairperson of Planet X's C.E.E. (Committee for the Exploration of Earth). Give the students time to develop skits in which the alien explorer describes Earth and its life forms to the C.E.E. chairperson.

Step 3: Way Back When...

Objectives:

☐ discuss past exploration and settlement within the local area
☐ describe how to use community resources to conduct research

Subjects:

☐ history, social studies

Have your students do a little detective work to find out about early exploration and settlement in your community.

Procedure:

1. Divide the class into groups of three or four students. Have them conduct research to find answers to the following questions:

☐ Who "discovered" the area where your community is located?

☐ Who lived in your area before Europeans settled there?

☐ Who established the community itself?

Encourage the students to use not only the library as a source of reference materials, but also the city hall, courthouse, historic homes, and other local resources.

2. Tell the groups that they are responsible for finding a copy of at least one document (or picture) that has some relevance to the community's early history—e.g., a deed of sale for land, a description of the area in an explorer's journal, or a portrait of someone important to the community's history.
3. Have the groups pool their research to create a small exhibit on the history of exploration in their community.

EXPLORER TRIVIA

1. Probably arrived in America nearly 500 years before Columbus.
2. Came from area known as Scandinavia.
3. Eric the Red and his son, Leif Erikson, were two of the most famous of these travelers.
4. Traveled to northern islands now known as Iceland and Greenland.

5. Died while looking for the source of the Nile River.
6. First came to Africa as a missionary.
7. Wanted to help the African people.
8. Explored African rivers, such as the Zambezi.

9. Was an accomplished Muslim explorer of the fourteenth century.
10. Visited Mecca, a holy city in Arabia that is important to Muslims.
11. Traveled through much of Arabia and northern Africa.
12. Often traveled by camel.

13. Expected to reach Asia by sailing west.
14. Talked the king and queen of Spain into paying for the voyage.
15. Hoped to expose native Caribbean Islanders to Christianity.
16. Journeyed across the Atlantic four times.

17. Journeyed to India and elsewhere in Asia to study Buddhism.
18. Often traveled along the Silk Road, a series of routes along which silk was transported for trade.
19. Natural obstacles, such as the Himalaya Mountains, kept these explorers from traveling directly south into India.
20. One of these travelers, named Fa Hsien, went on a fifteen-year journey that added much to people's understanding of Asia and India.

21. Chosen by President Thomas Jefferson to find a route to the West Coast.
22. Used canoes to travel up the Missouri River.
23. Several Native Americans traveled with the expedition.
24. A young Native American woman named Sacagawea became a valued guide and interpreter.

25. Was a leader of the *conquistadores* (con-KEES-tah-doors), which means "conquerors."
26. His army helped to destroy the Aztec empire.
27. Launched his journey from Cuba.
28. Captured what is now Mexico for Spain, his homeland.

29. Sailed on a ship called the *Beagle* as part of a journey to chart the oceans.
30. His observations of the Galapagos (guh-LOP-uh-gose) Islands helped him develop the theory of evolution.
31. Saw giant tortoises and other interesting animals.
32. Discovered bones of ancient, extinct animals.

Step 4: Faraway Feelings

Objectives:

☐ discuss some of the feelings that space travelers might experience on long journeys into space
☐ describe aspects of life on Earth that individuals might miss on a long journey into space

Materials:

☐ copies of the questions under "What Will You Miss?" (on Pull-Out Page)

Subjects:

☐ social studies, history

Astronauts go through rigorous training programs before lifting off from Earth. But nothing can totally prepare them for the emotional demands of being in a foreign—and extremely inhospitable—environment, separated by miles of empty space from all that's familiar to them.

As we plan to venture into space for longer periods of time, the psychological effects of space exploration are becoming more of a concern. Try this activity to help your students understand these effects.

