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Introduction

Spirit and *Opportunity* had an exciting mission ahead of them. The twins were going to journey to Mars. Their landing had been carefully planned. After they entered the planet's atmosphere, parachutes would help them land safely on the surface. After they landed, they would have the important task of gathering information about Mars. But before gathering data, *Spirit* and *Opportunity* would unfold their large wings and let them soak up the sun's rays. The twins wouldn't be using these wings to fly. They would use them for power to move while on Mars and to perform experiments.

Does this sound like the beginning of a science-fiction story? You might be surprised to learn that the story is real. *Spirit* and *Opportunity* are rovers that traveled to Mars to collect information for scientists on Earth.

Spirit and *Opportunity* are remarkable for many reasons, and one reason is their power source. The "wings" on each rover are actually solar panels. In other words, the rovers use the power of the sun to move and do their work.

Landing on Mars

What are some other ways we use solar power in space? In what ways could we use solar power in our daily lives?

Solar Energy in Homes

Think about all of the ways you use energy in your home each day. Every time you flip on a light switch, turn on the television, or make a piece of toast, you're using electricity for energy.

We buy electricity from a company that provides energy. The company produces its electricity at an electrical plant and sends it through wires to our homes and to other buildings. But instead of buying all of the electricity from electric companies, more and more people are using solar panels for some of their energy needs.

Solar panels catch the energy of the sun and turn it into a form we can use. Solar panels make electrical energy. That energy can then be stored in batteries. From there, we can use the energy in hundreds of different ways.

Builders design some houses specifically with solar power in mind. The houses catch as much sunlight as possible using a large solar panel in the yard or one or more panels on the roof. In fact, the roof itself can be one giant solar panel!

A solar-powered house

Solar-powered houses have many benefits. The houses use little energy from other sources, such as power plants. Power plants can cause pollution, therefore solar-powered homes help to reduce pollution. Also, people who live in houses with solar power don't have to worry about the power going out. If electrical wires come down in a thunderstorm, most people will be left in the dark. But houses that have been storing energy in batteries all day can keep on shining.

Scientists are working to design houses that will be completely solar-powered. This is different from using just some, or even a large amount of, solar power. If you lived in a true "solar house," you would be able to cook, clean, watch television, and even surf the Internet using power from only the sun.

This seems like a dream to some people, even people who already have solar panels on their houses to meet some of their energy needs. They may think of solar power as an extra power source. Someday soon, completely solar houses may be common.

Solar-Powered Cars

What do you park in the garage next to your solar house? How about a solar car?

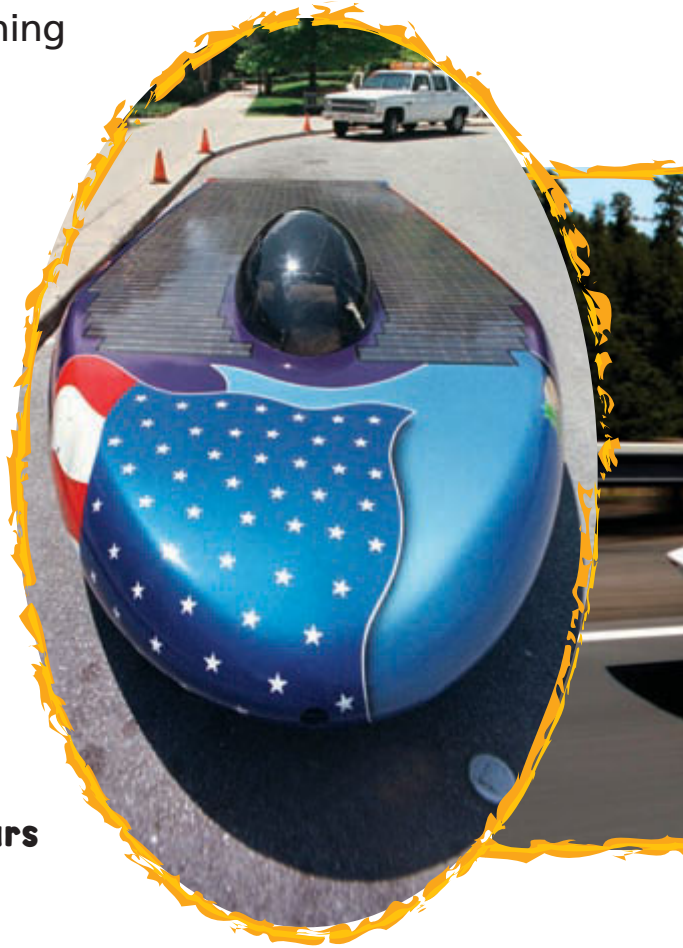
A solar car is just what it sounds like, a car that's powered by sunlight. Most cars today are powered by gasoline. Gasoline-powered cars have problems, however. For one thing, they cause air pollution. Also, gasoline comes from fossil fuels, which are a nonrenewable resource. This means that when we use up Earth's supply of fossil fuels, there will be none left. Why not build solar cars now?

