Spacecation

National Inventors Hall of Fame®
EDUCATION PROGRAMS

SPACECATION™

GALACTIC TICKET

ROUND TRIP

FIRST CLASS

WATER BEAR SPACE TRAVEL CO.

Passenger Name: _____

Destination: Wonders of Weightlessness (WOW) Hotel
Our Solar System, Milky Way Galaxy

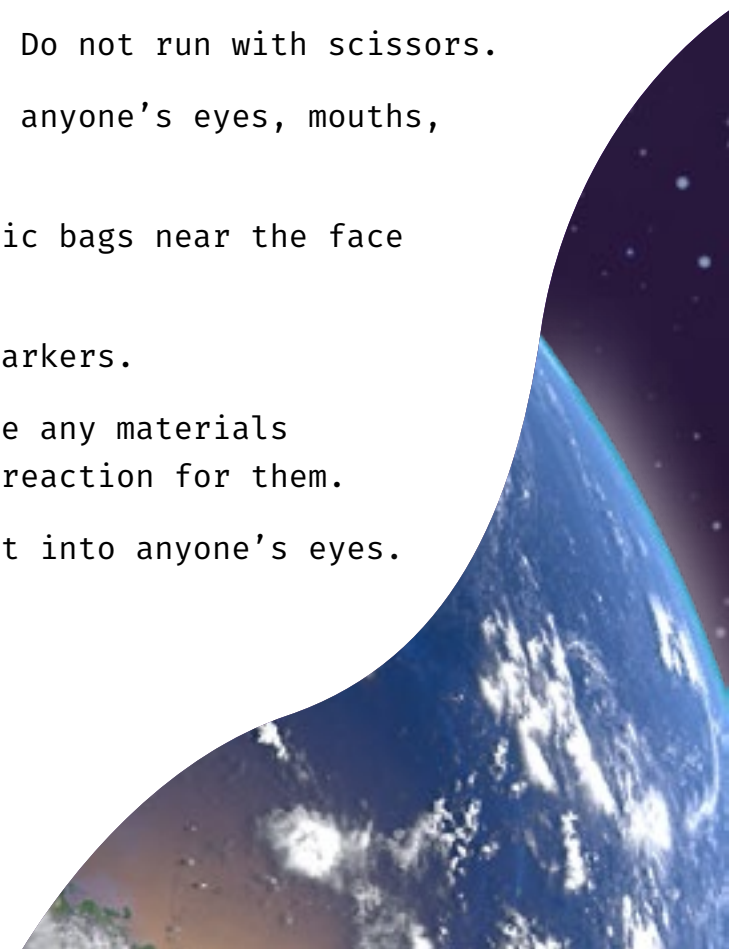
Images of Europa, Io, and Earth's Moon courtesy of NASA

SAFETY AND HYGIENE

WARNING

Choking hazard—small parts.
Not for children under 3 years.

- All activities require adult supervision.
- Ages 5+
- Read and follow all instructions.
- For safety and hygiene purposes, wash hands after each activity.
- Properly hold and use scissors. Do not run with scissors.
- Do not put materials in or near anyone’s eyes, mouths, and ears.
- Do not play with or place plastic bags near the face or mouth.
- Ventilate the room when using markers.
- If anyone has an allergy, remove any materials that might trigger an allergic reaction for them.
- Do not shine the mini blacklight into anyone’s eyes.



For an enhanced experience, access music, posters, and videos online at **invent.org/explore/space**

Password:

BLAST

Howdy, I'm CAPTAIN WATER BEAR EXTRAORDINAIRE! I'll be around to guide you on your journey.

Use your Spacecation stickers along the way!

WATER BEARS (aka **Tardigrades**) are microscopic creatures. They can live almost anywhere—even in space!—by entering *cryptobiosis*, where they curl up into a dehydrated ball and rehydrate later.

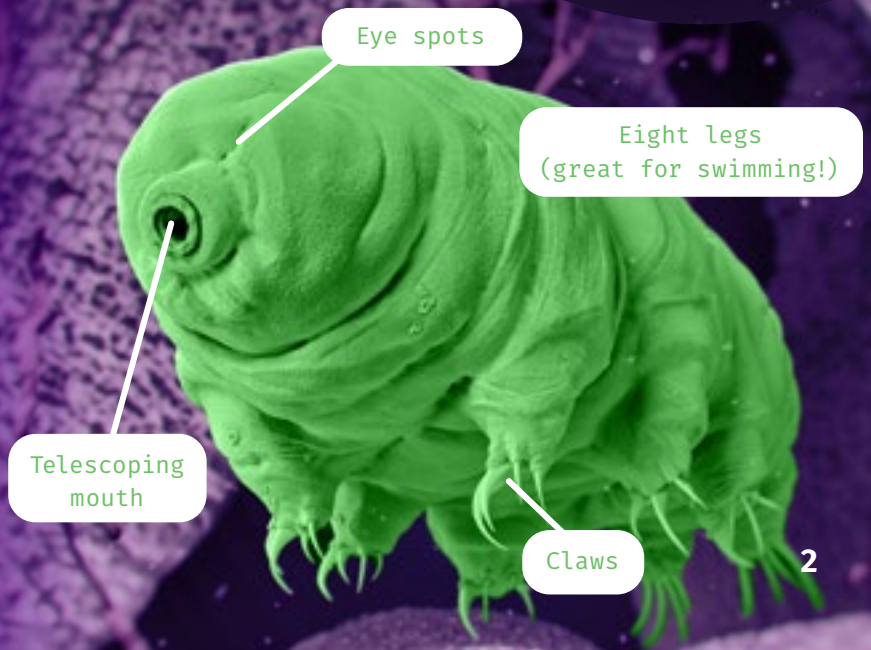
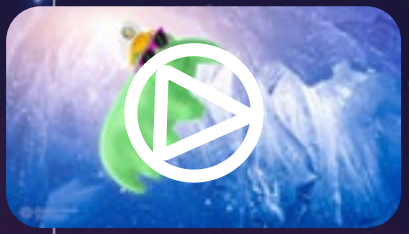