Procedure:

Part A—Space Is a Lonely Place

1. Tell the students to imagine that they've been chosen to participate in an exploratory expedition to Mars. Explain that they'll be part of a four-person crew and that their trip to the red planet will take about 10 months. They'll work on the planet for about a year, then make the 10-month journey back to Earth. The total mission will last a little less than three years.
2. Make copies of the "What Will You Miss?" questionnaire and give the students time to write down their answers.
3. Begin a discussion of students' answers by explaining that feelings of isolation and separation can be a problem for space travelers. Living in cramped quarters with other crew members can also be stressful. Then ask the students if they found the questionnaire difficult to complete. For some students the questions may have been hard to answer because they've never thought about what it would be like to be away from familiar people, activities, and surroundings.

Other students, such as those who have moved to your area from another part of the country or from another country altogether, may have experienced feelings of isolation and separation similar to those that space travelers might experience. If you can do so without singling out individuals, provide an opportunity for such students to share their experiences if they want to.
4. After discussing the rest of the questionnaire, ask students if they have any suggestions as to how space travelers' feelings of homesickness might be lessened. One idea is to educate travelers in advance about the feelings they might experience. Daily schedules designed to keep crew members busy—but that still incorporate recreation—might also help space travelers cope with their feelings.

You might want to point out that a space-

craft traveling to Mars would be able to communicate with the Earth. There would probably also be video and fax machines on a real expedition to Mars. But the time lag between sending and receiving signals (up to twenty minutes) would take some getting used to.
5. Have the students compare space exploration with past explorations of Earth. Ask what the conditions on a mission to Mars would have in common with those on Columbus's expeditions to the New World. (Both are characterized by cramped conditions, having to leave behind loved ones and the life you're used to, motion sickness, potential danger, etc.) Then ask how conditions on a Mars expedition would differ from Columbus's voyages. (Unlike space explorers, explorers on the open sea had no way of communicating with home. But ocean explorers could get extra food from the sea and extra water from rain, whereas travelers on a trip to Mars would have to take everything with them.)

Part B—Treasures from Home

1. Ask the students what they'd like to take with them on their three-year journey to Mars. Write down some of their ideas. Then remind them that spacecraft don't have much room to spare. Tell them that each crew member will be assigned a personal locker that's only 3 ft. tall x 2 ft. wide x 10 in. deep (1 m x 75 cm x 25 cm). Eliminate items on the list that would be too big to take on the journey.
2. Have the students create a display of the items they'd take with them into space. To help them decide what kinds of items to take, suggest that they consider things that give them something to do (books to read, a journal to write in, music to listen to, activity books with puzzles, a drawing pad, etc.), as well as things that remind them of loved ones (photos, letters, gifts from someone special, etc.). Have the students display their items in cardboard "lockers" cut to the dimensions listed earlier.

"Faraway Feelings" is adapted from a similar activity in Challenges for Space Explorers, *a teaching guide available from National Air and Space Museum.*

Step 5: Should We Stay Or Should We Go?

Objective:

☐ explain some of the opinions stated for and against space exploration

Materials:

☐ copies of "What Do You Think?" (on Pull-Out Page)

Subjects:

☐ social studies, language arts, math

Where will exploration take us in the future? Will we venture further into our solar system, or even beyond it? Right now it's difficult to say. Technical problems aside, there's a lot of controversy over whether we should even explore space. Try this activity to help your students clarify their own feelings about space exploration.

Procedure:

1. Divide the class into groups. Have each group brainstorm the pros and cons of space exploration.
2. Have the groups share their ideas. Write the ideas down, adding any from the background information that weren't mentioned. (See "Where Do We Go from Here?" on page two.)
3. Ask for a show of hands indicating how many students think we should/shouldn't explore space. Record the numbers.
4. Have students stage a debate focusing on space exploration. Afterwards, ask again for a show of hands indicating who is and isn't in favor of space exploration. Did anyone change his or her mind? Why?
5. Make copies of "What Do You Think?" (two or more per person) and have the kids give them to friends and family to complete.
6. Have the students use the results of the survey to find percentages and create graphs portraying people's feelings about space exploration.

