Nataliia Savchenko's team

SCENARIO

Collect a rock core sample

ACTIVITIES

- Use the drive tube to collect a rock core sample.
- Record descriptions of core sample in a field notebook.
- Label and stow the samples in a protective container for further analysis.

ASSUMPTION: INSTRUCTOR LED TRAINING

1. There is a dedicated person, or a group of people, participating in the scenario as instructors instead of trainees (i.e., future Mars explorers).

2. Instructors can set up initial training conditions, introduce changes during the scenario (e.g., weather changes), and act as a member of remote personnel for the Mars explorer group.

3. All Instructors are familiar with training system capabilities.

4. Some of the instructors have a good understanding of the exact training session targets.

BEFORE THE SESSION:

Open the map of Mars and define the location where trainees will start.

Define Date/Time of the training OR simply set daytime (morning, evening, etc.).

A briefing for the trainees to be conducted before the session.

Define weather conditions (e.g., an incoming storm may shorten the activity time for the trainees).

DURING THE SESSION:

- Monitor actions of trainees
- Change weather conditions
- Introduce malfunctions to certain equipment
- Play a role of command center/base station/another remote group during radio communication

AFTER THE SESSION:

Perform debriefing, explain what was good, what was wrong, what can be improved

Check metrics highlighting how good particular exercises goals were met

Replay log file, if needed, to highlight certain points of the scenario to make explanations of some exact activities

SUGGESTED METRICS FOR THE EVALUATION OF STONE SCENARIO:

DURATION OF THE SCENARIO

Scenario can be **time limited** and it can end after time runs out. This may represent limits set in real life by the oxygen available.
Scenario can have **no time limit**, but decreasing the time of activities within same or similar scenario will show that trainees are doing better.

DISTANCE TRAINEES TRAVEL

Assumption: limit of oxygen may define how long people can perform work (see previous metric) and how far should they go by feet.

DISTANCE BETWEEN THE TRAINEES

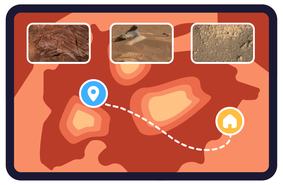
Challenge description says that scenarios are never performed by one person only.
So we assume there can be a metric showing how far people get from each other during the scenario and for how long.

3 POSSIBLE WAYS TO COLLECT ROCK SAMPLES

GENERAL ASSETS

Depends on method of collecting samples an astronaut uses a different colours of buttons on GPS Sensor.
It will help the crew to understand what equipment they have to use.
Also it will help to load sample data automatically to the notebook, by clicking on specific tag in UI.