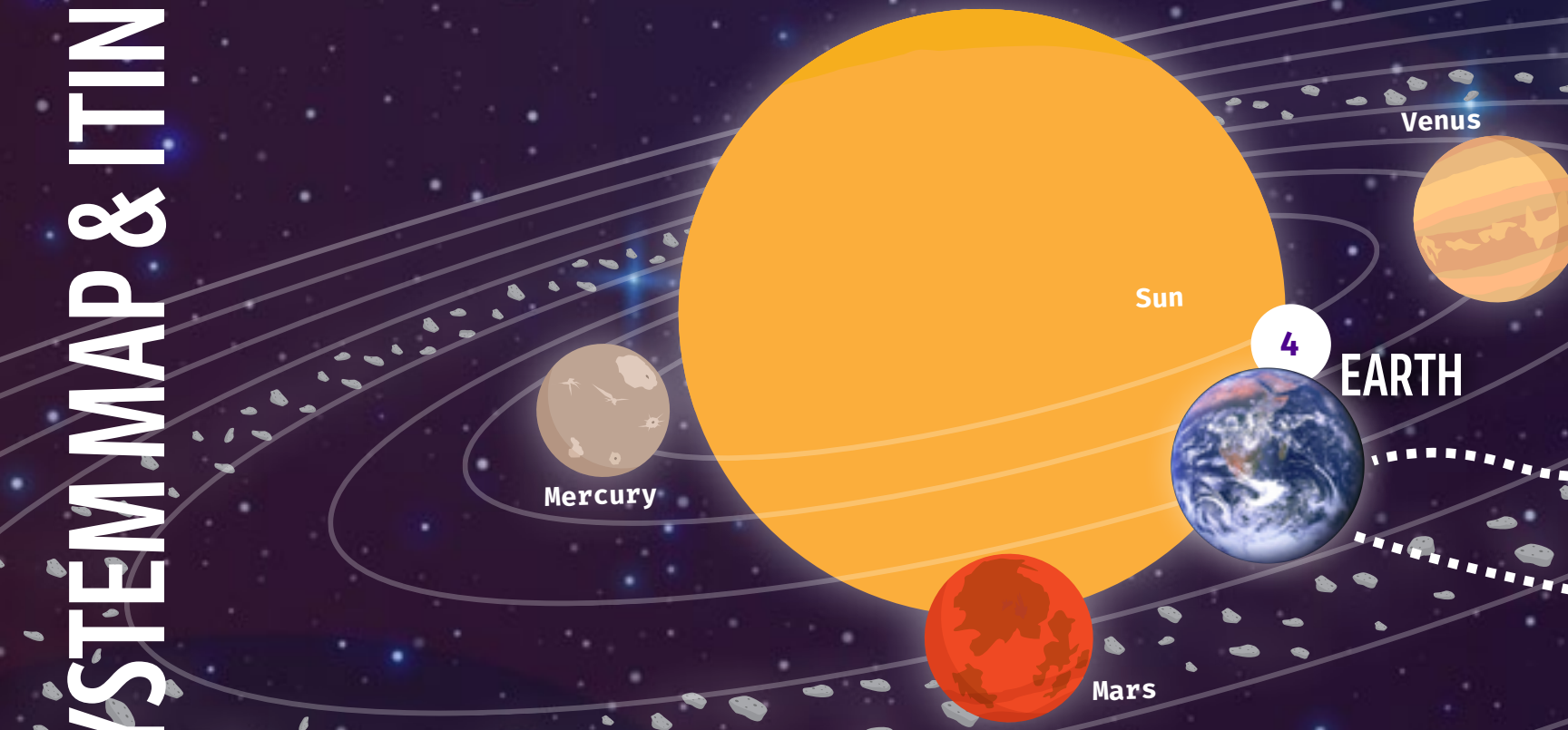
Image of Earth's Moon courtesy of NASA

SOLAR SYSTEM MAP & ITINERARY

Check out your space vacation travel destinations.

Watch the **Vacation Among the Stars** video to discover more!





MEET A HALL OF FAMER

EVELYN BEREZIN

Ready to reserve a round-trip flight to the Moon? One day, space vacationers might make their travel plans using a system inspired by Evelyn Berezin's invention of computer systems for business use. She designed one of the earliest computer reservation systems for airlines, connecting people to flights in a matter of seconds.

Learn more about Berezin here: invent.org/inductees/evelyn-berezin

Saturn

Jupiter

1 EUROPA

Uranus

3 CERES

Asteroid Belt

2 IO

Neptune

1

Jupiter's moon

EUROPA

2

Jupiter's moon

IO

3

Dwarf planet

CERES

4

Planet

EARTH

Images of Ceres, Europa, Io, and Earth's Moon courtesy of NASA

PACK YOUR BAGS

Build an out-of-this-world Spacepack for your upcoming astro-adventures!

You'll need:

1 **Brainstorm** ideas for a Spacepack. Start by writing down two things you'd love to do on vacation and what you'd need to pack.

2 **Think** about how those activities might inspire features on your Spacepack.

What would you want to bring on a vacation on Earth?

What might you want to bring if traveling through space?

