NAMAZU CHALLENGE n°3 2018 - 2019

The Namazu challenge is a fun competition between schools that allows you to get acquainted with seismology, and in particular this year, with the planet Mars, that the INSIGHT mission will explore! The challenge is open rather to classes from grade 8 to grade 10 ... but everyone can compete.

Episode 3 – Questions issued on January 15, 2019 ; answers due on or before the April 1, 2019 to namazu@geoazur.unice.fr

Part I. InSight is on Mars

As in previous challenges, this first part will enable us to get better acquainted with the InSight mission.

For each of the following questions, find the answer(s).

for each correct answer

Q1. On December 1, 2018, InSight sensors were able to record the vibration emitted by…

- the Martian wind
- a Martian earthquake
- a rocket landing
- an auxiliary motor

Q2. In the 2nd quarter of January, a protective shield will be deployed around the seismometer (SEIS) to protect it from :

- The Martian winds
- The extreme temperatures
- Acid rain
- Falls of possible meteorites

Q3. Although SEIS is the first seismometer capable of measuring the Martian surface vibration precisely, this is not the first mission to Mars to take a seismometer.
Name the two other missions to have had such an instrument.

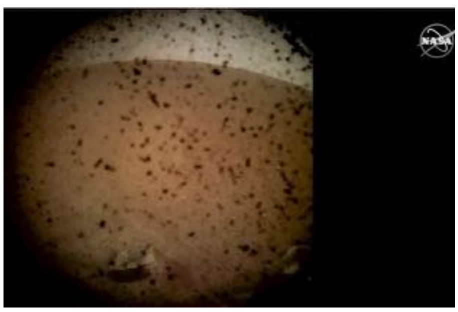
- Viking 1 and 2
- Spirit and Opportunity
- Opportunity and Mars Express
- Mars Pathfinder and Phoenix

Q4. How does InSight communicate with Earth?

- By sound waves
- By radio waves
- By infrared waves
- By gamma rays

Q5. The photograph below was the first picture taken by InSight after landing. What are the stains visible on this picture ?

- Mud glued onto the lens
- Development of bacteria during the trip
- Regolith glued onto the lens
- Impacts on the glass of the lens



Q6. How often SEIS seismometer expected to collect data :
- At regular intervals throughout the mission
- More often during the summer
- More often during the winter

Q7. HP3 takes Mars temperature, revealing just how much heat is still flowing out of the interior of the planet. But what causes this heat ?
- The radioactive decay
- The speed of rotation of the planet on its axis
- The heat produced by previous NASA missions
- Atomic fission at the centre of the core

Q8. Scientists expect the rate of heat flow on Mars to be :
- lower than that of the Earth
- higher than that of the Earth
- almost identical
- No estimates have yet been made

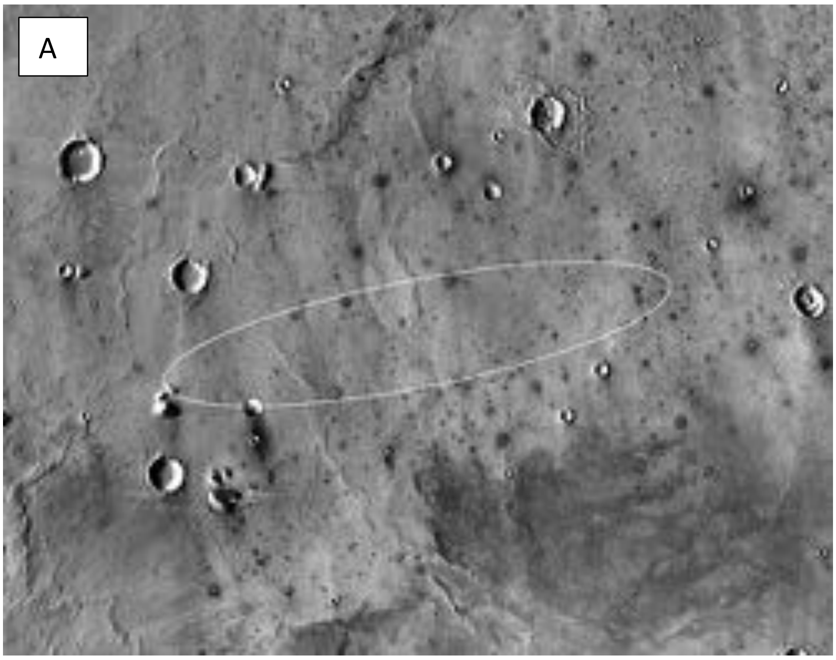
Q9. What is the expected duration of the operational phase of this mission ?
- A few weeks
- At least 2 years
- At least 10 years
- At least 100 years

