

Beneath the Sea

Activity 2: Grades 5-8 **ROV Grid Search**

Remotely operated vehicles, or ROVs, play an ever-expanding role in the exploration of the deep ocean environment. These relatively small submersibles are able to explore remote depths without placing humans in jeopardy. Operated from the control room of a surface ship, the ROVs receive control signals electronically through signal-carrying cables. Since the ROVs do not carry a human crew, there is no need to clutter the vehicle with life-support devices. What's more, the submersible can remain on site for extended lengths of time.



In order to locate target sites, underwater camera sleds and ROVs must often follow a well-defined search pattern. Using methodical sweeping movements, these craft will locate objects that might otherwise be overlooked if a more random searching method was employed. In this activity, you'll get to create a search pattern that will be used to uncover hidden targets.

This activity page will offer:

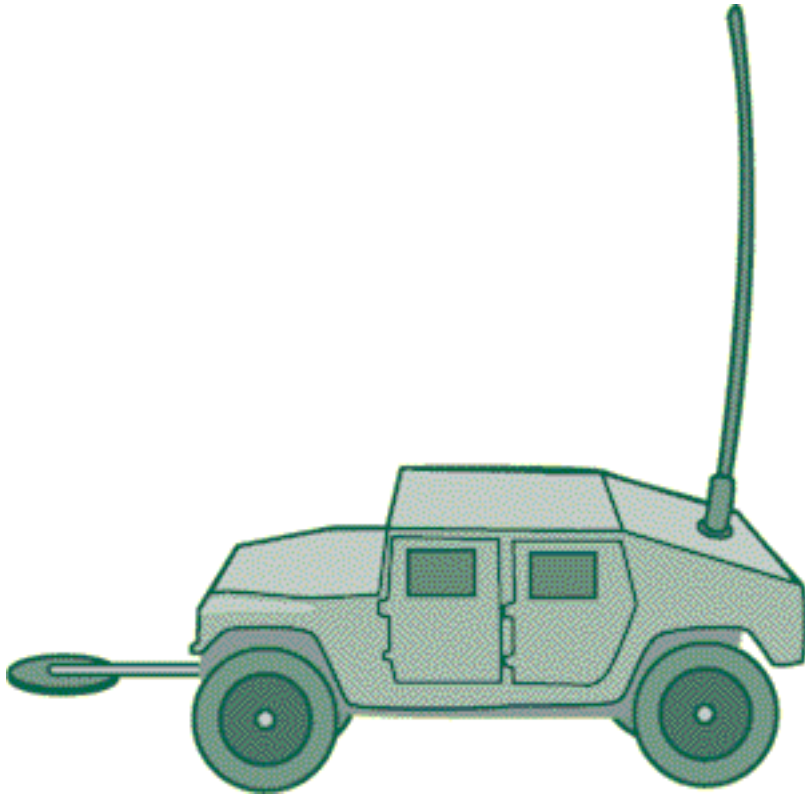
- An experience that recreates the remote exploration of the sea bottom.
- A hands-on activity using a remote-controlled vehicle.
- An exercise in uncovering targets through methodical searching.

MATERIALS

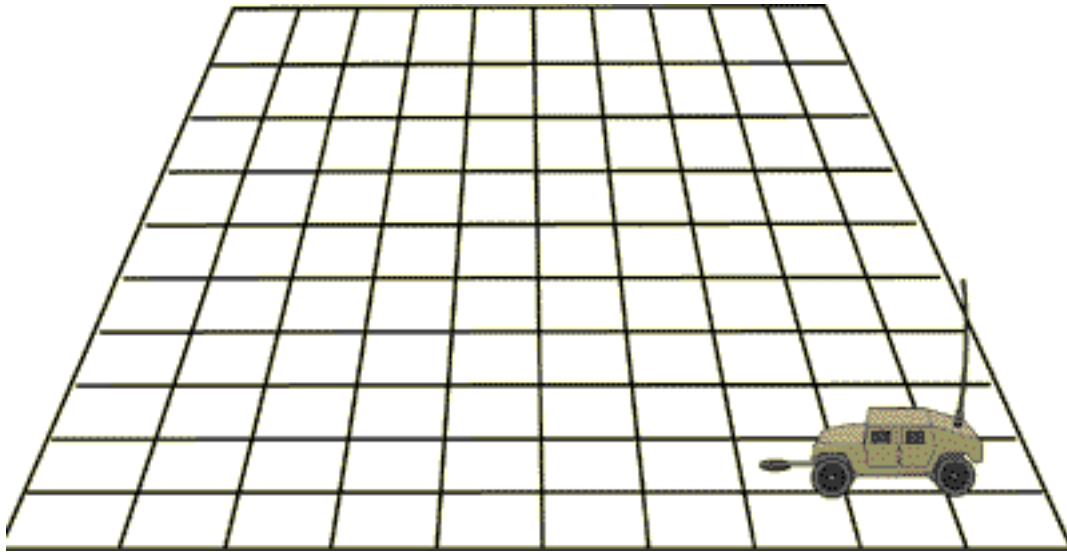
- Remote-controlled car
- Bar magnet
- Small iron washers
- Paint
- Masking tape