Resources

Books:

Astronaut Training Book for Kids. 1990. Kim Long. Lodestar Books.

The Children's Atlas of Exploration: Follow the Footsteps of the Great Explorers. 1993. Anthony Mason. Millbrook Press,

The Great Atlas of Exploration: A Pictorial Atlas of World Exploration. 1992. Neil Grant. Alfred A. Knopf.

Living in Space. 1993. Larry Kettlekamp. Morrow, Junior.

To Space and Back. 1986. Sally Ride. Lothrop, Lee and Shepard.

Women in Space: Reaching the Last Frontier. 1988. Carole S. Briggs. Lerner Publications.

Women of the World: Women Travelers and Explorers. 1992. Rebecca Stefoff. Oxford University Press.

Activity Sources:

Challenges for Space Explorers is a collection of activities focusing on living and working in space. Appropriate for grades four through twelve. Includes background information and reproducible pages. For a free copy, send your request on school letterhead to Education Service Center, MRC 305, National Air and Space Museum, Washington, D.C. 20560.

Columbus and the Age of Explorers is a teaching portfolio composed of 14 maps, engravings, journal accounts, and other primary source documents, along with background information and other materials. Appropriate for grades six through twelve. Available from Golden Owl Publishing Co., P.O. Box AO3, Amawalk, N.Y. 10501.

The Smithsonian Institution

Anacostia Neighborhood Museum
Arthur M. Sackler Gallery
Arts and Industries Building (Experimental Gallery)
Cooper-Hewitt National Museum of Design
Freer Gallery of Art
Hirshhorn Museum and Sculpture Garden
National Museum of African Art
National Museum of the American Indian
National Air and Space Museum
National Museum of American Art and Renwick Gallery
National Museum of American History
National Museum of Natural History
National Portrait Gallery
National Postal Museum
National Zoological Park
Smithsonian Environmental Research Center
Smithsonian Tropical Research Institute

ART TO ZOO brings news from the Smithsonian Institution to teachers of grades three through eight. The purpose is to help you use museums, parks, libraries, zoos, and many other resources within your community to open up learning opportunities for your students.

Our reason for producing a publication dedicated to promoting the use of community resources among students and teachers nationally stems from a fundamental belief, shared by all of us here at the Smithsonian, in the power of objects. Working as we do with a vast collection of national treasures that literally contain the spectrum from "art" to "zoo," we believe that objects (be they works of art, natural history specimens, historical artifacts, or live animals) have a tremendous power to educate. We maintain that it is equally important for students to learn to use objects as research tools as it is for them to learn to use words and numbers—and you can find objects close at hand, by drawing on the resources of your own community.

Our idea, then, in producing ART TO ZOO is to share with you—and you with us—methods of working with students and objects that Smithsonian staff members have found successful.

Special thanks to the following people for their help in developing this issue of ART TO ZOO:

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OFFICE OF ELEMENTARY & SECONDARY EDUCATION

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Astronaut Susan J. Helms plays a keyboard during a mission of the Space Shuttle Endeavour.
Courtesy of NASA.

ART to ZOO

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PULL-OUT page

Art to Zoo

January 1994

Translation by Orlando Lizama

What Will You Miss?

You've been chosen to be part of the crew of a three-year mission to Mars. What—and who—will you miss the most? See if you can answer the following questions.

1. Which five people will you miss the most?

2. Which five recreational activities will you miss the most?

3. Which five places will you miss the most?

4. Which five foods will you miss the most?

What Do You Think?

