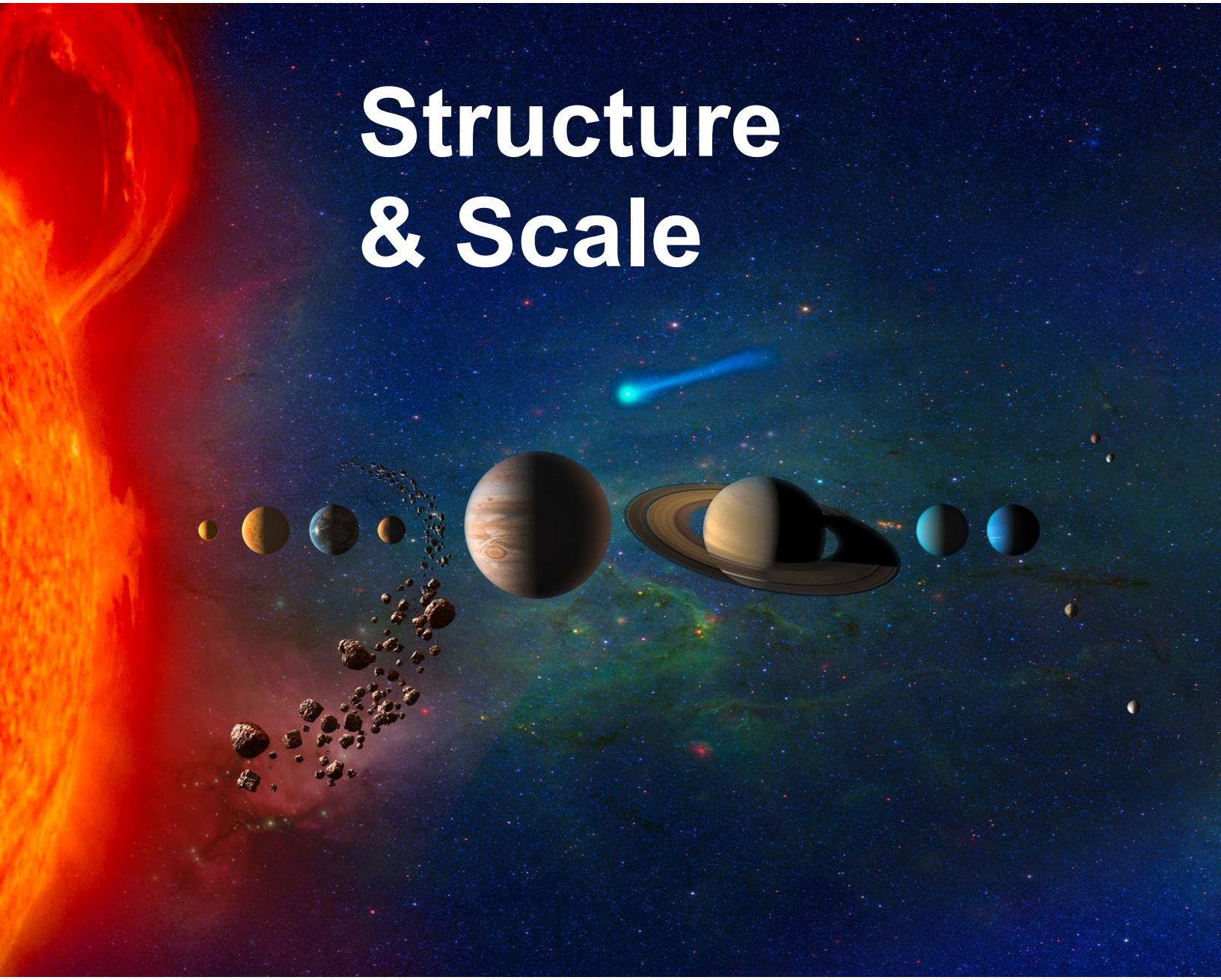
Structure & Scale



Source: NASA

Challenger® CENTER

Our Solar System: Structure & Scale

Activity 1: Planet Size Comparison

Facilitator Notes

Objective:

Students will choose food items to represent the planets and demonstrate the relative size of objects in the solar system.