The World Solar Challenge

Every other year, people from all over the world come to Australia to race their solar-powered cars. They travel across the entire continent on nothing but sunlight. Some teams make the long trip in fewer than four days.

Some people are already working on that idea. Several teams of engineers have produced solar cars. There are even races held around the world to see which solar car is best. This friendly competition serves as an incentive to build a better solar car. In time, people may drive to work in solar cars, and air pollution might decrease. Drivers won't have to stop at gas stations, and they'll never run out of gas! A car that's powered by sunlight could solve a lot of problems.

How does a solar car work? The roof of a solar car is a big solar panel. It's made of something known as PV cells. When turned on by the sun, each PV cell can make about one-half volt of electricity. One-half volt isn't much, so the car needs hundreds of cells.



Solar-powered cars

There's one question people often ask about solar power: What happens when clouds hide the sun? That's not a problem for a solar car. The car has a battery. Part of the solar energy collected by the PV cells is stored in the battery for later. When it's cloudy, energy from the battery powers the car. When the clouds pass by, it's back to sun power.

If solar cars are ever to be used in places where there isn't much sunshine, battery storage could be a problem. One of the biggest challenges for people who make solar devices of any sort is figuring out how much energy should be used right away and how much should be put aside for a rainy day.

Satellites

In what other ways can we use solar panels? The only thing a solar panel needs for making electricity is sunlight. As long as sun can shine on the panel, it works. It even works in space.

Scientists use solar panels on satellites. Once satellites leave Earth, they aren't easy to get to. If satellites used regular batteries instead of solar power, astronauts would have to travel in space shuttles to replace old batteries.

Satellites orbit the planet high above the atmosphere, where nothing blocks the sunlight. The satellites put all of the free energy to use. Satellites make their own electricity.

The Hubble Space Telescope

When would the Hubble Telescope be in Earth's shadow?

The Hubble Space Telescope uses solar power. Hubble is a telescope that's about as big as a school bus. It orbits the Earth 375 miles above the surface.

The Hubble has many different kinds of scientific instruments attached to it. People operate the instruments from Earth. But for the instruments to work, the telescope needs energy. It has two big winglike panels on each side. These panels, called solar arrays, catch sunlight and turn the light into energy that Hubble can use.

The Hubble's solar arrays store some of their power in batteries. When Hubble is in Earth's shadow, its arrays can't collect sunlight. The batteries keep power flowing to the telescope.

If the arrays need to be replaced, astronauts can install new ones. The arrays can fold up to fit inside of a space shuttle.

The International Space Station also uses solar power. The space station is large enough for astronauts and scientists to live on for many months.

In 2000, five astronauts on board the space shuttle *Endeavor* flew to the station and attached a solar array structure. It really was big—the entire array was 240 feet long! It was the longest human-made object in space.

Now the International Space Station has more power than it did before. Having more power makes it easier for the crew members who live on the station to do experiments.

The International Space Station

Rovers

And don't forget about *Spirit* and *Opportunity.* These rovers were like miniature cars run by remote control. Each one was loaded with scientific equipment to collect information about Mars. After the rovers landed, scientists on Earth sent radio signals to operate them. The rovers traveled around on the surface of the planet, sending back pictures.