1. Do you think we should explore space?

____ yes ____ no

2. Which of the following do you think is the best reason for exploring space?

____ to increase scientific knowledge
____ to search for other life
____ to start colonies on other planets
____ to be respected as leaders in space exploration
____ to encourage international cooperation

____ other (explain): _____

_____

_____

3. What concerns you most about space exploration?

____ risks and dangers
____ cost
____ urgent needs and problems on Earth
____ competition among exploring nations
____ environmental impact on other worlds

____ other (explain): _____

_____

_____

4. Where in space do you think we should explore?

____ the moon
____ Mars
____ other planets (besides Mars) in our solar system
____ stars
____ all of the above
____ none of the above

____ other (explain): _____

5. How should we explore space?

____ observe it from Earth
____ send robots and probes into space
____ send people into space
____ all of the above
____ none of the above

6. Do you think that life exists on other worlds?

____ yes ____ probably ____ probably not ____ no

7. Do you think we should settle on Mars?

____ yes ____ no ____ undecided

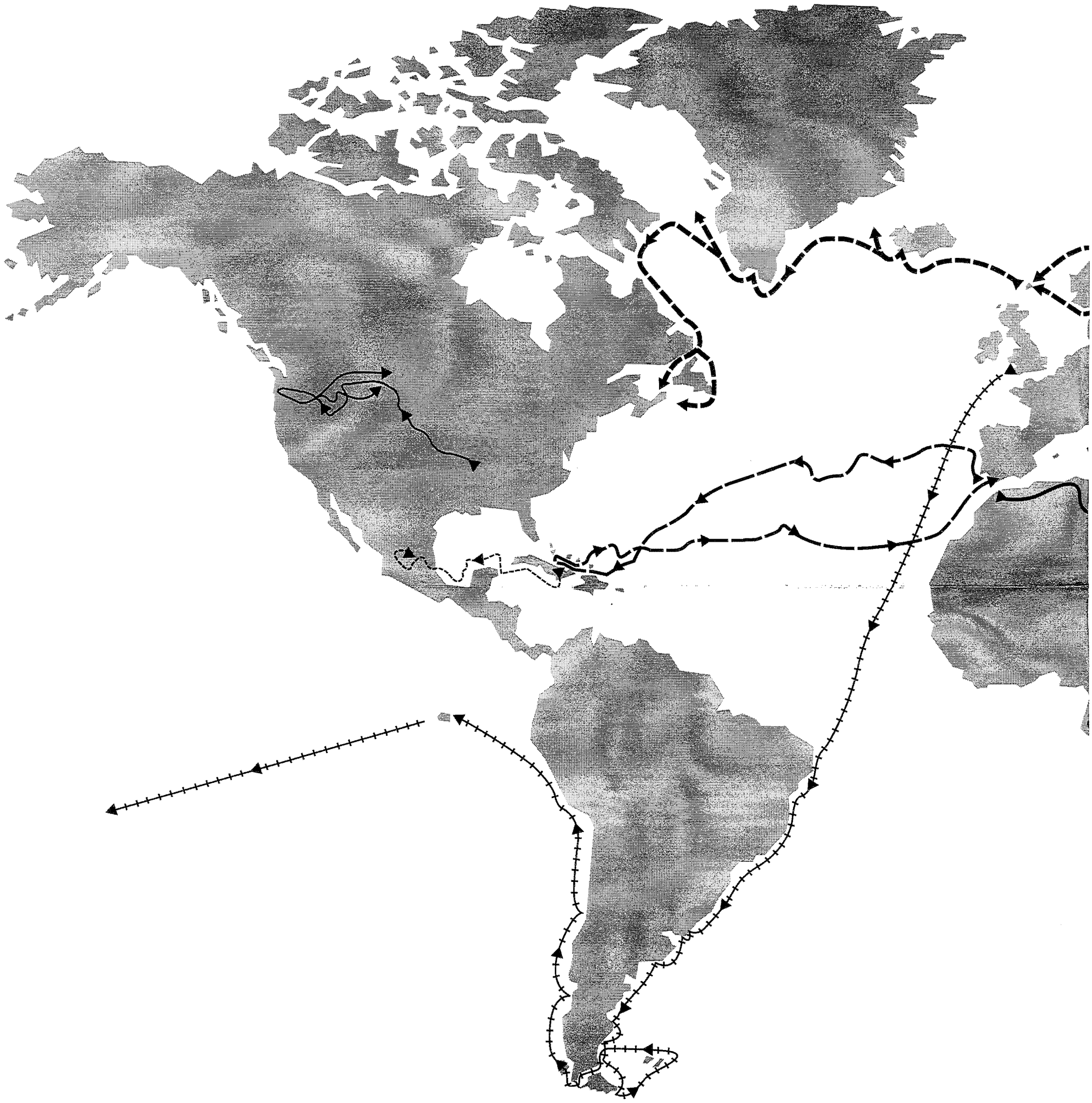
8. What percentage of a nation's budget should be spent on space exploration? (Right now, about 1% is spent.)