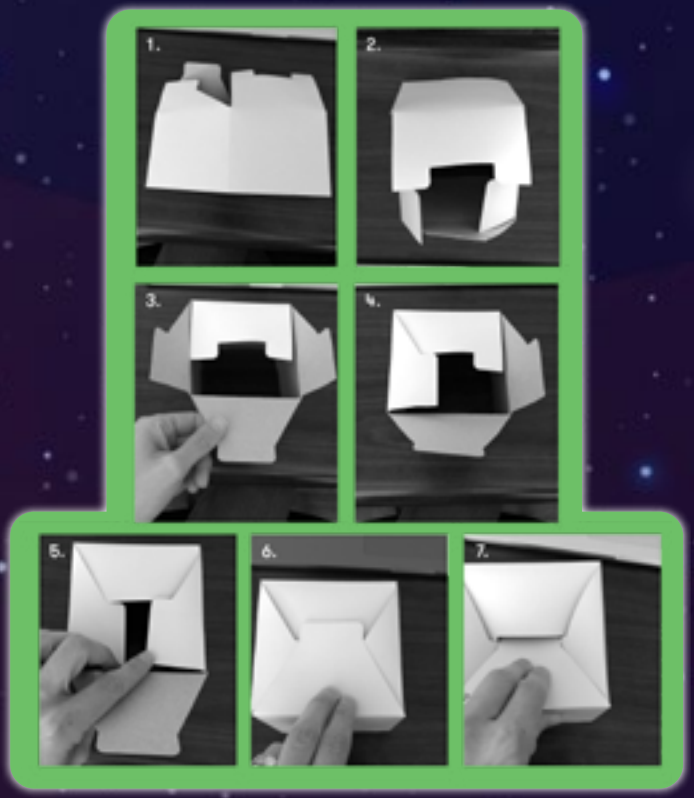
Think of "wild" ideas like a candy dispenser, a built-in camera, or a camouflaging color-changing design!

What features do school backpacks have? What is missing that could make the pack even better?

3 **Build** your Spacepack!

Watch the **DIY Spacepack Tips** video for inspiration.

Use your box as a base or compartment.



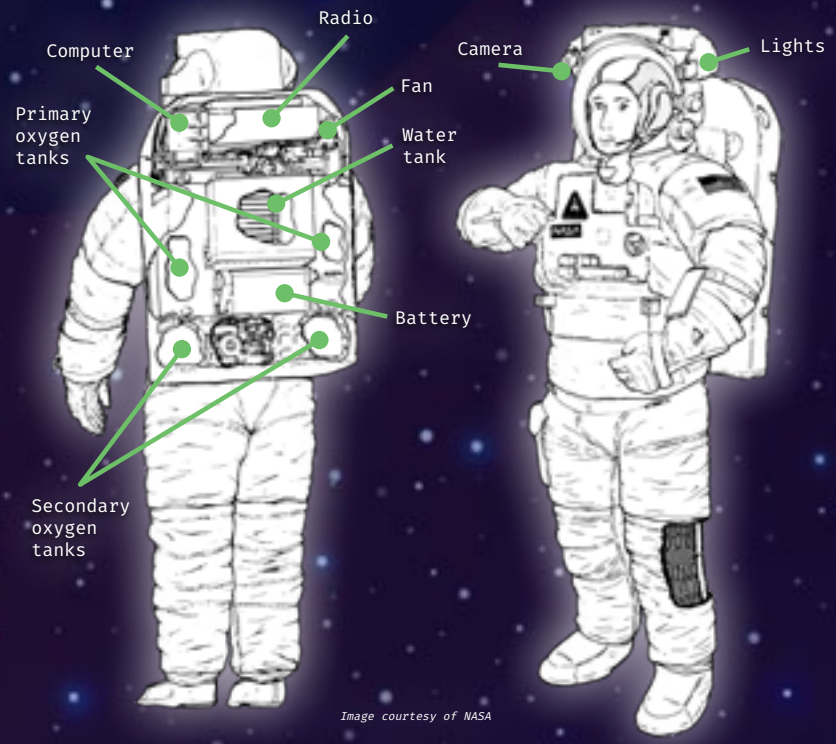


Image courtesy of NASA

MEET A HALL OF FAMER

GEORGE DE MESTRAL

VELCRO®* brand adhesive fasteners were invented by George de Mestral and are special materials that are extraordinarily useful in space. Astronauts use them as a quick way to attach objects to themselves or the wall before they float away in zero gravity. Some astronauts have even used pieces inside their spacesuit's helmet as a hands-free way to scratch their nose while adventuring outside their spacecraft.

Learn more about de Mestral here: invent.org/inductees/george-de-mestral

**VELCRO is a registered trademark of Velcro BVBA.*

HATCH AN EGG IN SPACE

Record data to see how your egg changes and grows!

You'll need:

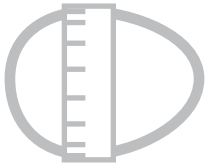
*Colors may vary

1. **Remove** the egg from its packaging.

2. **Measure** the egg lengthwise and widthwise using the measuring tape.

LENGTH

_____ inches



WIDTH

_____ inches

3. **Fill** the container halfway with water.

4. **Place** the egg in the water. Hold it down until any air bubbles come out. Make sure the egg is fully covered with water.

5. **Check** on your egg every day. Record new observations and measurements on the next page to see how your animal grows!

An **incubator** is a device that keeps eggs at just the right temperature and conditions.

Astronauts aboard the International Space Station study how living in microgravity (almost zero gravity) affects animals and plants, including water bears.

Image courtesy of ESA/Alexander Gerst

HATCHED ANIMAL INFORMATION

Type of Animal	
Animal Name	
Date of Birth	
Place of Birth	WOW Space Hotel, Milky Way Galaxy

ANIMAL GROWTH CHART // DATA COLLECTION

	 Length (inches)	 Width (inches)	Observations
1st			
2nd			
3rd			
4th			

Design the ultimate spacecraft for traveling in style!

You'll need:

*Only two cups! Save one for later.

Leftover materials from building your Spacepack

1 **Brainstorm** ideas of what might be inside or outside your spacecraft. Think of it like your hotel room in space.