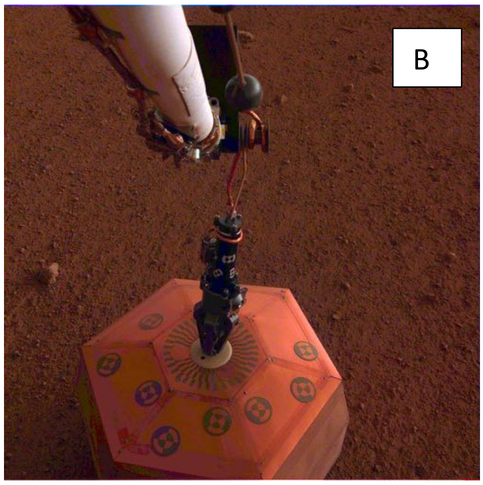
Q10. The resolution of the cameras on InSight is:
- Much lower than an HD image
- Similar to the resolution of an image in HD
- Similar to the resolution of an image in 4K
- Better than an image in 4K

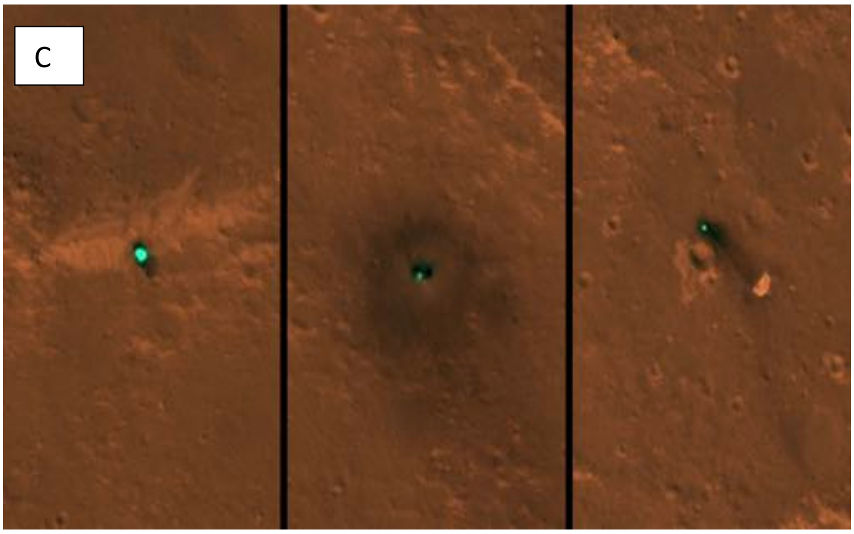
Part II. Current images.

InSight's activity has been rich over the last few weeks and many photographs have been broadcasted in the media. Research and identify the images below.

 for each correct answer







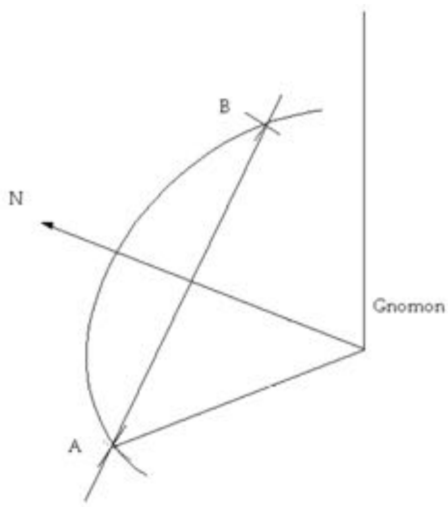
Part III – Looking for North !

Since ancient times, it has been well known that the shadow on the ground of a vertical stick is a valuable resource in determining North.
This technique will be implemented during the Mars Insight mission to determine the north of this planet. Indeed, unlike the Earth, Mars no longer has a global magnetic field since 4 billion years.

The operator responsible for this delicate mission is Denis Savoie, a great French specialist in gnomonic projection and Honorary President of the Sun Solar Board of the SAF.
The information provided by the seismometer will be interesting but, to supplement this information, it must be clear as to where the vibrations are coming from. Hence the need to have a geographical mark, the North. The seismometer grip rod will serve as a gnomon and the mark of its shadow will be the decisive data.

Objective: You will need to build a gnomon comparable to that of the InSight mission using the following indications (page : Assembly of the SEIS paper model) and you will have to determine North.
You will be required to submit a photograph of your device.