GPS SENSOR



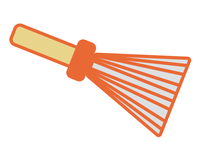
TABLET

FOR BREAK OFF A PIECE OF ROCK

BLUE BUTTON

BOX FOR TUBES

TUBE



BRUSH

PICKAXE

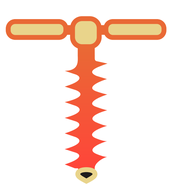
TONGS

FOR DRILL DOWN UNDER SURFACE

GREEN BUTTON

BOX FOR TUBES

TUBE



DRILL

FOR PICK UP STONES FROM SURFACE

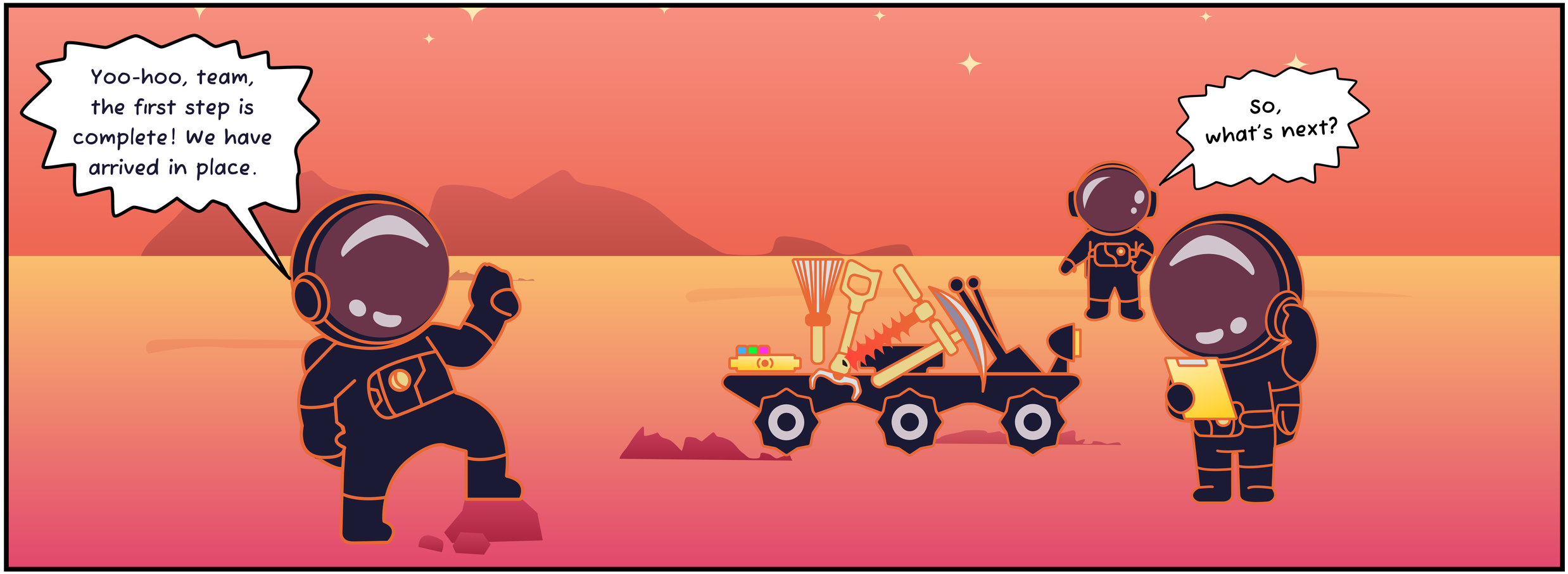
PURPLE BUTTON

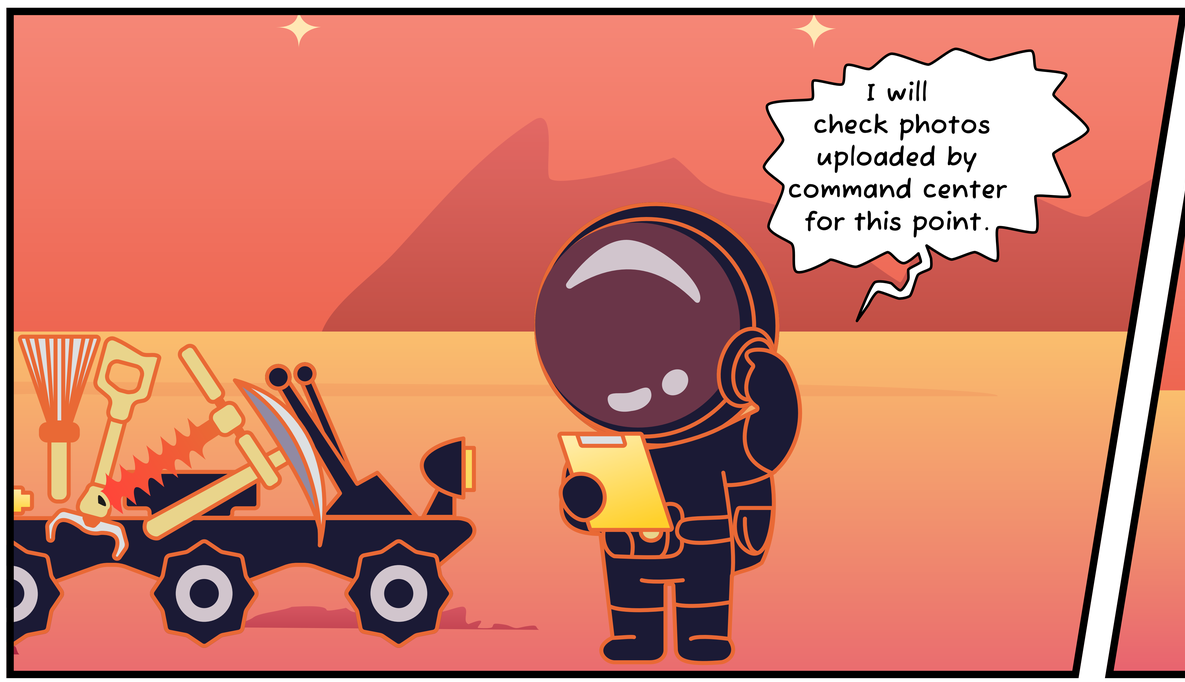
BOX FOR TUBES

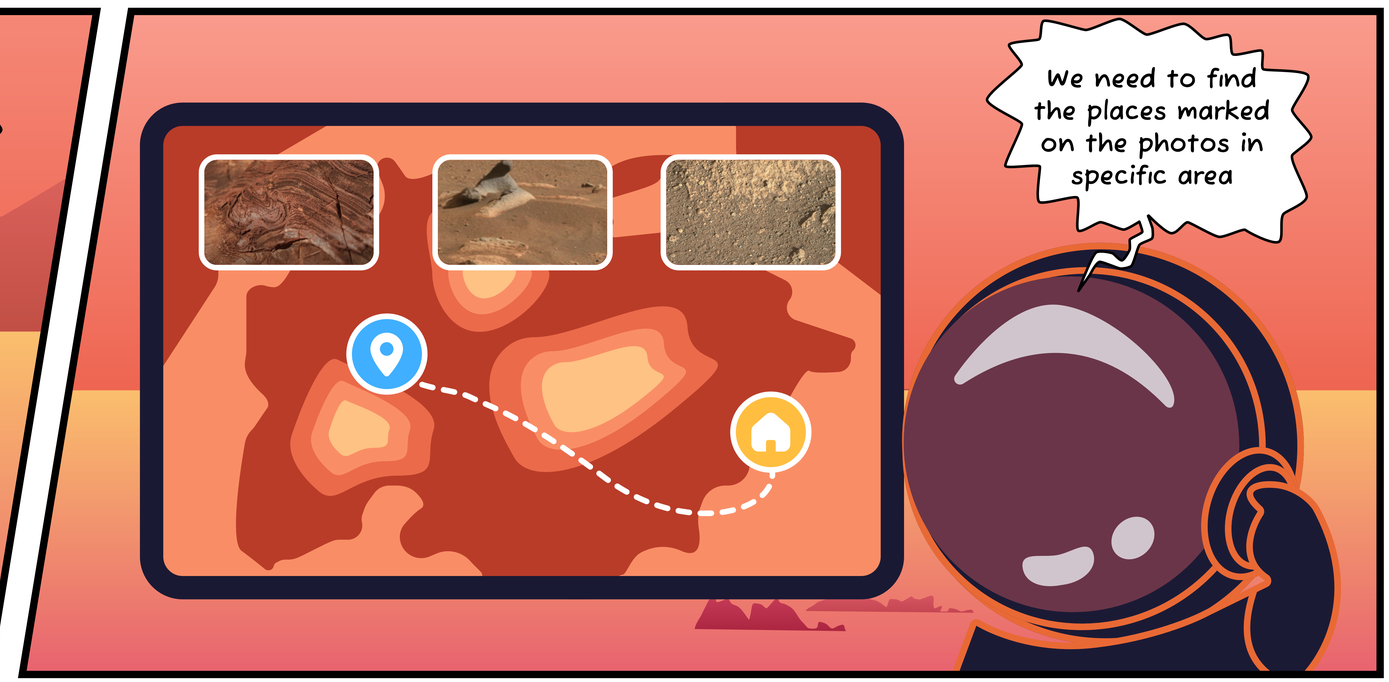