- Will your spacecraft have a theme? If so, what might be fun?
- What are your favorite parts of a trip? How might you include that in your design?
- What features would make the ultimate room to hang out in while traveling through space?
- Check out pictures of the International Space Station online. Does it give you any ideas?

MEET A HALL OF FAMER

LONNIE JOHNSON

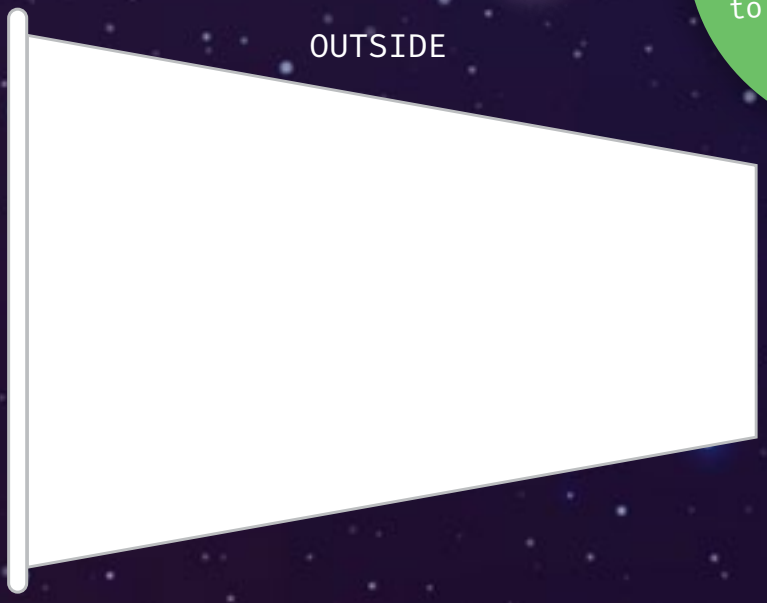
Lonnie Johnson created award-winning spacecraft system designs while working as an engineer at NASA's Jet Propulsion Laboratory. Johnson's designs were part of the Galileo mission that sent an unmanned spacecraft to study Jupiter and its moons! He is also an entrepreneur best known for his invention of the Super Soaker®*.

Learn more about Johnson here: invent.org/inductees/lonnie-johnson

*Super Soaker is a registered trademark of HASBRO, INC.

2 **Sketch** your design.

Without gravity, there is no real floor or ceiling aboard a spacecraft. Be sure to add features all the way around the cups.



3 **Build** your spacecraft!

After you finish the inside, tape the cups together like this.

Make sure your spacecraft can stand upright by itself so it can dock later.

MORE TO EXPLORE

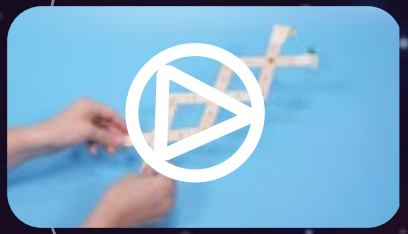
The International Space Station makes about 16 orbits around the Earth every day! Go online and track its path to find out when it might be passing over your neighborhood.

Image of the ISS courtesy of NASA

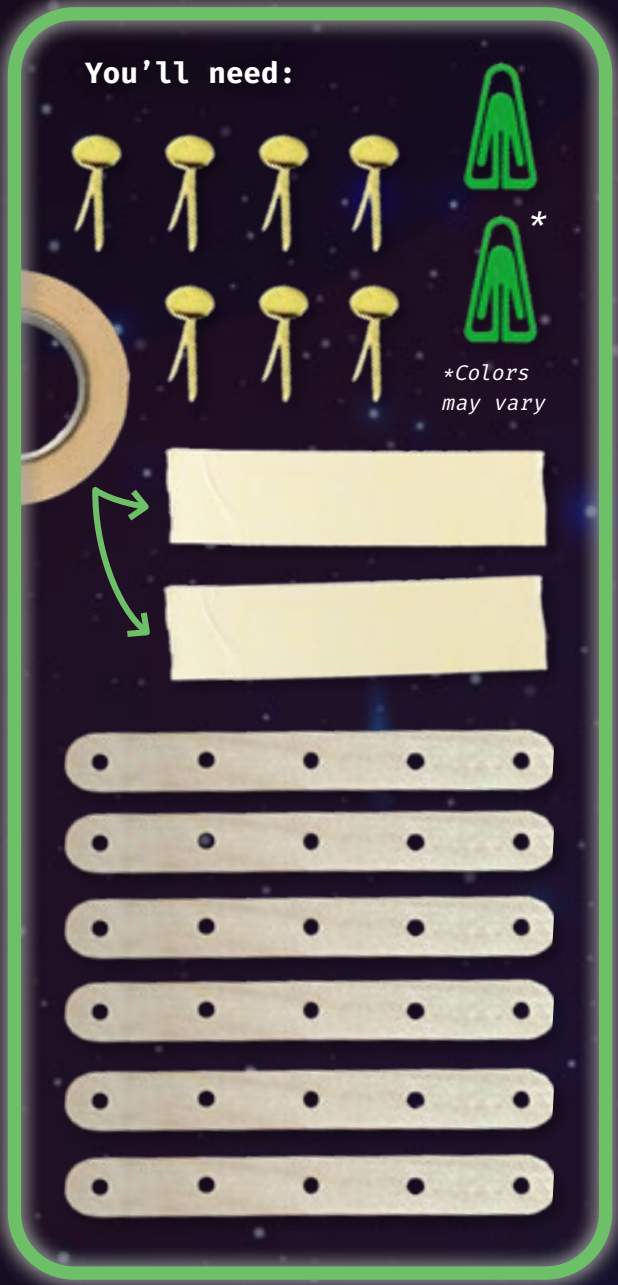
ASTRO-ARM ASSEMBLY

Build an Astro-Arm to explore space!

