

# EXPLORE SPACE







# EXPLORE SPACE



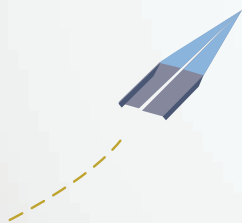
## YOUR MISSION:

“Space” is an enormous concept. We want students to feel how amazing space is, and also to imagine themselves working there. Maybe one of these students will be the first woman to walk on Mars, or will start a private space exploration company!

## ADVICE ON VOLUNTEERING



**SAFETY CHECK:** There’s a lot to handle on these exhibits, but make sure students do it safely (no running, no poking each other in the eye, etc.)

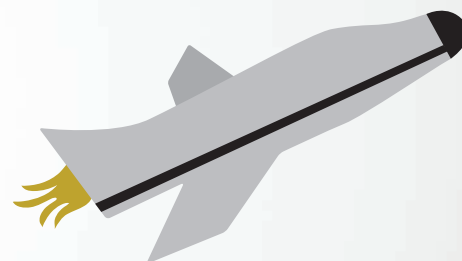


**ENCOURAGE EXPLORATION:** Ask questions and make sure everyone gets a chance to participate. A little positive feedback goes a long way.



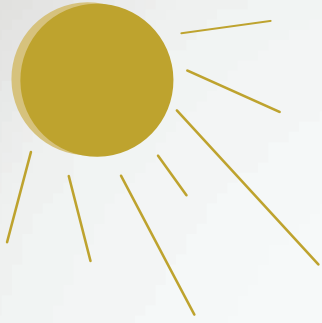
**GEEK OUT!** You don’t have to be an expert. Your curiosity and enthusiasm inspire kids to learn.

## AREA OVERVIEW



**WHAT’S IT LIKE TO WALK ON MARS?** What do astronauts actually do all day? This area introduces students to some of the concepts and tools used by astronauts, astronomers and other space experts to explore life outside of Earth’s atmosphere.

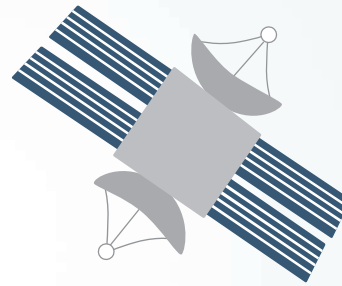
# EXPLORE SPACE



- The sun is one of at least 100 billion stars – and that’s just in our galaxy. There are more stars in the sky than there are grains of sand on all of Earth’s beaches.
- If you were traveling at the speed of light(186,000 miles per second), it would still take you 100,000 years to get across the Milky Way.
- You are made out of stars. Almost every element in your body (and on earth) comes from stardust - tiny pieces of stars that exploded eons ago.
- Astronomers have discovered a planet where it rains melted glass, sideways.

## GRAND CHALLENGES

If you could do one thing to make life on Earth better, what would that thing be? Here's a **GRAND CHALLENGE**: according to some of the world's smartest people, this is a challenge that humans will face in the next 100 years. **What would you do to help solve it?**



**HOW CAN WE EXPLORE NEW PLANETS**, or find out what lives in the deepest parts of the Earth’s oceans? What will it take to sustain human life on another planet? Today’s students will help invent and improve vehicles and tools for exploration of the farthest reaches of the universe.

## JOKES

**What did the alien cook for lunch?**

Unidentified frying objects

**If a meteorite hits a planet, what do we call the ones that miss?**

Meteowrongs



# HOW MUCH DOES IT WEIGH?



## SAFETY FIRST: HOW TO USE

- Okay for students to handle.
- Give each student a turn lifting each of the four cans. Ask them to predict whether each can will be heavier or lighter than on Earth. (Don't tell them this, but the can representing the sun is secured in place so the students cannot lift it up. The gravity of the sun would make the can of Coke weigh about 25 lbs.)

## CONCEPT BREAKDOWN



Mass measures how much matter an object contains. Weight measures the pull of gravity on that object. When you travel to a different planet, your mass doesn't change, but your weight does.



The moon has a weaker gravity than Earth, so when you try to walk there, you bounce. You can't walk on the sun, but if you could, the sun's powerful gravity would cause you to sink into the surface.

## RELATE TO REAL LIFE!

Imagine you're standing on a ladder and your friend is a few rungs down, holding onto your ankles. If your friend is very strong, you'll find it very hard to move. If your friend lets go altogether, you can climb right up the ladder.



Gravity works the same way: it's the force that keeps you from floating up. In fact, people DO exert a gravitational pull on each other. However, because our bodies are tiny compared to the Earth, the pull is not very strong.

AREA: SPACE

EXHIBIT: HOW MUCH DOES IT WEIGH?

# HOW MUCH DOES IT WEIGH?



## QUESTIONS

Try lifting the can on the left. That's how much a can of soda weighs on Earth. Now try lifting the can on Jupiter. Can you feel the difference?

