Watch out for Static Electricity

Static electricity can be dangerous to rovers exploring other moons and planets.

Scientists and engineers building NASA's Mars 2020 rover took precautions to prevent static electricity.

LEARN MORE:
nasa.gov/vision/space/livinginspace/10aug_crackling.html

Static electricity—caused by a charge imbalance when positive and negative charges are separated—can damage sensitive electronics. Researchers building the rovers and landers that explore the solar system must be careful to minimize discharging static electricity. To do so, they often wear wrist straps that prevent static electricity from building up on their bodies. Static electricity can also be a problem after spacecraft have landed on a moon or planet. The Earth's moon, for instance, can become charged with static electricity after passing through clouds of particles emitted by the Sun. This charge imbalance can release sparks that can harm a spacecraft's electrical equipment.

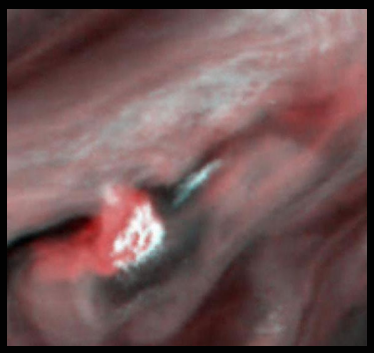
Static electricity can cause moon dust to cling to spacesuits, equipment, and instruments, which was a problem for Apollo astronauts.

Lightning on Other Planets

Earth isn't the only world that has lightning.

An artist's impression of lightning in Jupiter's northern hemisphere.

LEARN MORE:
nasa.gov/feature/jpl/juno-solves-39-year-old-mystery-of-jupiter-lightning



Storms on Jupiter illuminated by lightning strikes, taken by NASA's Galileo spacecraft.

Planets other than Earth also experience lightning, including Venus, Jupiter, and Saturn. And research has shown that intense electrical storms might even exist on exoplanets far beyond the solar system. Lightning bolts can form when positive and negative charges separate within clouds. The air between the charges acts as an insulator, but when the charges build up enough to overcome this insulator, there is a rapid discharge of electricity that we know as lightning. Lightning is an important phenomenon on our planet and others because its energy can break molecules into smaller pieces. These fragments of molecules can then combine in new ways, changing the chemistry of a planet's atmosphere and potentially its ability to support life.

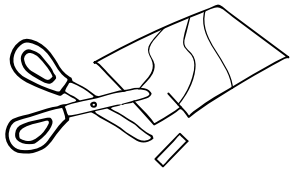
BUILD AN

ELECTROSCOPE

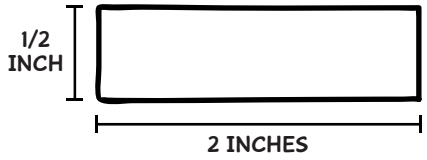
1) CURL ONE END OF THE WIRE.

2) MAKE A SMALL HOOK ON THE OTHER END.

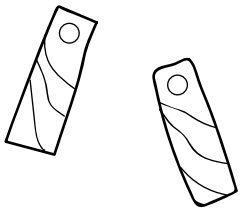
3) CUT TWO SMALL FOIL RECTANGLES.



APPROXIMATE SIZE

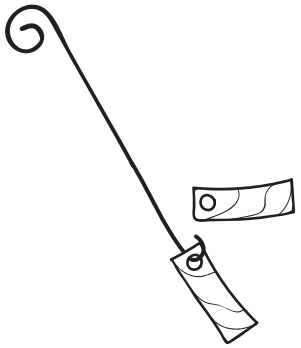


4) PUNCH A HOLE AT THE TOP OF EACH FOIL RECTANGLE.

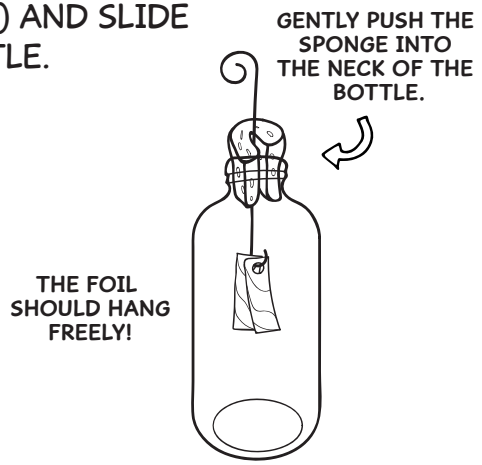


FLATTEN THE FOIL BY SMOOTHING IT ON THE TABLE.

5) SLIDE BOTH FOIL RECTANGLES ONTO THE SMALL HOOK.



6) FOLD A SPONGE AROUND THE WIRE (LIKE A TACO) AND SLIDE IT ONTO THE BOTTLE.



YOU'VE MADE AN **ELECTROSCOPE!**

EXPLORING THE UNIVERSE

Static Electricity

Try this!

Experiment with the model *electroscope*—an instrument used to detect electrical charge. First, rub the foam tray on the wool felt for about ten seconds to charge it up. Then, wave the tray next to the wire on top of the electroscope without touching the tray to the wire. What do you notice about the foil shapes inside?

Follow the "Build an Electroscope" instructions to construct your own tool!

Now try this! Charge up the foam tray again and hold it close to (but not touching) the wire on your own tool. Keep experimenting! What happens if you use your own shirt to develop a charge? Can you get a stronger charge by rubbing the foam on the carpet? What happens if you rub the tray for a longer or shorter time?

Special tools can help detect invisible forces on Earth and in space.

Massive lightning storms on Earth, viewed from the International Space Station.

Engineers and scientists invent and build tools to answer specific questions. You might be familiar with different tools that measure or detect different things. For example, a scale measures weight and a thermometer measures temperature. The electroscope you made in this activity detects if an object is electrically charged or not.

By rubbing the foam tray on the wool, you created an *electrostatic charge* (static electricity), and the wire and foil in your electroscope moved in response. A build-up of static electricity causes many events we witness on Earth, including lightning storms, getting a shock from a doorknob in the winter, or your hair standing on end after you go down a slide!

An electrostatic discharge point on the Sojourner Mars rover's antenna.

Some NASA scientists study how static electricity behaves—here on Earth, in space, and on other worlds. For example, scientists have theorized that the earliest stage of planet formation is tiny particles, pulled close together by gravity, attracting each other due to static electricity.

Static electricity is also important as we explore other worlds. Another reason we measure and monitor electrical charge is because a build-up of static electricity, and an uncontrolled discharge, could zap critical electronics. For example, the dry, dusty soil on the Moon and Mars is so insulating that the wheels of a rover moving over the surface can develop a static charge—kind of like dragging your feet across carpet. Engineers have designed special features to ensure that any electrostatic build-up is safely discharged.