PROCEDURE

1. Use tape to attach the magnet to the side or front of a remote-controlled car. Make sure that the magnet extends from the side of the vehicle and skims just above the surface as the car moves. The magnet must be positioned so it can pick up bits of magnetic metal as it moves over them. You may need to use tape to build up the surface between the magnet and the bottom of the car to get it low enough to the ground.
2. Use tape to lay out a grid on a floor surface that is flat. The columns and rows of the grid pattern should be the same width as the remote-controlled car. Begin with a grid that is about 10 rows by 10 columns.
3. Paint the iron washers so that they blend with the floor surface.



4. Position your remote-controlled car in the center of the grid pattern.
5. Stand about five meters from the grid.
6. Face away from the grid. Have your instructor randomly place five camouflaged washers on the grid pattern.
7. Turn around. Your job is to develop a pattern that would best uncover the unseen targets. Implement your plan to see how many washers you can collect.



Questions

1. Why was it important to camouflage the iron washers?
2. Could plastic chips have been substituted for the washers?
3. Describe your search pattern.
4. What makes a search pattern effective?

EXTENSIONS

Weighing the Advantage

With your instructor's approval, compose two lists. One list should detail all of the advantages of using robotic vehicles. The other list should include all of the disadvantages of this exploration tool. Using these lists as a starting point, write a letter to a granting agency asking for money that would fund continued ROV research.

Science Fiction

With your instructor's approval, write a science fiction story about an ROV that uncovers the mythical kingdom of Atlantis. Don't forget to describe the interaction among the people who are at the controls of this submersible.

Art Connection

With your instructor's approval, work with classmates to create a large mural that illustrates an undersea vent community. To ensure accuracy, you'll need to use both print and Internet resources to learn more about the structure of these deep ocean communities. When the mural is complete, draw a sketch that can be used as a key to identify each of the illustrated organisms.

JASON Junior

With your instructor's approval, use the Internet to develop a search strategy for uncovering the role of JASON Junior (affectionately called "JJ") in the initial exploration of the sunken ship Titanic. What key words would you use? Which ones are most important?

WEB CONNECTION

Jason/Medea and ARGO-II

http://www.marine.who.edu/ships/rovs/jason_med.htm

This site offers many details about JASON, one of the best-known ROVs in ocean research.

Hydrothermal Vent Communities

<http://www.botos.com/marine/vents01.html>

The basic construction of a submarine and its ballast tanks are illustrated at this site.

ROV Video Clips

<http://www2.ncsu.edu:8010/unity/lockers/project/scijunct/terminal/lessons/coast/research/rovmov/rovmov.html>

Read this biography of William Beebe on *The American Experience* Web site.

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Answers

Questions

1. Why was it important to camouflage the iron washers?
(Since the activity explored the use of a search pattern, you needed to make sure that the car operator didn't see the targets and drive straight to them).
2. Could plastic chips have been substituted for the washers?
(No. The chips would not be attracted to the vehicle's magnet.)
3. Describe your search pattern.
(Answers will vary, but most will use the grid lines to orient straight paths through the search area.)
4. What makes a search pattern effective?
(Accept all reasonable answers such as sticking to a predetermined method for covering territory.)

JASON Junior

With your instructor's approval, use the Internet to develop a search strategy for uncovering the role of JASON Junior (affectionately called "JJ") in the initial exploration of the sunken ship Titanic. What key words would you use? Which ones are most important?

(JJ was a smaller version of the famous ROV JASON. JJ was tethered to the piloted submersible ALVIN. It was JJ that went into the Titanic and took the pictures of the ship's interior)

CURRICULUM LINKS

Life Science :

Deep-Sea/Vent Ecosystems, Chemosynthesis

Physical Science:

Properties of Matter, Tension, Buoyancy of Water, Buoyancy of Air, Balanced/Unbalanced Forces

Technology:

Robotics in Deep-Sea Exploration

NATIONAL SCIENCE STANDARDS (Grades 5-8)

Science as Inquiry- Content Standard A

Scientific explanations will be based on observational evidence and modeling.

Physical Science - Content Standard B

Students will investigate properties of matter such as magnetism.

Life Science - Content Standard C

Students will explore the biotic and abiotic factors that affect deep-sea niches and the resources needed to sustain ecosystems.

Science and Technology - Content Standard E

Students will appreciate that technology allows scientists to observe and study objects and events that have never before been observed.

Science in Personal and Social Perspectives - Content Standard F

Students will analyze the risk and benefit of using robotics as a tool of data collection.