Materials Needed:

- ☐ Food cards
- ☐ OPTIONAL: planet diameters

Summary of Student Action:

Students will look at the food cards and attempt to match the planets to each to create an appropriate scale representation of the relative sizes of the planets.

Setup Instructions:

- Display all objects on a table. Provide a list of planets, and their pictures, to the students.
- You can choose to provide the diameters of the planets to help with their estimations.
- Using the included fruits for scale, **the Sun would be approximately 10 feet across**.

Delivery:

- This activity is intended to be delivered in person.
- If delivering virtually, display the food cards on the screen and send students the file with planet images and diameters.

Additional Notes:

- One option is to allow students a few minutes to think, then provide the actual diameters and ask if they want to change their choices.
- **ANSWER KEY:** Mercury: pea, Venus: cherry tomato, Earth: grape, Mars: blueberry, Jupiter: watermelon, Saturn: coconut, Uranus: orange, Neptune: apple
- When revealing the correct matches, tell students that Pluto would be the size of a peppercorn. Comets and asteroids would be about the size of salt and pepper grains.

Our Solar System: Structure & Scale

Activity 1: Planet Size Comparison
Student Instructions

Activate Your Knowledge:

How big is the Earth compared to other planets? Is it the largest, smallest, or somewhere in between? Does the size of a planet have anything to do with its distance from the Sun? If you shrunk the Earth down to the size of a common object, such as a baseball, how large would the rest of the planets be? How about if the Earth was even smaller, like the size of a marble?

Materials You Will Need:

- ☐ Food cards
- ☐ OPTIONAL: planet diameters

Procedures:

1. Analyze the food cards to determine the relative size of each fruit.
2. Match each food card to one of the planets, based on what you know about the relative sizes of the planets.
3. How big do you think the Sun would be at this scale?
4. Check your answers by using the table of planet diameters.

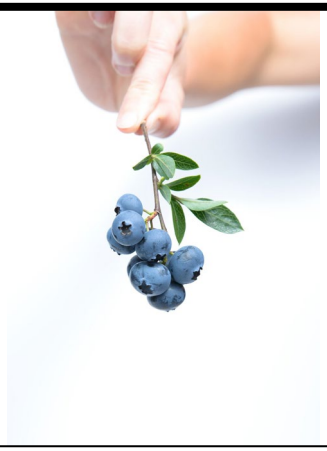
Size & Scale - Activity 1 - Food Cards

PEA

Approximate Diameter of One Pea: **0.45 inches**

Credit: Pexels/R Khalil

BLUEBERRY



Approximate Diameter of One Blueberry: **0.63 inches**

Credit: Pexels/Pixabay

CHERRY TOMATO

Approximate Diameter of One Tomato: **1.12 inches**

Credit: Pexels/Karolina Grabowski

GRAPE

Approximate Diameter of One Grape: **1.18 inches**

Credit: Pexels/Any Lane

APPLE

Approximate Diameter of One Apple: **4.58 inches**

Credit: Pexels/Mali Maeder

ORANGE

Approximate Diameter of One Orange: **4.77 inches**

Credit: Pexels/Pixabay

COCONUT

Approximate Diameter of One Coconut: **11.09 inches**

Credit: Pexels/Natalie Dmay

WATERMELON

Approximate Diameter of One Watermelon: **13.20 inches**

Credit: Pexels/Brian van den Heuvel

Our Solar System: Structure & Scale

Activity 2: Walk the Solar System

Facilitator Notes

Objective:

Students will walk the relative distances between planets by taking one step (approximately 2 feet) per astronomical unit (AU) to demonstrate the vast distances between the planets.

Materials Needed:

- ☐ Printed planets
- ☐ Planet distance table
- ☐ A long space (minimum 60 feet)
- ☐ OPTIONAL: toilet paper

Summary of Student Action:

Students can walk out the distances individually or watch one person do it as a demonstration. A facilitator can ask students to estimate the number of steps to the next planet. Students will place a paper planet on the floor at the appropriate location.

Setup Instructions:

- Print and cut out the planets in advance.
- Ensure the chosen location is long enough for this demonstration by walking through the activity beforehand. You will need approximately 60 feet.

