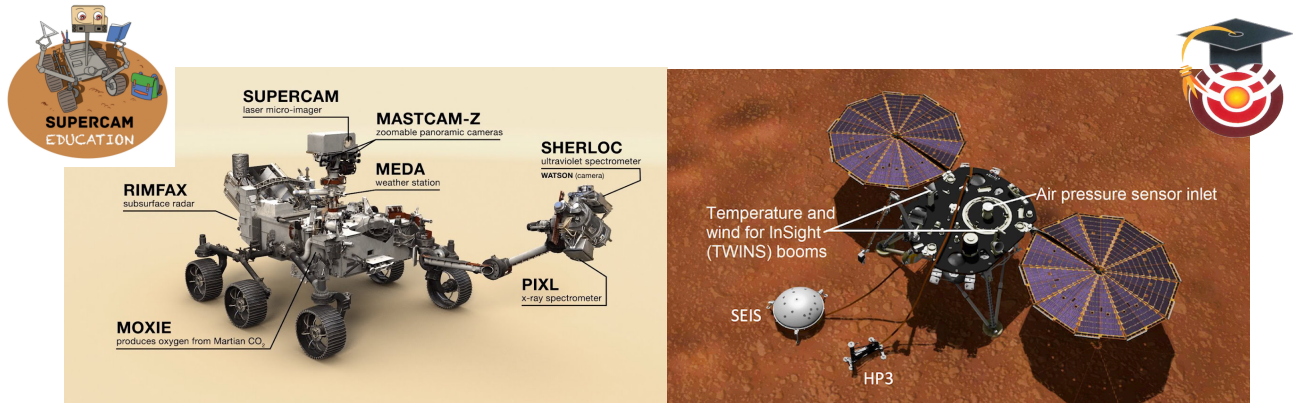


Episode 1 – Questions issued on 31/08/21 ; answers due on or before the 14/11/2021 to namazu@geoazur.unice.fr



Part I - Reminders on the InSight and Mars2020 missions.

In order to start this new Namazu season, the MCQs in part I will provide an update on the InSight and Mars2020 missions so that the new participating schools can familiarize themselves with these Martian missions.



Q1. InSight's solar panels become covered in too much Martian dust, which limits power production for the SEIS seismometer. Last May, NASA engineers devised a solution to remove some of this dust. Which one ?

- Reactivate the deployment motors of the solar panels
- Ask the Perseverance rover to clean them with its laser
- Cause vibrations using the mole HP3
- Pour grains of sand near the panels on a windy day



Q2. InSight data revealed that the core of Mars has an approximate radius of:

- 1000km
- 1800km
- 2500km
- We still don't know

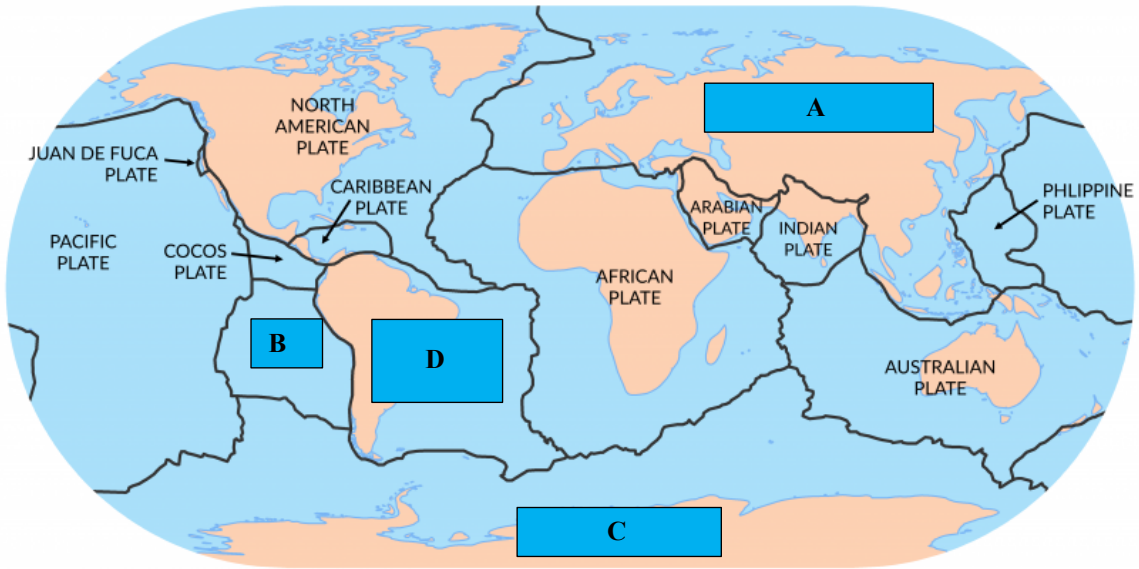


Q3. As for the surface, it seems

- to be composed of lithospheric plates like on Earth
- not have lithospheric plates
- that half of the surface covered with molten rocks
- to own a few lakes of liquid water



Q4. There are tectonic plates on Earth : Can you label the diagram below ?

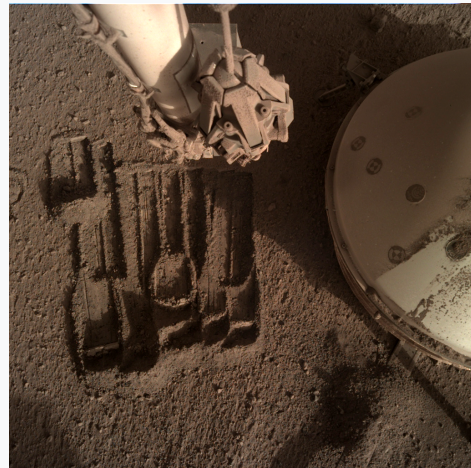


- A :
- B :
- C :
- D :



Q5. What do these traces photographed on Martian soil by InSight correspond to?

- Past flows of liquid water
- Traces left by the shovel from the mechanical arm
- The burial site of the HP3 mole
- The first location of the SEIS seismometer





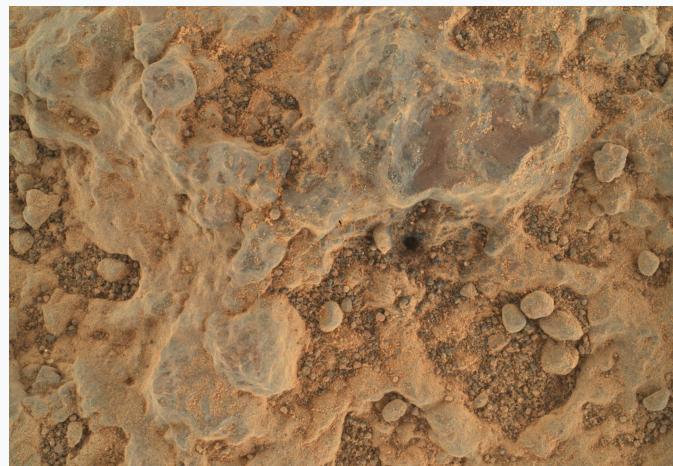
Q6. Here is a view of the Jezero crater and a location of the Perseverance landing site. The goal of the mission is to study the rocks at the bottom of the crater then to reach the Western delta and finally the Upstream Valley which will be the area with the oldest rocks. Near the landing site, there is an area with dunes in which the rover could become bogged down. What path will he take to reach the upstream valley?



- Cross the dune area
- Go around the dune area to the south
- Go around the dune area to the north
- The engineers have not yet made their decision



Q7. Mystery photography.



Credit: NASA / JPL-Caltech / MSSS

What is this a photo of, and what instrument was used to take this picture ?