**Which of the cans is heaviest?**

The Sun.

**Why is the can heaviest there?**

Because the Sun has the most mass.

**Which of the cans is the lightest?**

The moon.

**Why is the can lightest there?**

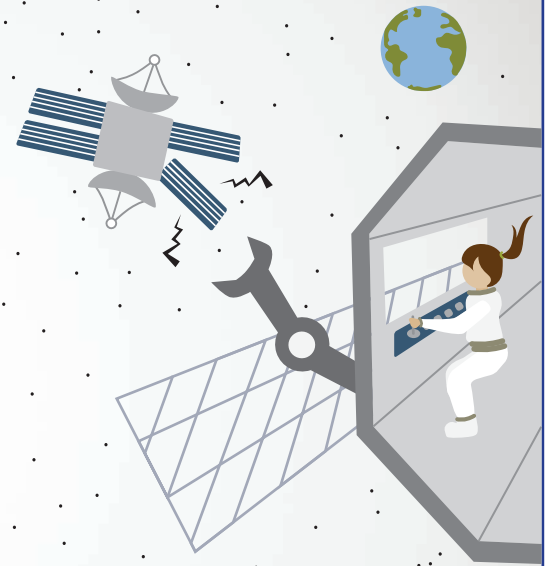
Because the moon has the least mass.



## CAREERS

**ASTRONAUTS** pilot spacecraft and travel to space to run science experiments, repair space stations, and explore the Earth and other planets.

**ANNUAL SALARY:** \$90,000



## ADDITIONAL INFORMATION



Say you weigh 100 pounds on planet Earth. Guess how much you'd weigh on the moon? Just 17 pounds. But on Jupiter, your same 100-pound body would weigh 236 pounds. And on the sun, you'd weigh more than 2,700 pounds!

The display screen will show students what they weigh on any planet. Just enter a weight and select a planet to see the result.

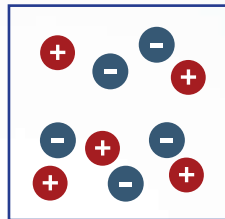
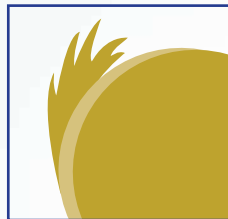
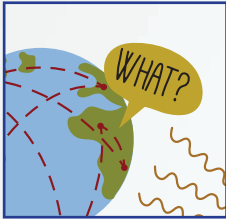
# SOLAR FLARES



## SAFETY FIRST: HOW TO USE

- Okay for students to handle.
- Students can press the button to simulate how solar flares interrupt communications on Earth.

## CONCEPT BREAKDOWN



- The sun is almost 93 million miles away, but it can still interrupt your conversation.
- Your cell phone calls are carried in the air using radio waves that bounce back and forth between the Earth and satellites in orbit.
- Solar flares are bursts of solar radiation that disrupt radio waves and cause big problems for communications on earth.
- Solar flares happen when magnetic energy builds up in the sun's atmosphere and has to be released. **Some scientists think of it like a giant "burp" from the sun.** The release is an explosion that's as big as millions of 100-megaton hydrogen bombs exploding all at once – but that's still just 10% of the energy that the sun emits every second.
- There are a lot of pieces in a solar flare: fast-moving electrons, protons, and heavy atomic nuclei as well as radiation across the entire spectrum.
- We can't see solar flares by staring at the sun. In fact, **staring at the sun can cause permanent eye damage.**

## RELATE TO REAL LIFE!



**HOW MANY OF YOU HAVE LOOKED UP DIRECTIONS ON A CELL PHONE?** When you look up directions, your phone uses something called GPS, or Global Positioning System. GPS uses 24 satellites, orbiting 12,550 miles above us, to calculate where you are, and how to help you get where you're going.

Because GPS signal uses radio waves, solar flares can interrupt them too. That's why paper maps are still handy!



# SOLAR FLARES



## QUESTIONS

**Why do solar flares break off from the sun?**

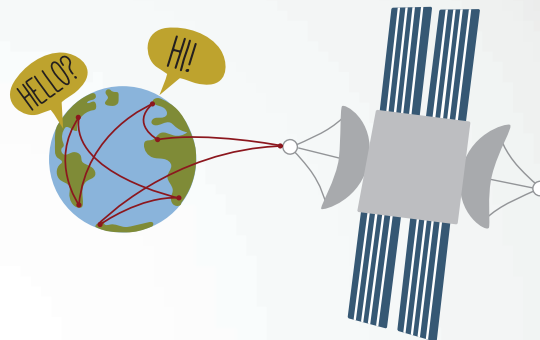
The magnetic energy builds up and has to be released.

**How long does it take for radiation from a solar flare to reach Earth?**

It takes a little over eight minutes to travel the nearly 93 million miles to Earth.



## CAREERS



**SATELLITE ENGINEERS** design command systems to control satellites from the Earth, communicate with outer space missions, and collect data on satellite behavior.