Delivery:

- This activity is intended to be delivered in person.

Additional Notes:

- You may choose to only provide the distances in miles/kilometers and ask students to calculate the distances in Astronomical Units (AU).
- If a long enough space is not accessible, you can use a roll of toilet paper. Set one square equal to one AU.

Our Solar System: Structure & Scale

Activity 2: Walk the Solar System
Student Instructions

Activate Your Knowledge:

How far is the Sun from Earth? Which planets are closer to the Sun than Earth? Which are farther away? The Earth is roughly 93 million miles away from the Sun. This distance is called an Astronomical Unit (AU) and is used to measure distances in the solar system. In other words, 1 AU = 93,000,000 miles. That's 93 million miles! If you set one step equal to one AU, how many steps would it take to get to the rest of the planets?

Materials You Will Need:

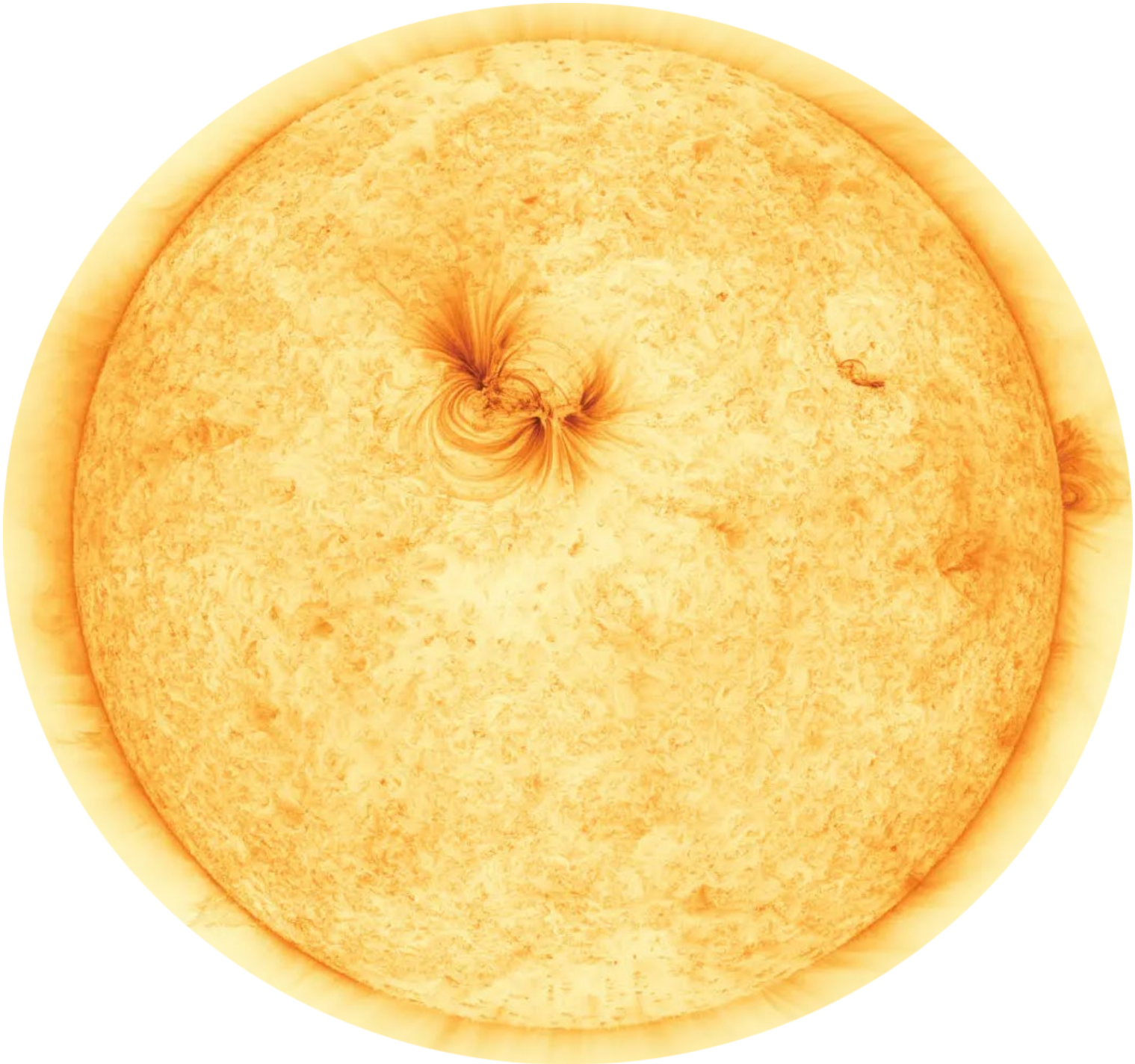
- ☐ Printed planets
- ☐ Planet distance table
- ☐ A long space (minimum 60 feet)
- ☐ OPTIONAL: toilet paper