During the Martian day, the rovers recharged their batteries using the sunlight. Because their batteries stored solar power, they could travel at night.

Spirit and *Opportunity* needed about 100 watts of power to operate. That's about the same amount of power that an ordinary light bulb uses.

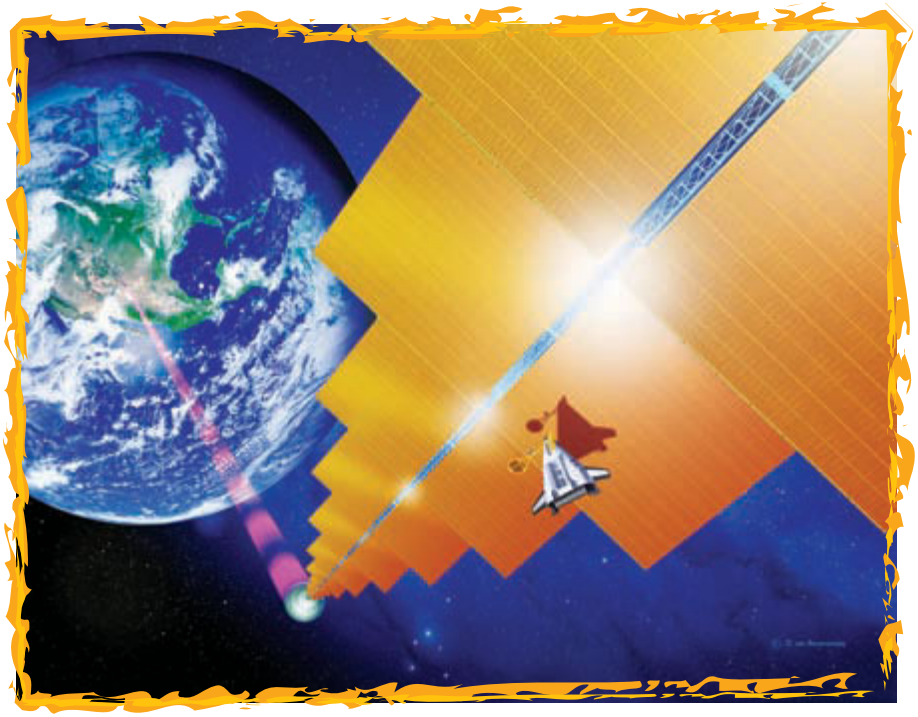
The rovers' solar power was not entirely without problems. During a Martian winter, the solar panels on *Spirit* and *Opportunity* received less sunshine. Also dust on the solar panels meant that less power could get through.

A Mars Exploration rover

Solar Power in the Future

What's next for solar power? Some scientists have suggested building a giant solar array in space. This would be an orbiting platform with many solar panels. It would catch energy from the sun and send that energy to Earth.

Because an orbiting solar array would be above the atmosphere, it could catch sunlight no matter what the weather was like down on Earth. Even on the darkest winter day, our cities would still have full power.



An artist's drawing of a future space array

Think and Write

1. Suppose that you live in a solar-powered house. Your friend asks you, "What are you going to do if it rains?" What would you tell your friend?
2. What do the Hubble Space Telescope and the International Space Station have in common?
3. Would you like to race a solar-powered car? Explain your response.
4. **Persuasive Writing** Some people think that new houses should get at least some energy from the sun. Write a paragraph persuading home builders to use solar energy. Explain why solar energy is a good source of power.

Hands-On Activity

Rover Report Continue the story about the adventures of *Spirit* and *Opportunity*. Write about what they do as they travel on Mars. Describe how their "wings" help them. Draw pictures that show what you're writing about. Share your story with your class.

School-Home Connection

Solar Cooking You can find directions on the Internet for building a solar oven to heat up foods. Ask a family member to type "solar oven activity" into a search engine. Choose an activity. With the family member, build your own oven. Be sure to follow all directions for safety.

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