TUBE

TONGS

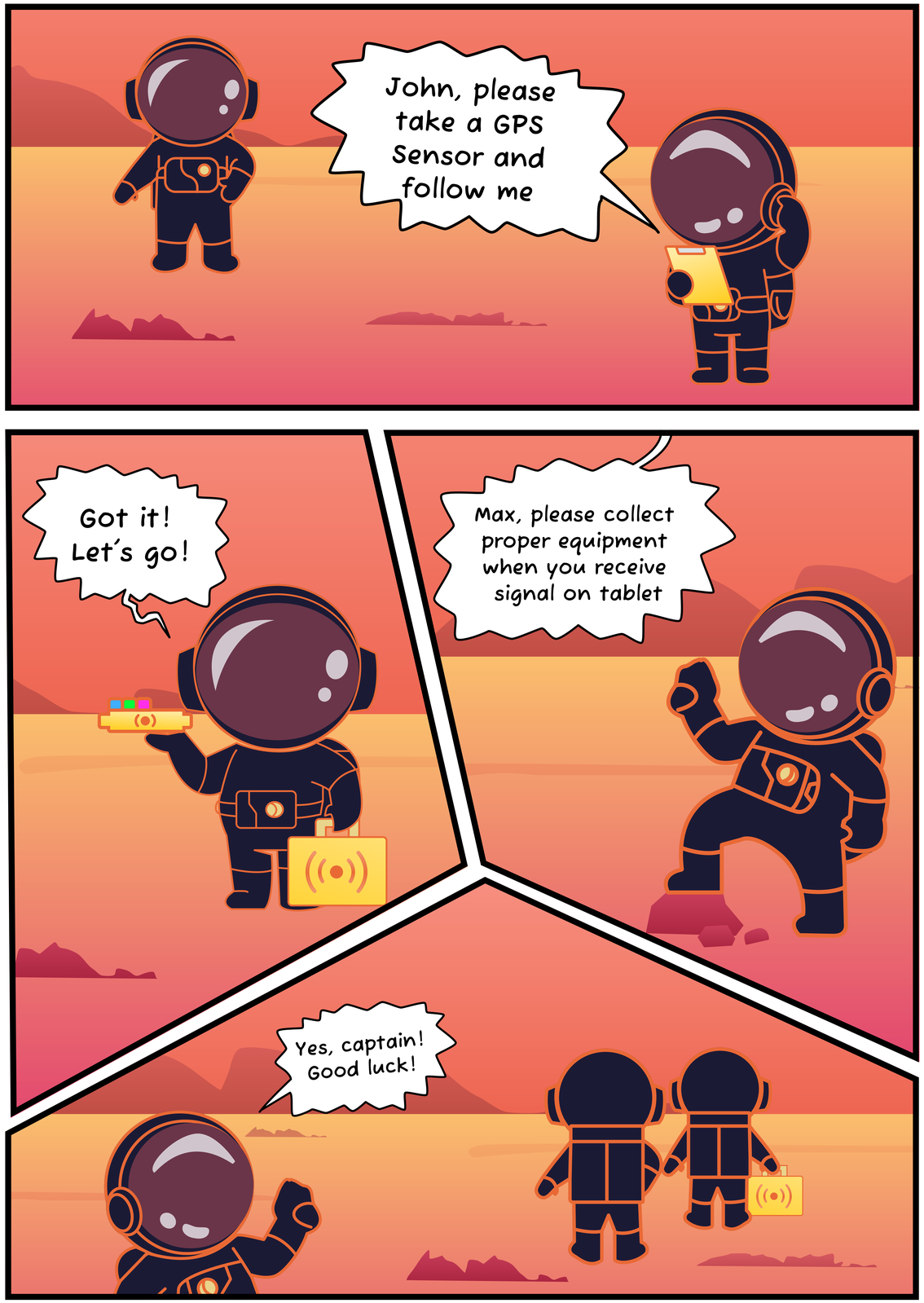
STEP 1: THE BEGINNING OF THE MISSION

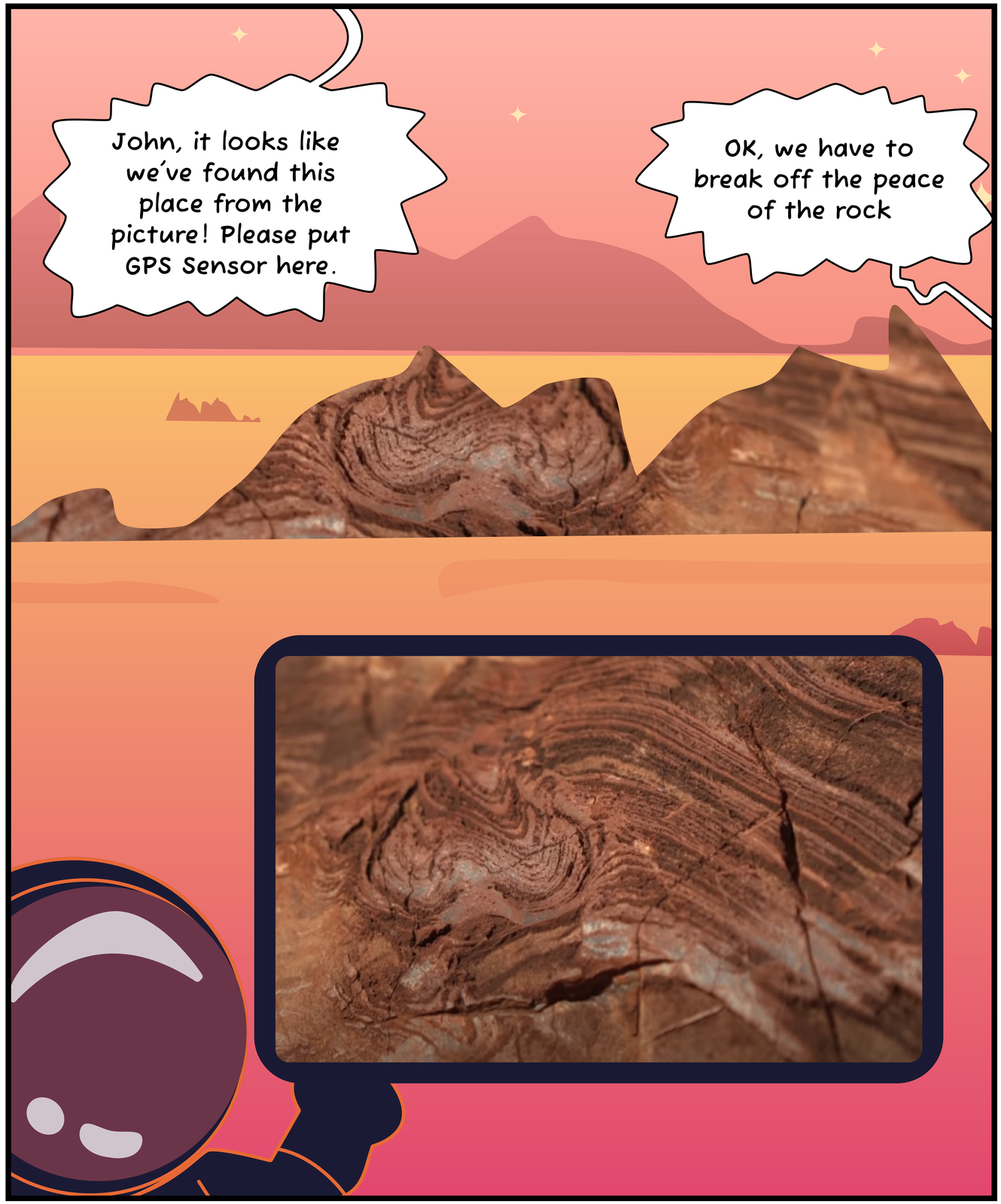