Watch the **Astro-Arm Assembly** video.



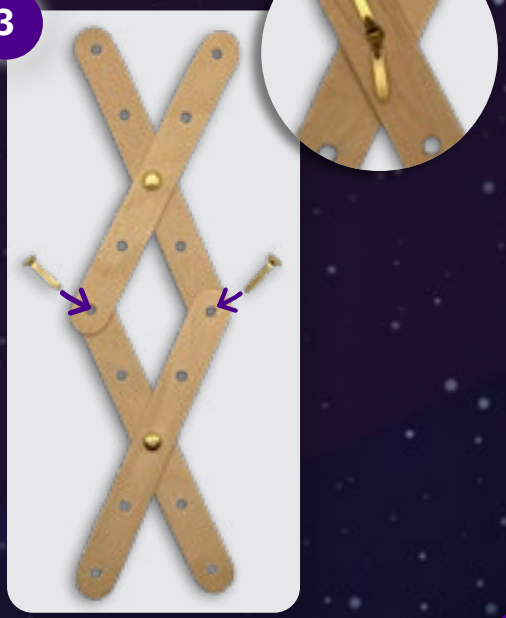
You'll need:



1

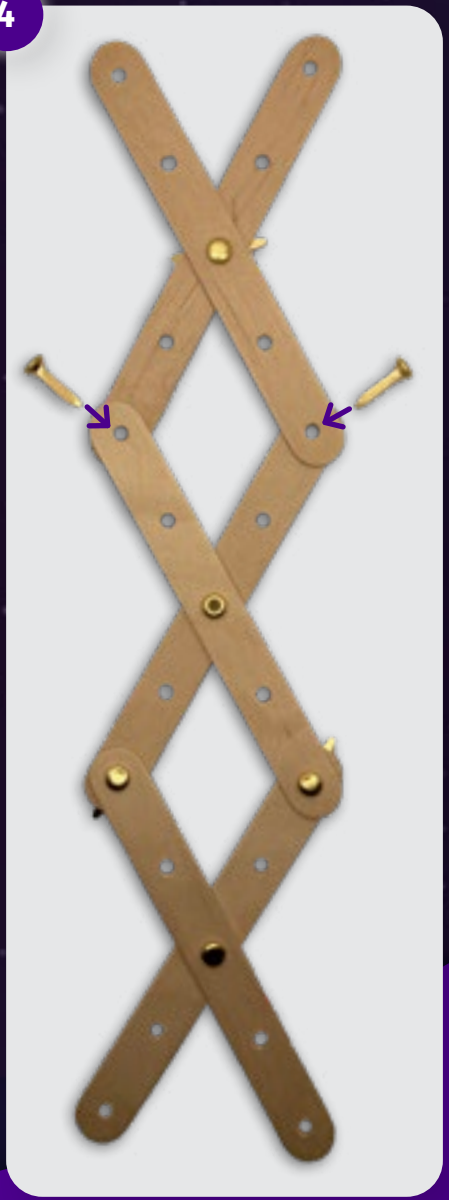
2

3



Line up your Astro-Arm here!

4



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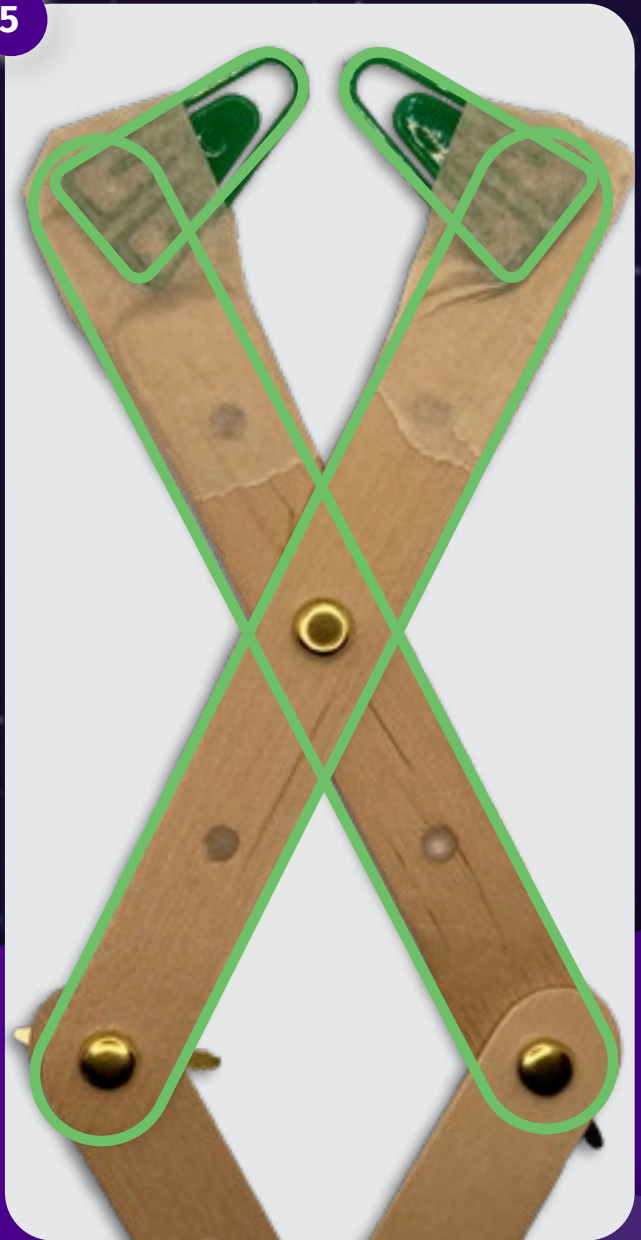