- A few centimeters of a rock by the WATSON camera
- A few decimeters of a rock by the SuperCam camera
- A few centimeters from the ground by the Perseverance Navcam camera
- A few meters from the ground by Ingenuity's high-resolution camera



Q8. Which school won the Namazu 2020/2021 competition?

- French school of Shanghai
- Medium school of Bizanos
- Medium school Bellevue of Beausoleil
- French school of Dublin

Help : <https://mars2020.oca.eu/fr/mars2020-namazu-contest>

PART II - Successful landing on Mars!



Material:

- 3 meters of smooth line (e.g., fishing line, dental floss, etc.)
- 1 index card
- 1 marble or similar object
- 1 paper clip
- 1 medium-size paper cup
- 1 target (to print)
- Masking tape
- scissors

NASA lands spacecraft in different ways depending on the goals of the mission. For NASA's Perseverance Mars rover, a team of people wrote computer code that the spacecraft will use to

land itself on the Red Planet! For other missions, a spacecraft might drop a probe onto the surface of the planet or Moon while the spacecraft continues orbiting from above. For example, the long-lived Cassini mission to Saturn dropped the Huygens probe on Saturn's moon Titan in 2005 so it could peer beneath the moon's thick, hazy atmosphere. When astronauts land on the Moon as part of NASA's Artemis program, the lunar Gateway will remain in orbit while astronauts embark on their journey to the Moon's surface inside a lunar lander.

It can be pretty tough to land on the Moon, Mars or another planet because both the spacecraft and the place it's landing on are moving! The Moon and planets are in constant motion, rotating on their axes and revolving around the Sun. The good news is that for this activity, your landing spot will be relatively stationary compared with your fast-moving "spacecraft."

1. Set up your target and zipline

Use the smooth line to create a zipline about 9 feet (3 meters) long between two chairs or a door handle and a chair. One end of the line should be higher than the other.

Place the paper target under the zipline about 2 feet (1 meter) from the low end of the zipline. This will be the target you are aiming for.

2. Hang your spacecraft on the zipline

Use the paperclip to hang your paper cup spacecraft from the zipline. You can decide how to do this so it will work with your design. Make sure the cup and paperclip can slide freely from the top of the zipline to the bottom.