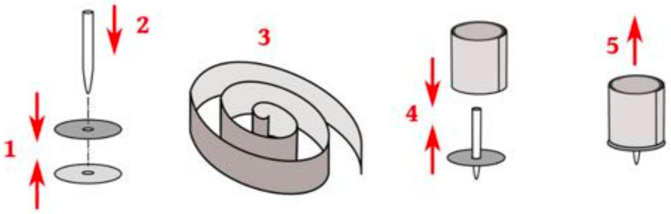
Method: choose a clear space, well lit up by the Sun during class hours (and throughout the year). Place the SEIS paper model on the floor. As soon as possible in the morning, a child marks the end of the shade of the hook by a small cross (point A). Using a thread to trace a half-circle crossing the cross (the center of the circle is the location of the hook). As the sun changes in position in the sky, the shadow of the hook changes in place and dimension. Every half hour mark a dark cross the end of the shade. Locate the position of the shade end when it reaches the circle again (point B). Locate the right segment that passes through points A and B. The line that goes from the hook and passes through the AB segment is the meridian of the place: the end of this line on the Sun side tells us the South, while that the other end tells us the North.



Assembly of the SEIS paper model

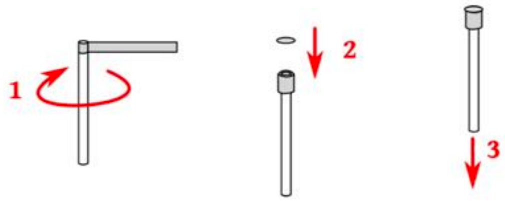
The feet

Two black disks are cut which will be glued on their white faces (1). Then, we drill this disk to paste the tip of a toothpick (2). The long strips are cut which will be rolled and glued (3) so as to form a rigid cylinder under which will be glued a disk provided with a tip (4).
The finished foot will be glued under the SEIS instrument (5).



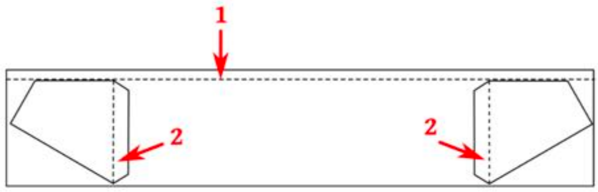
The hook

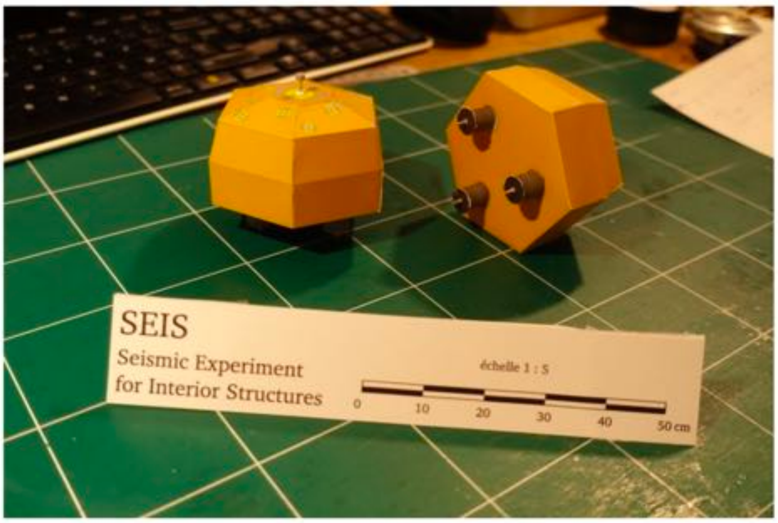
The hook on the top of the instrument allows the robotic arm to grasp the instrument and place it on the floor. This hook is made from a piece of toothpick which has been removed a point, and around which is wrapped the small strip of gray paper and white (1). Then we stick to a small disk (2). When the set is dry, stick the hook to the top of the instrument (3).