**ANNUAL SALARY:** \$103,000

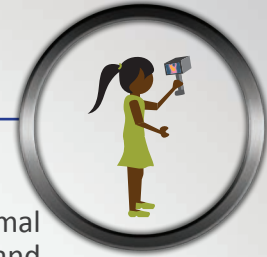
## ----- ADDITIONAL INFORMATION -----



**WHO INVENTED THE CELL PHONE?** It took a lot of people to develop the different technologies that let you message your friends, take videos, or navigate using your phone. One of those people was Henry Sampson, an African-American inventor and nuclear engineer who helped develop technology used in all the billions of cell phones around the world today.



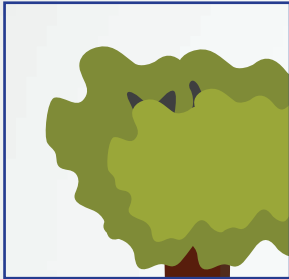
# THERMAL IMAGING



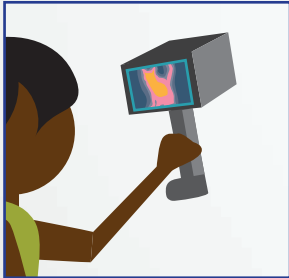
## SAFETY FIRST: HOW TO USE

- Ask students to line up, with the first student facing the thermal camera. Ask each student to place their hand on their heart and hold for a count of five. When they remove their hand, what do they see?

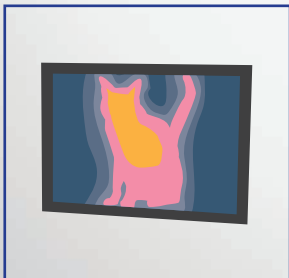
## CONCEPT BREAKDOWN



- Thermal cameras let us see things that the human eye can't see.
- "Thermal" means that something is "related to heat".
- All objects emit infrared energy (heat). Generally, the hotter an object is, the more radiation it emits.

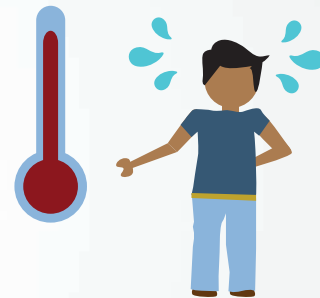


- A thermal camera (sometimes called an infrared camera) is essentially a heat sensor.
- The thermal camera measures the infrared radiation from objects and creates an electronic image showing different temperatures as different colors.



- For instance, a mosquito, your hand, and an ice cube will all be different temperatures, so a thermal camera will show them as different colors.

## RELATE TO REAL LIFE!



A thermal imaging camera operates on the infrared spectrum: warm objects appear reddish, and cool objects appear more blue. Human beings can't see infrared, but mosquitoes can. When they see red, they know there's a warm body, and head in for a snack.

# THERMAL IMAGING



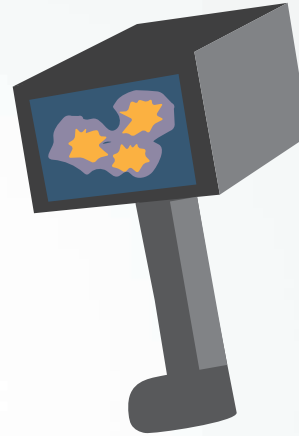
## QUESTIONS

What are some uses for thermal imaging?

- Astronomers studying new galaxies -- NASA uses an infrared camera on the Hubble Telescope because it can see through clouds of space dust
- Meteorologists mapping temperatures of the Earth to understand and predict weather patterns
- Space station mechanics locating a leak in a spacecraft



## CAREERS



An **ONCOLOGIST**, a doctor who specializes in treating cancer, uses thermal imaging to locate tumors or cancerous cells

**AVERAGE SALARY:** \$300,000

## ADDITIONAL INFORMATION

### HEAT-SEEKING RESCUE MISSIONS



Thermal imaging helps save lives, and can even be powerful enough to see recent footprints.

Rescuers use it to search for people trapped in rubble after an earthquake or tornado.

Firefighters use it to locate people and fire through smoke, dust, darkness, and even walls.

# THANK YOU!

Thank you for inspiring students and encouraging them to explore careers in STEM. We could not do this work without you, and we truly appreciate your support.

If you took photos today and plan to post to social media about your experience, please consider tagging the TAME State Office. We would like to recognize your hard work and may share images and stories on TAME.org or with our corporate partners who help bring this experience to different communities around Texas.



[Facebook.com/TAMESTEM](https://www.facebook.com/TAMESTEM)



[Twitter.com/TAME\\_STEM](https://twitter.com/TAME_STEM)

# #DRIVINGSTEM



Texas Alliance for Minorities in Engineering

Schedule your own Trailblazer experience:

**[TAME.ORG/TRAILBLAZER](http://TAME.ORG/TRAILBLAZER)**