3. Brainstorm and design

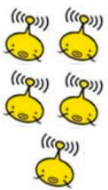
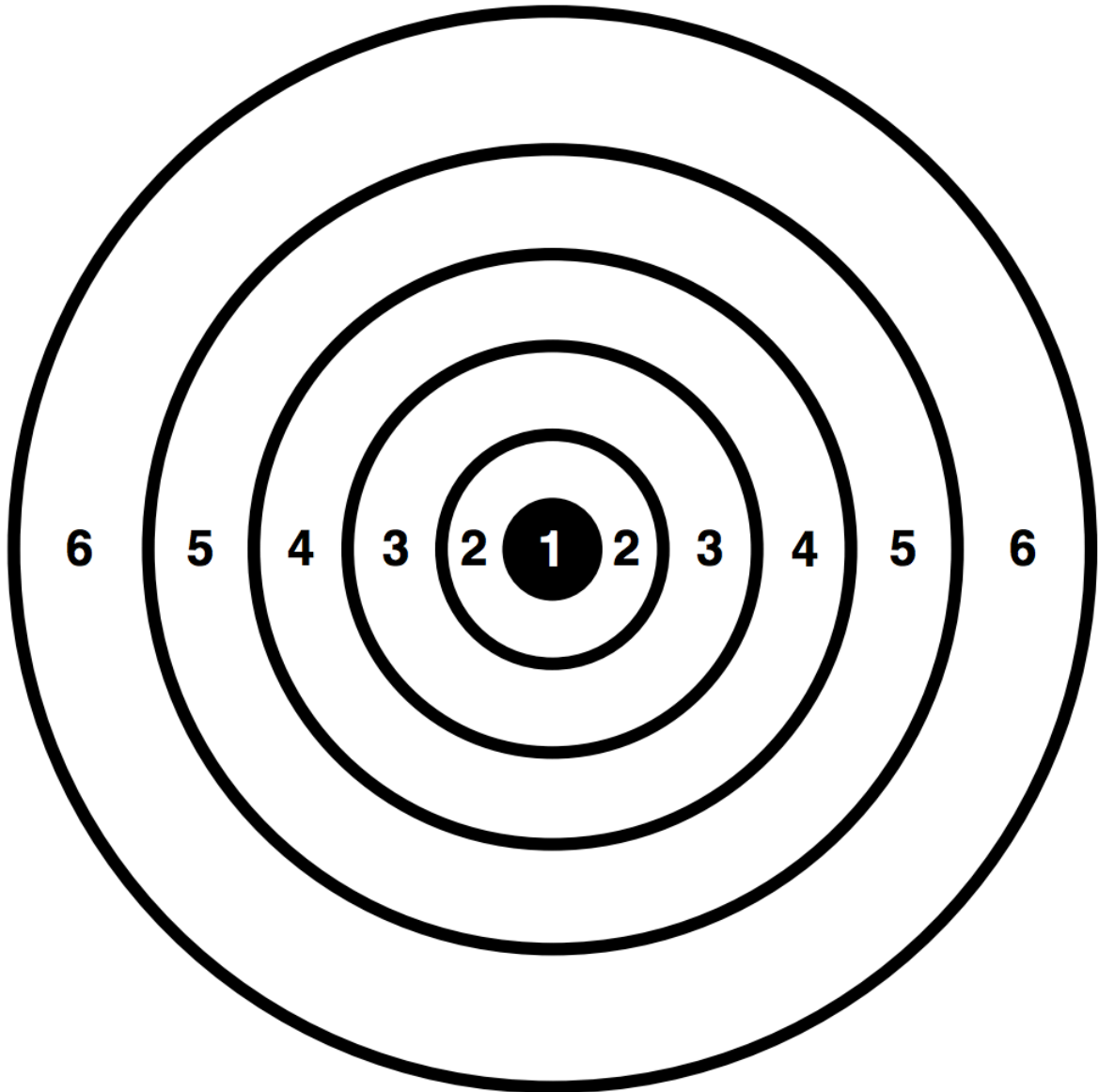
Figure out how to modify the paper cup to carry the marble down the zipline using the available materials or others you have on hand. Will the marble travel inside the cup? Outside of the cup on a platform? Underneath it? How will your spacecraft release the marble lander while zipping down the line? Consider whether you will use an automatic release system or a remotely-activated release system.

4. Build it

Build your spacecraft based on the design you made in Step 4.

5. Test and evaluate

Starting at the top of the zipline, send your spacecraft down the line and try to land your marble on the target using the release system you designed. How close did you get? Use the numbered rings on the printed target to keep track of your accuracy. Repeat this step several times and try to get consistent results.



To show Namazu your achievement, you will need to draw a diagram of your device and make a short video of a "landing".

Part III – Let's Scratch !

- Realization of a game

1. Get set up

Download the Jezero Crater surface image, the Mars sample collection tube image, and Mars fetch rover sprite image, and save them to a computer.

On the Scratch website, click **Create** to begin a new project. (Sign in or create an account if you want to save your work so you can revisit or redesign your game in the future.)

Create a new backdrop by moving the mouse over **Choose a Backdrop** in the Stage window and selecting **Upload Backdrop**. Pick the Jezero Crater surface image. The Stage area of the screen should now display your selected backdrop image.

Create a new sprite by moving the mouse over **Choose a sprite** in the Sprite window and selecting **Upload sprite**. Choose the Mars fetch rover sprite image. There should now be a rover placed over your backdrop image along with the original cat sprite.

Delete the existing cat sprite by clicking on it in the Sprites window and clicking the “x” in the corner.