The legend

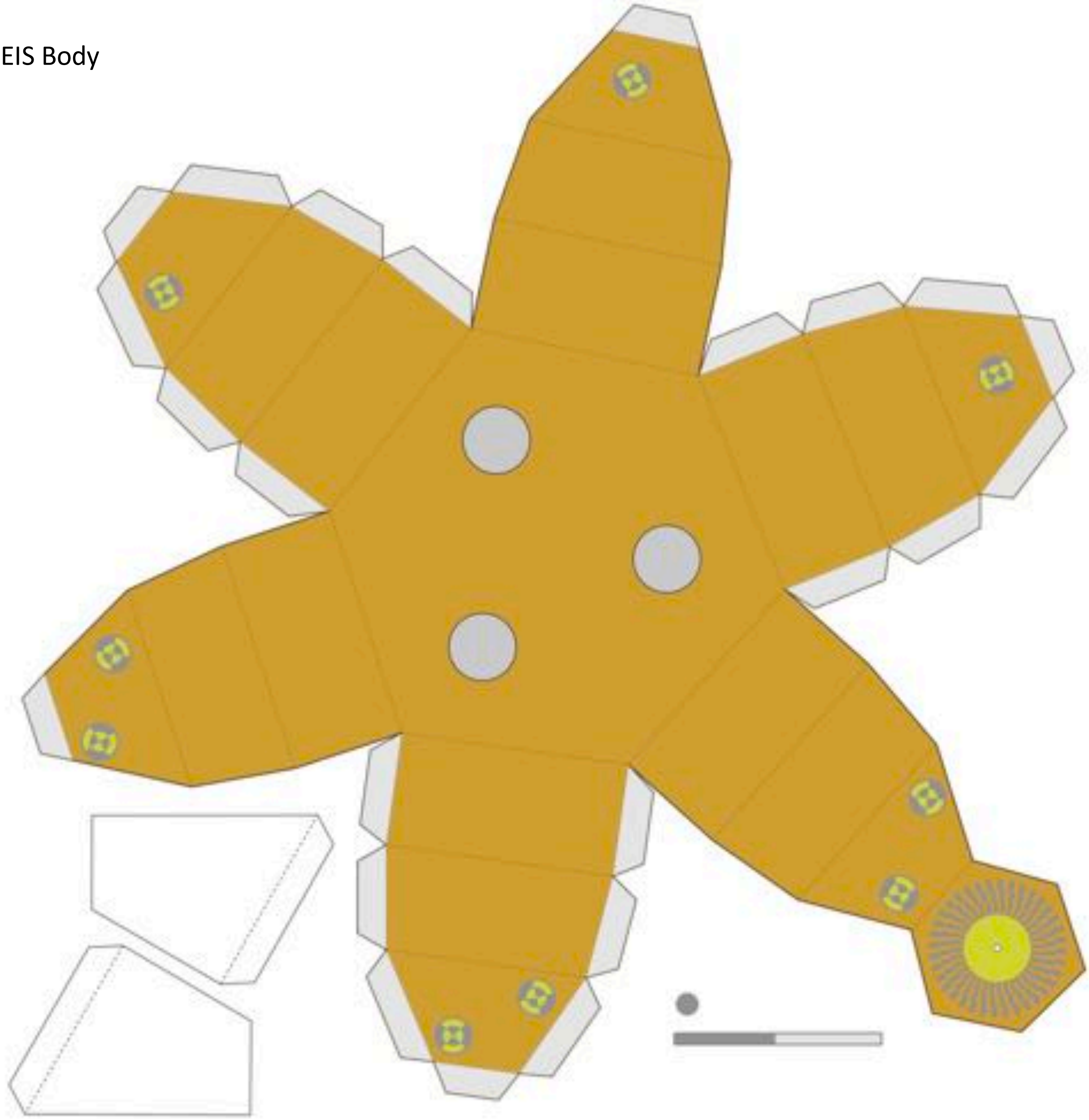
The upper edge of the legend panel is bent at 90 ° in order to stiffen it (1).
Then, glue on the back of the panel the two foldable legs that will place it on the floor (2).





SEIS Feet

SEIS Body



SEIS

Seismic Experiment
for Interior Structures

échelle 1 : 5

0 10 20 30 40 50 cm

Part IV – Robotic arm.

Objective: NASA uses robotic arms to accomplish tasks that are potentially too dangerous, too difficult or simply impossible for astronauts to do. The robotic arm on the International Space Station can capture approaching cargo ships for docking or be used to assist astronauts on spacewalks. The Mars rovers Spirit, Opportunity, Curiosity and now InSight were each designed with robotic arms that would help scientists on Earth conduct scientific experiments on Mars. While all of these arms look different, they are similar in that each robotic arm was designed to help it accomplish a given task.

In this challenge you will have to build and use a robotic arm to move objects from place to place.

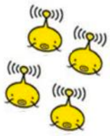
Graphic of a long table depicting two stations for the robotic arm challenge. The objective is to use a student-designed robotic arm to move as many objects as possible from the rectangular container (at the 60 cm line) to a container at the 70 cm line within a given amount of time without crossing the 30 cm line with any human body part.

JUNIOR level

Possible equipment:
duct tape
masking tape
bowls
paper clips
string
rubber bands
binder clips
barbecue skewers
chenille stems
brass fasteners
index cards
Other choice craft supplies ...

EXPERT level (if you have the available hardware)

All requirements for the JUNIOR level, but you will need to use Lego Mindstorms, Arduino or any other programmable support to make your robotic arm independent in its task.



For this question, you will need to make a short video showing the use of your robotic arm ... and to complete your answer, please add the drawing describing how your robotic arm is built.

GOOD LUCK AND HAPPY NEW YEAR !