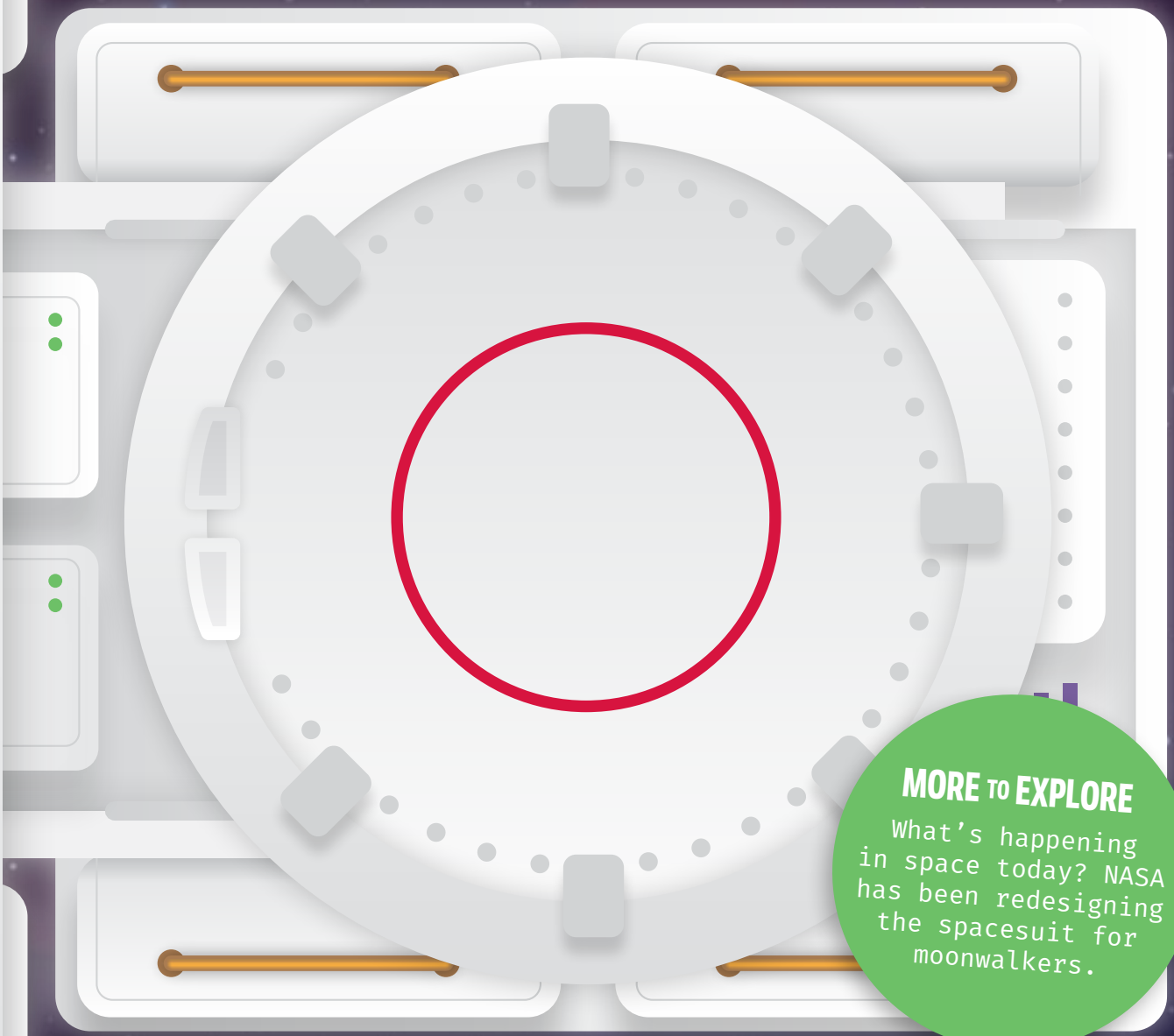
6

Make sure your triangular clips match the picture.

Are your triangular clips wobbly? Wrap more tape around the craft sticks and clips.

WOW SPACE HOTEL DOCKING PORT

1. **Watch** the **Liftoff** video.
2. **Lift off** by picking up your spacecraft with your Astro-Arm.
3. **Dock** your spacecraft upright in the center of the docking port target on the red circle!



MORE TO EXPLORE

What's happening in space today? NASA has been redesigning the spacesuit for moonwalkers.

Get inspired by innovators and then follow your own extraordinary path into space exploration!

MEET A HALL OF FAMER

GEORGE ALCORN

Space exploration is a huge arena for developing cutting-edge innovations because so much is still unknown. Scientists have been uncovering more information about space thanks to George Alcorn and his invention of the x-ray imaging spectrometer.

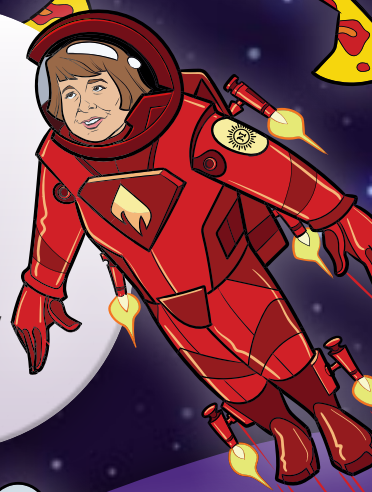
Learn more about Alcorn here:
invent.org/inductees/george-edward-alcorn

MEET A HALL OF FAMER

YVONNE BRILL

As the only woman of her generation in aerospace engineering, Yvonne Brill made history with her invention of a rocket propulsion system called the electrothermal hydrazine thruster (EHT). Her thruster design system needed less fuel and could carry more tools, advancing our ability to explore space.