With the rover sprite selected, you’re ready to create the code that manages the game and controls the rover!

2. Make the rover drive

NASA explores Mars with orbiters that travel around the planet, stationary landers on the ground, and rovers that can travel many miles on the surface. For rovers to visit more than one place on Mars, they must be able to drive. Rovers on Mars aren’t controlled with joysticks or keyboards. But in the future, astronauts in orbit around Mars or on the surface of the planet could use remote controls to drive rovers. Your game can use keys on the keyboard to make the rover drive.

Tasks

Make the rover move up, down, left, and right on the screen using four different keys on the keyboard. **Hint:** See if a block in the Events section will help.

Specify how far the rover will move each time one of those keys is pressed. Select a distance that makes the rover movement appear smooth when the key is pressed and held. **Hint:** See if a block in the Motion section will help.

Make the rover rotate so it points in the direction of travel.

Bonus: Make the rover move diagonally using keys other than the keys already assigned.

3. Add sample tubes for collection

Sample tubes contain valuable rock samples collected by the Perseverance Mars rover and left behind for a fetch rover to collect. You should add sample collection tubes to your game to provide destinations for your rover. By studying the backdrop images closely, you can identify areas that look interesting and place sample tubes in those spots.

Tasks

Add three or more sample tube sprites to visit during gameplay by placing the downloaded sample tube sprites to the backdrop by selecting **Upload sprite** the same way you did in Step 1.

Make the sample tube sprites disappear when they are visited by the rover. **Hint:** See if a block in the Control section will help.

Make the sample tube sprites reappear when players click the green flag to restart the game.

4. Add a countdown timer

NASA’s missions to Mars and other destinations have a planned life expectancy. Some missions, including every Mars rover to date, have been extended and operated beyond their planned mission life expectancy, while others experience problems that shorten their mission. You can create a timer that counts down to the end of the mission and ends the game. Your timer should not be so short that the game is unplayable or unwinnable, but it should not be so

long that there is no challenge to playing the game. As a bonus, you can create code to extend or shorten the planned mission time.

Tasks

Create a timer that counts from a set time down to zero. **Hint:** Create a Time variable that you can program to change.

Make gameplay stop when the timer reaches zero.

Make a “Mission Over” message appear when the timer reaches zero.

Make the timer start over when a player clicks the green flag to restart the game.

Bonus: Develop code that will increase or decrease the amount of time on the timer by one or two seconds at random.

5. Add a scoring system

Rover missions on Mars don't have a scoring system. But the science they collect is valuable, and some discoveries may be more exciting, interesting, or important than others. To determine how well players are doing while playing your game, you can develop a scoring system that includes points earned for collecting sample tubes. How points are totaled is up to you. You could also program your game to reduce point totals in certain scenarios (see Step 6, for example).

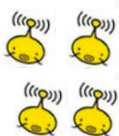
Tasks

Develop code to create a scoring system.

Increase the score by one or more points for each sample tube collected.



Screenshot of a possible example.



Once your game is done, you will need to send the link to it or the Scratch file.

- Participation in a game



The medium school of Michelet in Tours has created a Scratch game dedicated to the Perseverance mission.



<https://planet.mblock.cc/project/925300>

For this mission you will be associated with a second school.

1. Send an email to namazu@geoazur.unice.fr to find out which school you will be matched with for this game.
2. Through dialogue between the two schools, you will have to find a way to finish the game as quickly as possible.
3. Take a screenshot of your best score and that of your matched school. The addition of the two scores will be taken into account.

1st price : 

2nd price : 

3rd price : 

Part IV - Mystery Rock

Watch the video https://youtu.be/F9-s_Z0HPig

Researcher K. Benzerama working on the Perseverance mission presents a mystery rock to you.



Q1. What is the name of the family of rocks observed?



Q2. If we find it on Mars, what can we deduce from it?



Q3. Would there be any interest in bringing a sample back to Earth? To do what ?