Procedures:

1. Analyze the table of planet distances.
2. Set the starting point and place the image of the Sun on the floor.
3. Take one step from the starting point and place the Earth at that spot.
4. Estimate the location of Mercury and Venus, and place those between the Sun and the location of Earth.
5. Take another step. Place Mars halfway between Earth and the location of your second step.
6. Continue taking steps and placing the planets using the table of distances.

NOTE: On this scale, the Sun would actually be less than an inch across, and all the planets would be too small to see without magnification.

Planet Images



The Sun

Source: NASA/UCLan

Mercury

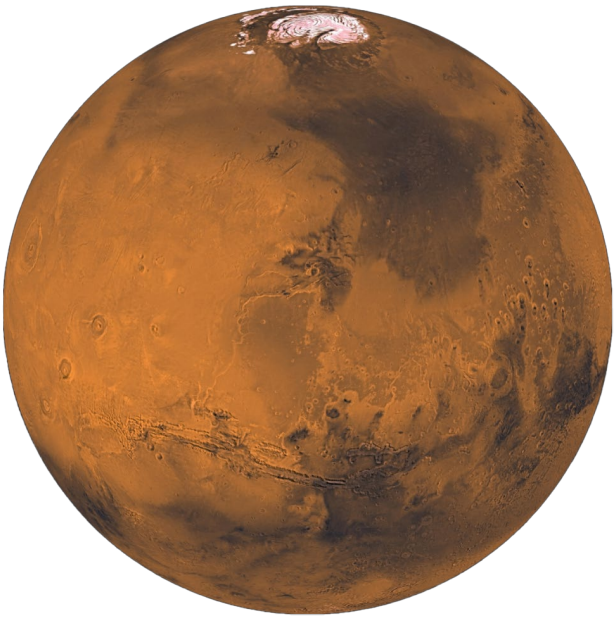
Source: NASA

Venus

Source: NASA

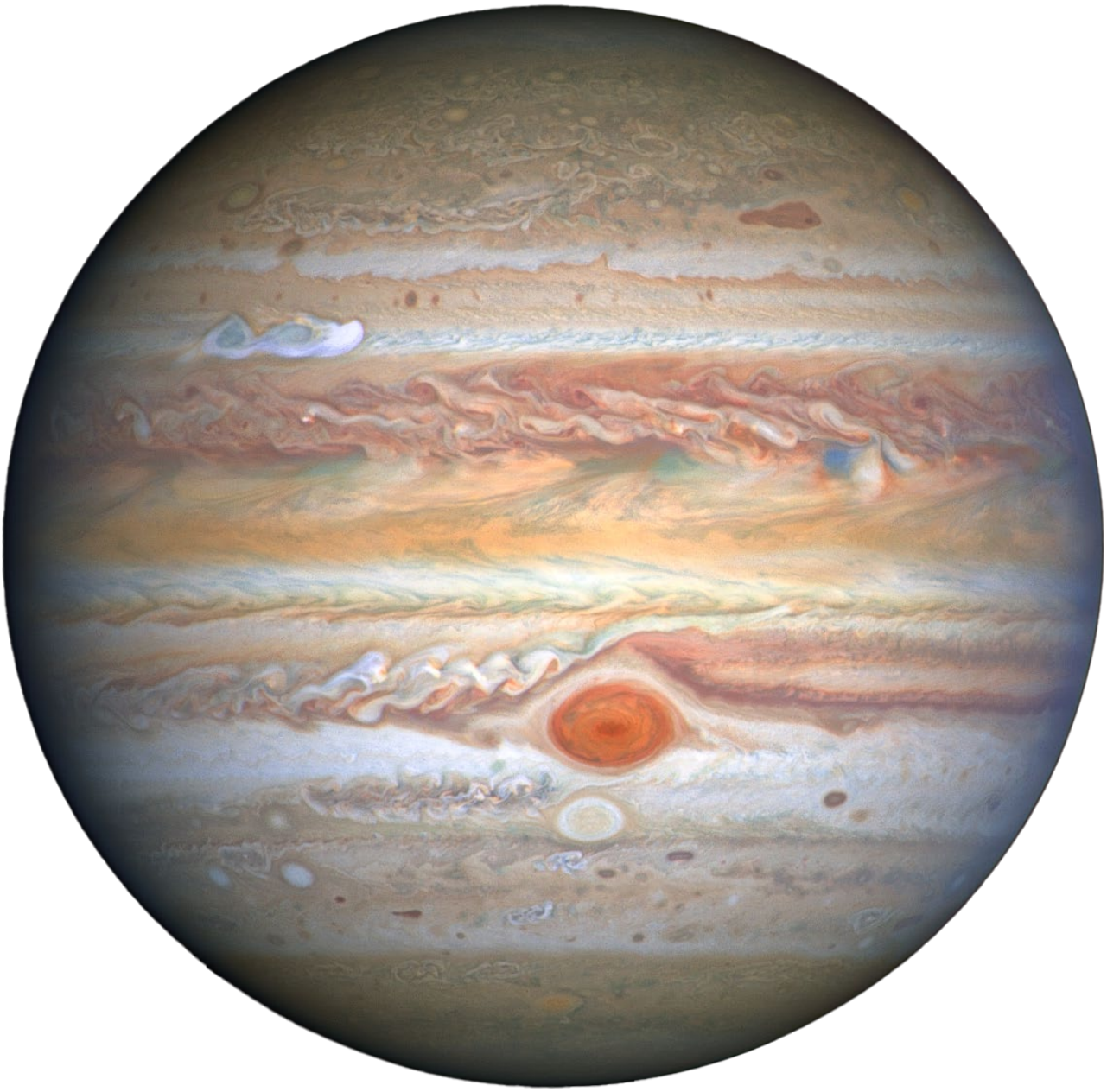
Earth

Source: NASA



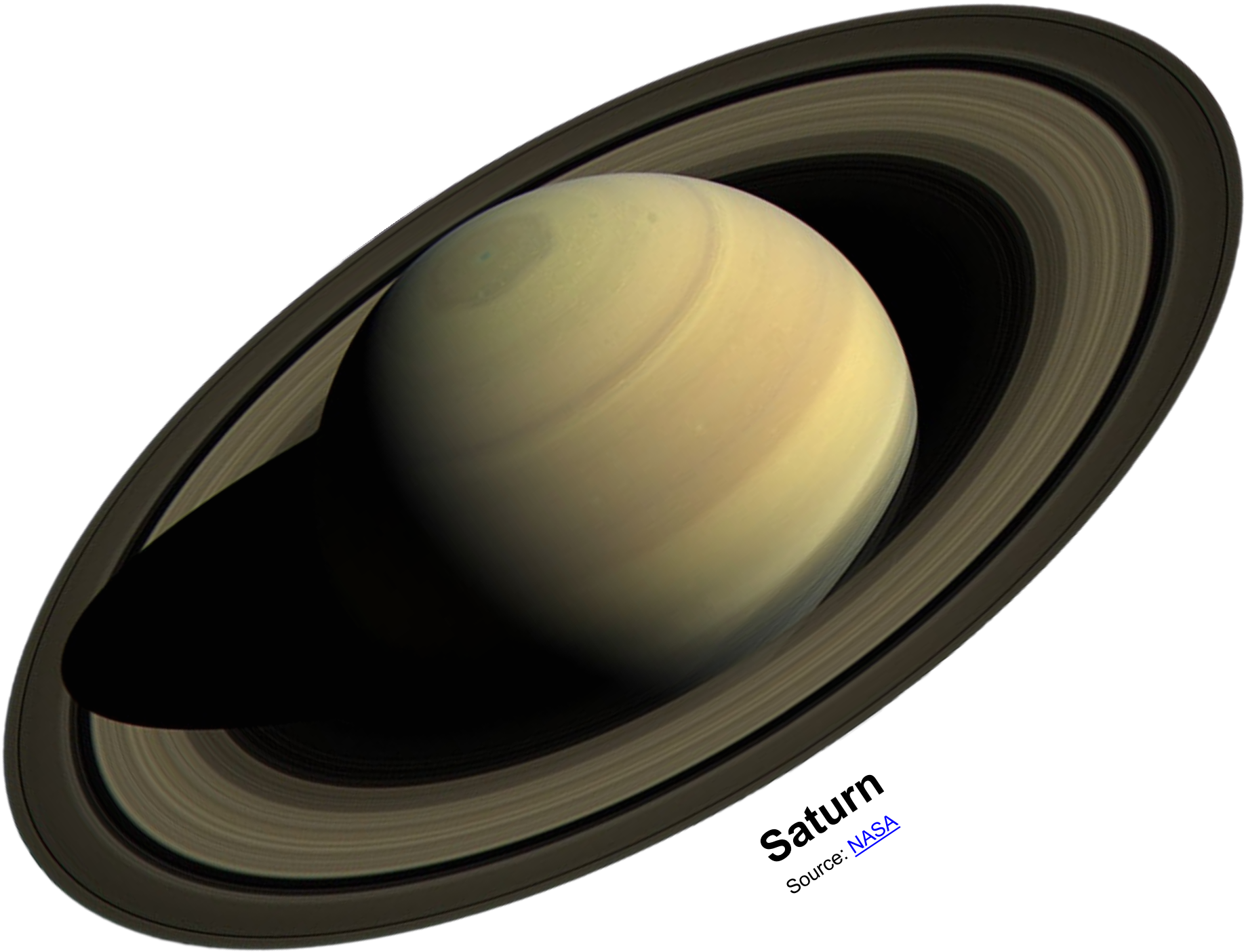
Mars

Source: NASA



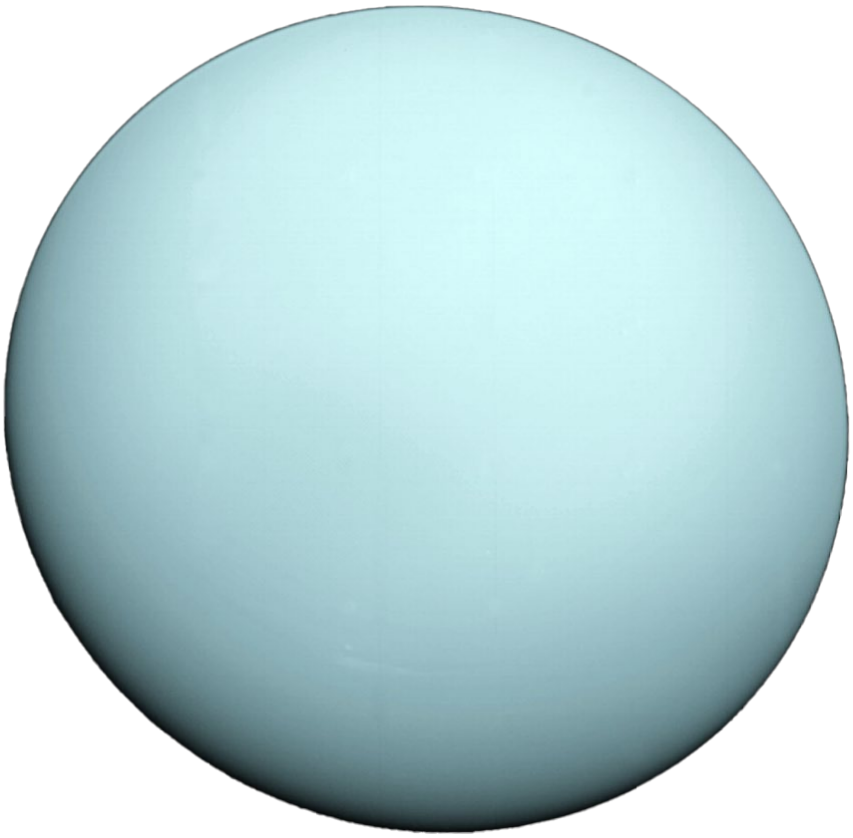
Jupiter

Source: NASA



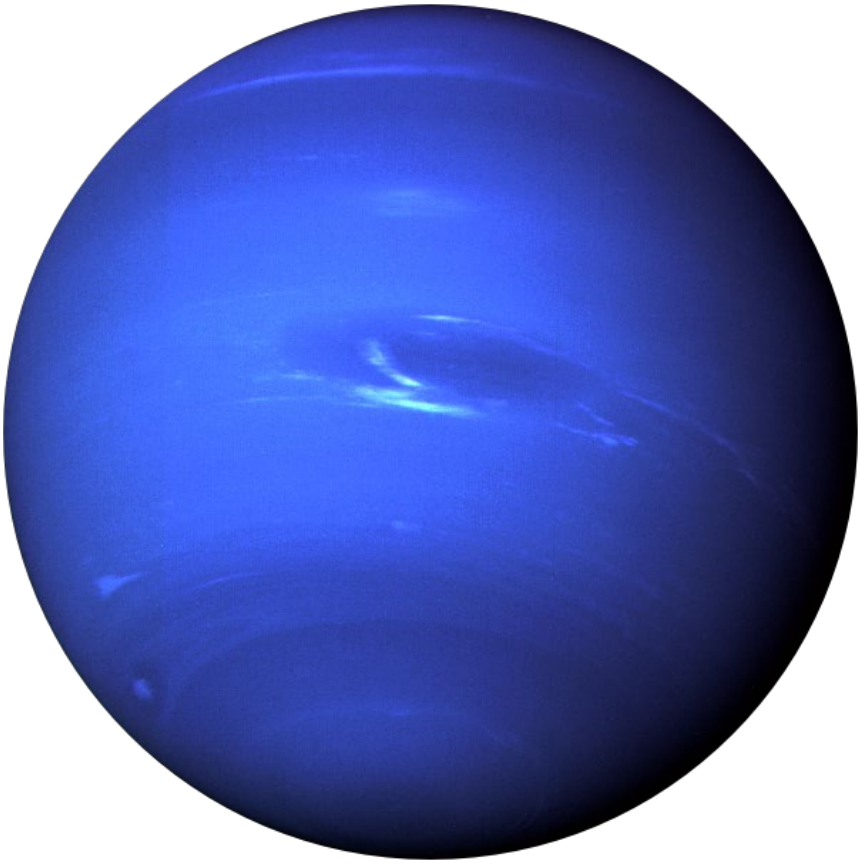
Saturn

Source: NASA



Uranus

Source: NASA



Neptune

Source: NASA

Our Solar System: Structure & Scale

Activity 3: Formation and Outer Limits
Facilitator Notes

Objective:
Students will watch videos and read text to learn about the formation, structure, and outer limits of the solar system.

Materials Needed:
- ☐ Video: "How Did the Solar System Form?"
- ☐ Video: "Life and Death of a Planetary System"
- ☐ Video: "What Is a Nebula?"
- ☐ Video: "Where does the solar system end? The Oort Cloud"

Summary of Student Action:
Students will learn about the origins of our solar system and the major structures, including the asteroid belt, Kuiper Belt, and Oort Cloud. They will also explore nebulae, the outer reaches of the solar system, and what the future holds for our star, the Sun.

Setup Instructions:
- Open all links in advance to ensure they work as expected.

Delivery
- This activity is intended to be delivered virtually.
- You may choose to share your screen to watch the videos.
- This activity can be delivered in person by setting up a tablet for each resource.

Additional Notes:
- Ask questions before each activity to engage the students' prior knowledge and set the stage for the content they will see in each.
- Additional resources are linked in the implementation guide, allowing students to explore these concepts in more depth.