Learn more about Brill here: invent.org/inductees/yvonne-brill



MEET A HALL OF FAMER

FRANK J. CEPOLLINA

Astronauts typically go on spacewalks to repair and upgrade parts of the International Space Station and satellites orbiting above Earth. They might add a solar panel or replace batteries after they run out of charge. Thanks to Frank J. Cepollina, repairs and upgrades can be made without sending the spacecraft or satellite to and from Earth when they need to be fixed!

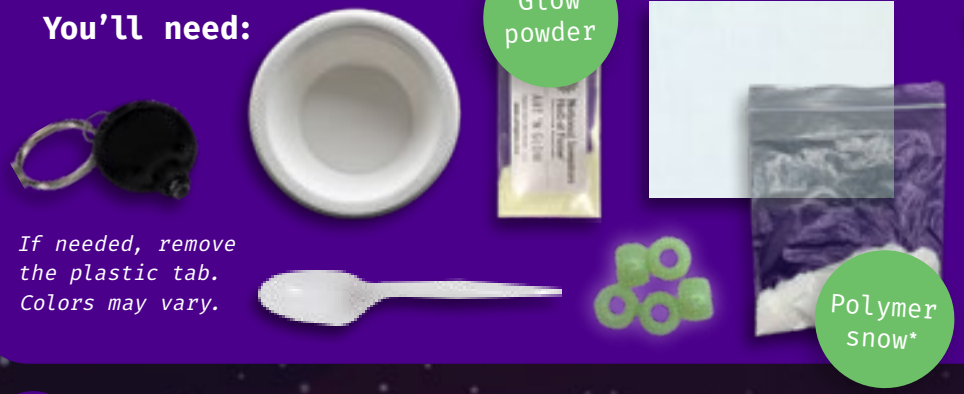
Learn more about Cepollina here:
invent.org/inductees/frank-j-cepollina

EUROPA

THE ICE MOON

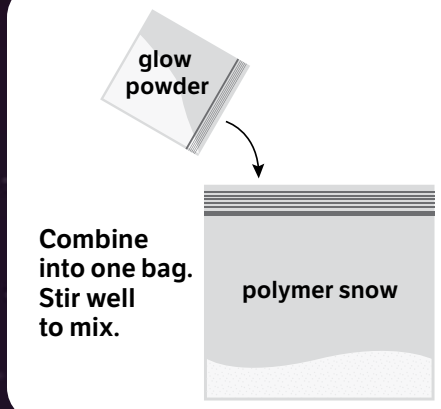
One of Jupiter's moons has an exciting secret beneath its surface that is about to overflow!

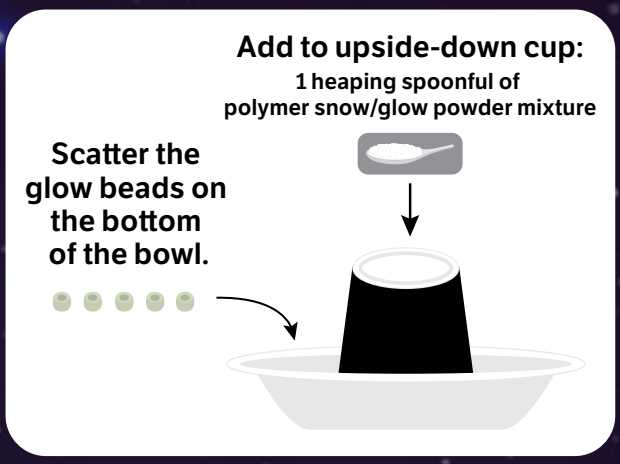
You'll need:



If needed, remove the plastic tab. Colors may vary.

1. **Cover** your work surface with the white paper. Put the bowl on the paper.
2. **Assemble** an ice volcano by following the pictures below.





3. **Fill** the white cup with water.
4. **Slowly pour** the water into the powder on the black cup to activate it.
5. **Turn on** the blacklight and turn off your room lights. Explore the ice volcano!

**Polymer snow is safe to touch. When finished, dispose of the ice volcano in the garbage.*

IO

THE PIZZA MOON

Make a Galactic Pizza using your Astro-Arm!

You'll need:

Galactic Pizza Toppings

Pizza Crust

MORE TO EXPLORE

Jupiter has over 75 moons, and about 20 of them are still waiting to be given a name! Other than Io and Europa, what are the other names of Jupiter's moons, and what makes them unique? Check them out online and pick one that launches your curiosity. Build a prototype of a device to explore its unique features.

Let's get cooking!

1. **Scatter** the Galactic Pizza Toppings on one side of the room and place the Pizza Crust on the floor across the room. (The farther apart they are, the more challenging it becomes!)

2. **Grab** the toppings using your Astro-Arm and place them on the Pizza Crust.

Start the the **Galactic Pizza Timer** video.

3. **Place** as many toppings as possible before the timer runs out!

Images of Europa and Io courtesy of NASA

GALACTIC PIZZA MENU

Decide what toppings are on your pizza and then create a name for it!

I MADE A

1

CIRCLE 1

- Galactic
- Black Hole
- Deep Space
- Solar
- Stellar
- Cosmic
- Astro

PIZZA WITH

2

CIRCLE 1 FOR EACH COLOR

RED

- Pepperoni
- Tomato
- Strawberry

GREEN

- Spinach
- Pickle
- Anchovy

WHITE

- Candy sprinkle
- Beet
- Eggplant

BLUE

- Gummy worm
- Blue raspberry
- Blueberry

AND

TOPPING ON YOUR PIZZA

YELLOW

- Cheese
- Banana
- Lemon

BROWN

- Chicken
- Sausage
- Pumpkin

BLACK

- Toasted marshmallow
- Squid
- Olive

PINK

- Passion fruit
- Shrimp
- Watermelon

3 ***CIRCLE 1***

- Chocolate sauce
- Pizza sauce
- Ranch sauce
- BBQ sauce
- Pick your own sauce: _____

I'm naming my pizza:

The _____ _____ Pizza.