____ none
____ less than 1%
____ current spending is OK
____ between 1% and 5%
____ more than 5%

Survey adapted with permission from the National Air and Space Museum's "Where Next, Columbus?" exhibit.

Pathfinders

Who went where? Figure out which of the routes shown below represents the journeys of the following explorers: Ibn Battuta, Hernando Cortés, Charles Darwin, early Chinese explorers, Lewis and Clark, David Livingstone, and the Vikings.



Exploradores

¿Quiénes llegaron allí?. Investiga cuál de las rutas que se muestran a continuación es la que siguieron los exploradores: Ibn Battuta, Hernán Cortés, Charles Darwin, los primeros exploradores chinos, Lewis y Clark, David Livingston y los vikingos.

ART TO ZOO

Enero, 1994

Traducción de Orlando Lizama

¿Qué es lo que vas a echar de menos?

Has sido elegido para integrar la tripulación de una misión de tres años a Marte. ¿Qué cosa —y a quiénes — vas a echar más de menos?. Trata de responder las siguientes preguntas:

1. ¿Cuáles serán las cinco personas que vas a echar más de menos?

2. ¿Cuáles serán las actividades recreativas que vas a echar más de menos?

3. ¿Cuáles serán los lugares que vas a echar más de menos?

4. ¿Cuáles serán los alimentos que echarás más de menos?

¿Qué piensas tú?

1. ¿Crees que deberíamos explorar el espacio?

____ sí ____ no

2. ¿Cuáles, de las siguientes, piensas tú que es la mejor razón para explorar el espacio?.

____ aumentar el conocimiento científico
____ buscar otras formas de vida
____ fundar colonias en otros planetas
____ ser respetados como líderes de la exploración espacial
____ alentar la cooperación internacional

____ otros (explica)_____

_____

_____

3. ¿Qué es lo que más te preocupa respecto a la exploración espacial?

____ los riesgos y peligros
____ el costo
____ las necesidades urgentes y los problemas de la Tierra
____ la competencia entre los países que participan en la exploración
____ el impacto ambiental en otros mundos

____ otros (explica)_____

_____

_____

4. ¿Qué parte del espacio piensas tú que debemos explorar?

____ la Luna
____ Marte
____ otros planetas (además de Marte) en nuestro sistema solar
____ las estrellas
____ todos los mencionados

____ otros (explica)_____

_____

_____

5. ¿Cómo debemos explorar el espacio?

____ observarlo desde la Tierra
____ enviar robots y sondas al espacio
____ enviar gente al espacio
____ todos los mencionados
____ ninguno de los mencionados

6. ¿Crees tú que existe vida en otros mundos?

____ sí
____ probablemente no
____ probablemente sí
____ no

7. ¿Qué porcentaje del presupuesto de la nación debe aplicarse a la exploración espacial? (Actualmente se gasta un 1%.)

____ nada
____ menos del 1%
____ lo que se gasta
____ entre 1% y 5%
____ más del 5%