(insert word from 1) (insert words of your choice)

Example: Solar Garbage Pizza

SPACEWALK AND ASTEROID MINING

Exit the spacecraft to pick up space trash and then jet over to mine an asteroid!

You'll need:

**Colors may vary*

Rare Earth Metals

Space Trash

Get ready for a spacewalk and mining excursion.

1. **Tape** the magnet to one of your Astro-Arm's clips.

   Do not push the magnet into the clip as it could break.

2. **Crumple** aluminum foil to make Space Trash.

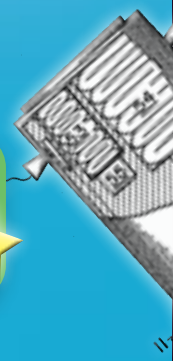
3. **Shape** pipe cleaners. These, along with the gold brads, will be Rare Earth Metals.

4. **Grab** your materials and **head outside!**
   - Toss the Space Trash around one area.
   - Scatter the Rare Earth Metals in another area for asteroid mining.

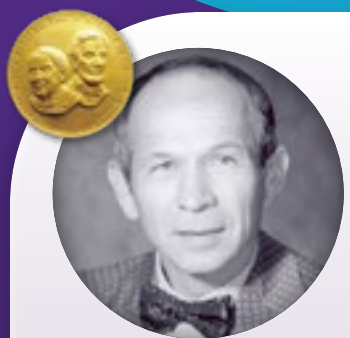
5. Time to **explore** space!
   - **Pick up** the Space Trash with your Astro-Arm, leaping in slow motion as you go.
   - **Travel** over to the asteroid area and use the magnet on your Astro-Arm to mine (collect) the Rare Earth Metals.

In the zero gravity of space, astronauts move very slowly.

Congratulations! You helped clean up space and have a valuable payload to take back to Earth.



Be sure to bring all materials back inside.



MEET A HALL OF FAMER

MAXIME FAGET

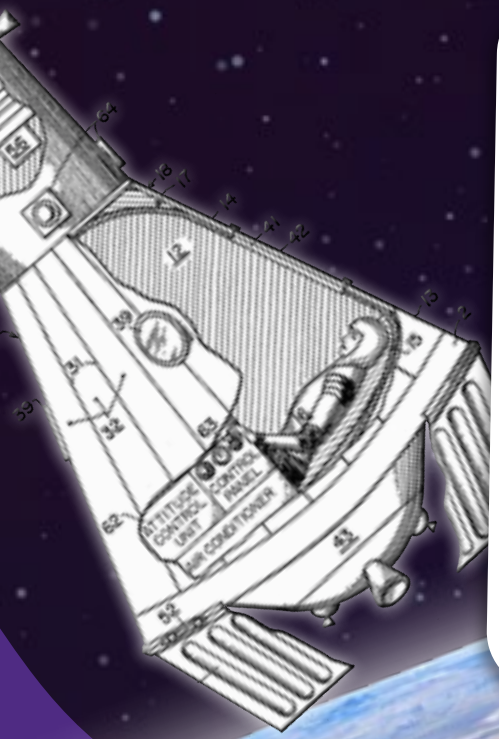
Maxime Faget *(Fah-zhay)* designed the first space capsule, Mercury. His design allowed for the space capsule to slow down in the upper part of Earth's atmosphere during re-entry, resulting in less friction and G-force. Faget also made major contributions to the design of the space shuttle, which was instrumental in the American space program. How might you take your dreams above and beyond?

Learn more about Faget here: invent.org/inductees/maxime-faget

Design your own postcard!

Greetings from:

Draw a picture of your favorite *Spacecation* experience.



GLOSSARY

Check out these words and use them as you create the Next Big Thing!

brain•storm:
\ ˈbrān ˌstôrm \
Coming up with new ideas for a goal, wish, or challenge as a group.

copy•right (©):
\ ˈkäpē ˌrīt \
Protects your right to copy and sell the books, music, and art you create.

in•vent:
\ in-ˈvent \
To create something new and useful for the first time.

in•ven•tion:
\ in-ˈven(t)-shən \
A new solution to a specific problem.

pat•ent:
\ ˈpa-tᵊnt \
A document that gives an inventor the right to prevent others from making, using, or selling their invention.

pro•to•type:
\ ˈprō-tə-ˌtīp \
The first model of an invention, which is used to develop other models.

trade•mark (™, ®):
\ ˈtrād-märk \
A name or registered symbol that identifies your product.

U•S•P•T•O:
\ u-s-p-t-o \
The United States Patent and Trademark Office issues patents and trademarks to protect your inventions and original works.

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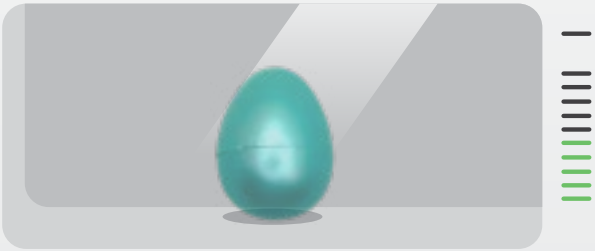
Spacecation

CHECK OFF EACH ACTIVITY AS YOU COMPLETE IT! ⟶

- [ ] Solar System Map and Itinerary
- [ ] Pack Your Bags
- [ ] Hatch an Egg in Space
- [ ] Spacecraft Innovations
- [ ] Astro-Arm Assembly
- [ ] WOW Space Hotel Docking Port
- [ ] Europa, the Ice Moon
- [ ] Io, the Pizza Moon
- [ ] Galactic Pizza Menu
- [ ] Spacewalk and Asteroid Mining
- [ ] Design Your Own Postcard



Observation Tank

Q: How do you make sure your Spacecation goes smoothly?

A: You plan-et.

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