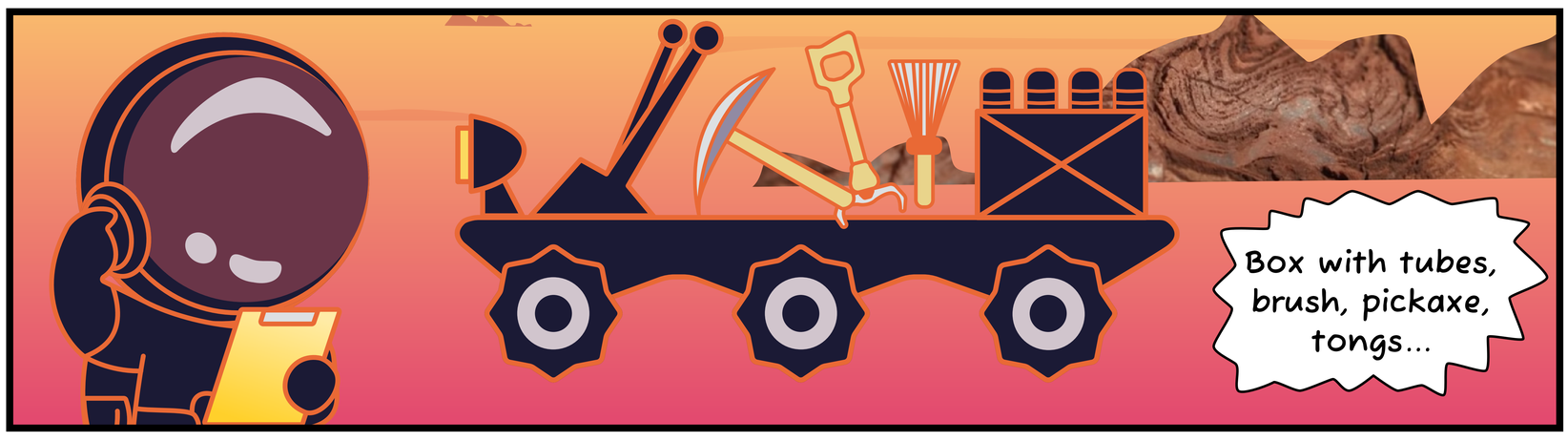


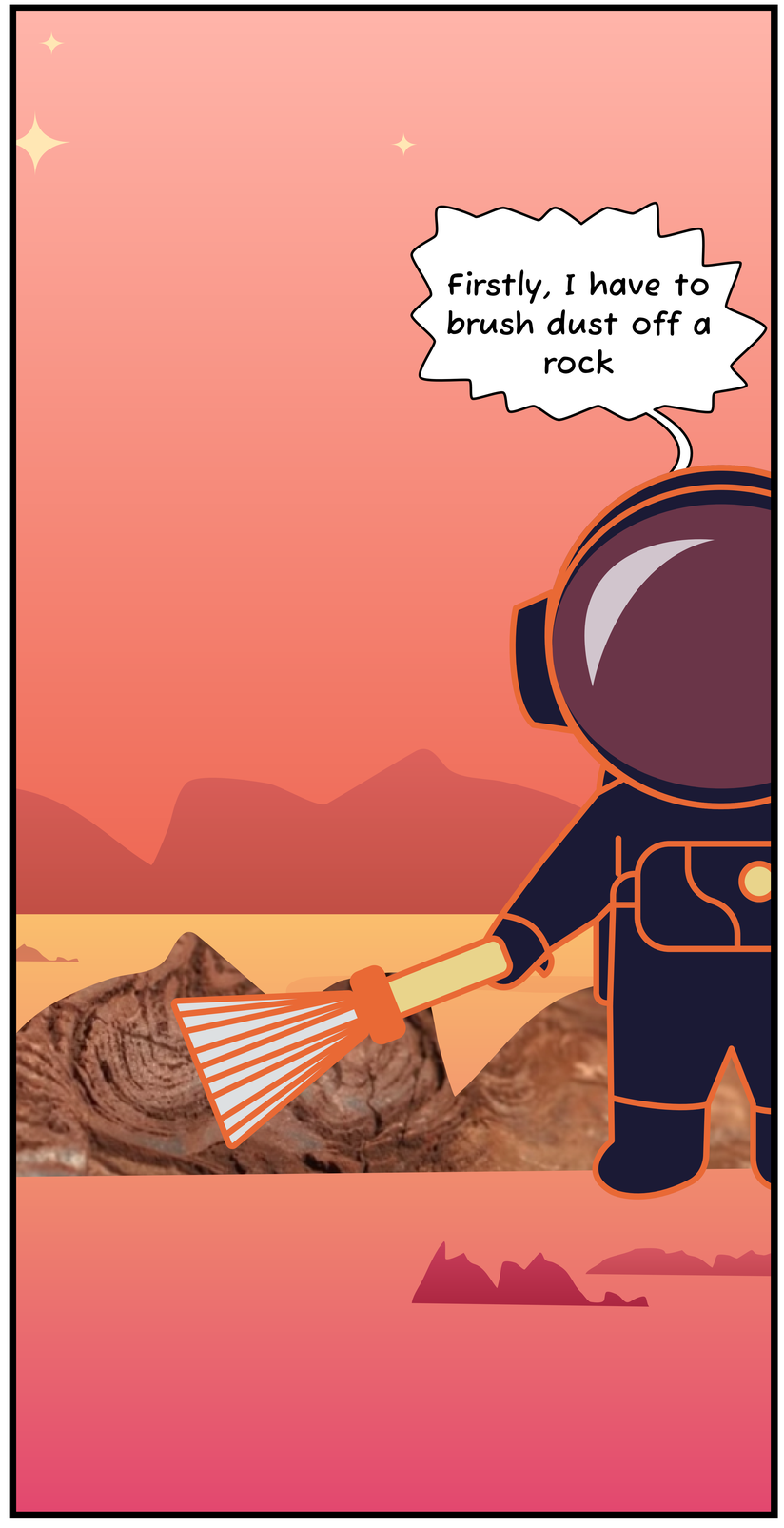
STEP 2: PART OF CREW GOES TO FIND EXACT PLACES



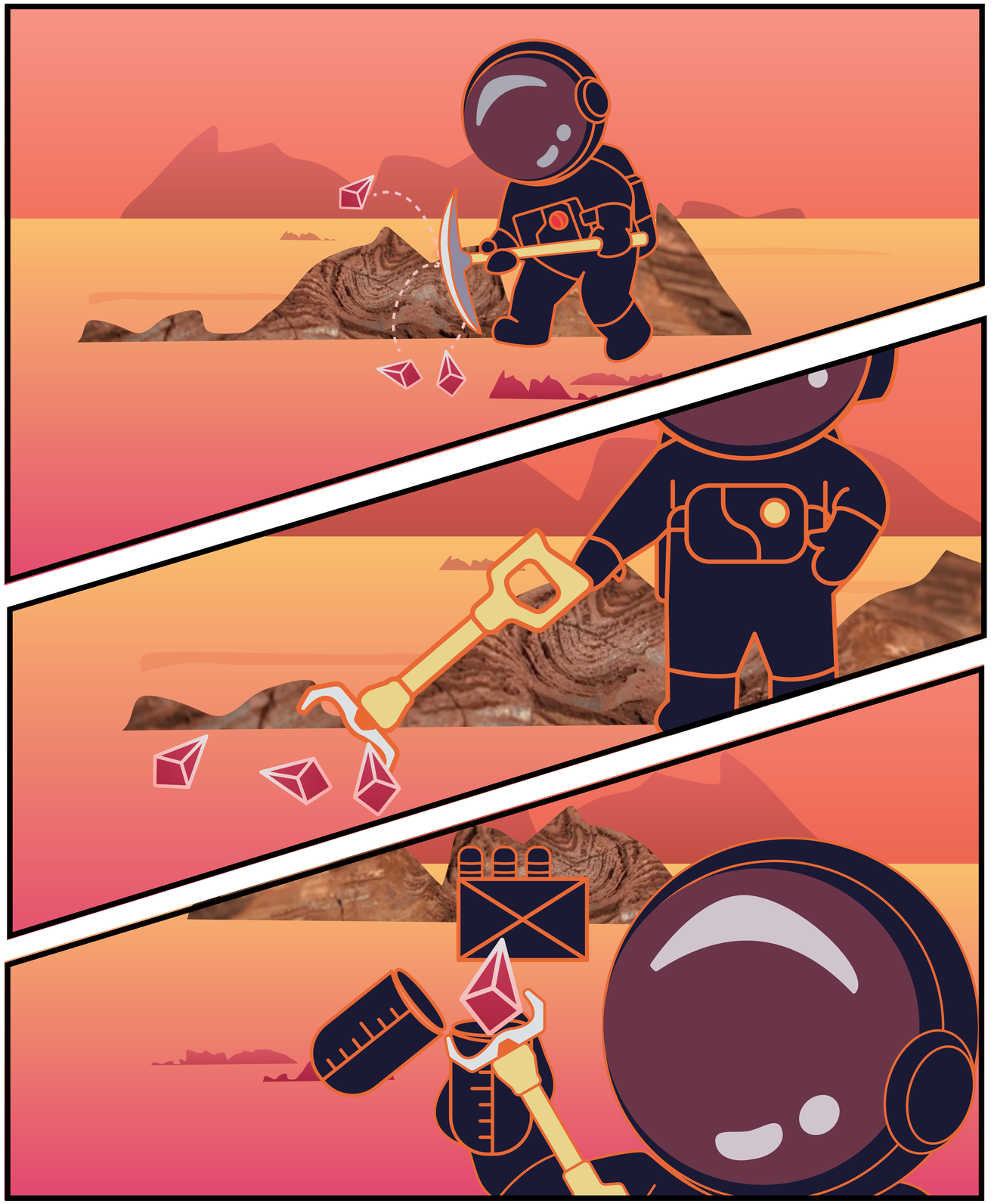


STEP 3: THE CREW SELECTED PLACE ON THE MAP BY BLUE BUTTON ON SENSOR





STEP 4: AN ASTRONAUT COLLECTS SAMPLE BY BREAK OFF FROM THE ROCK

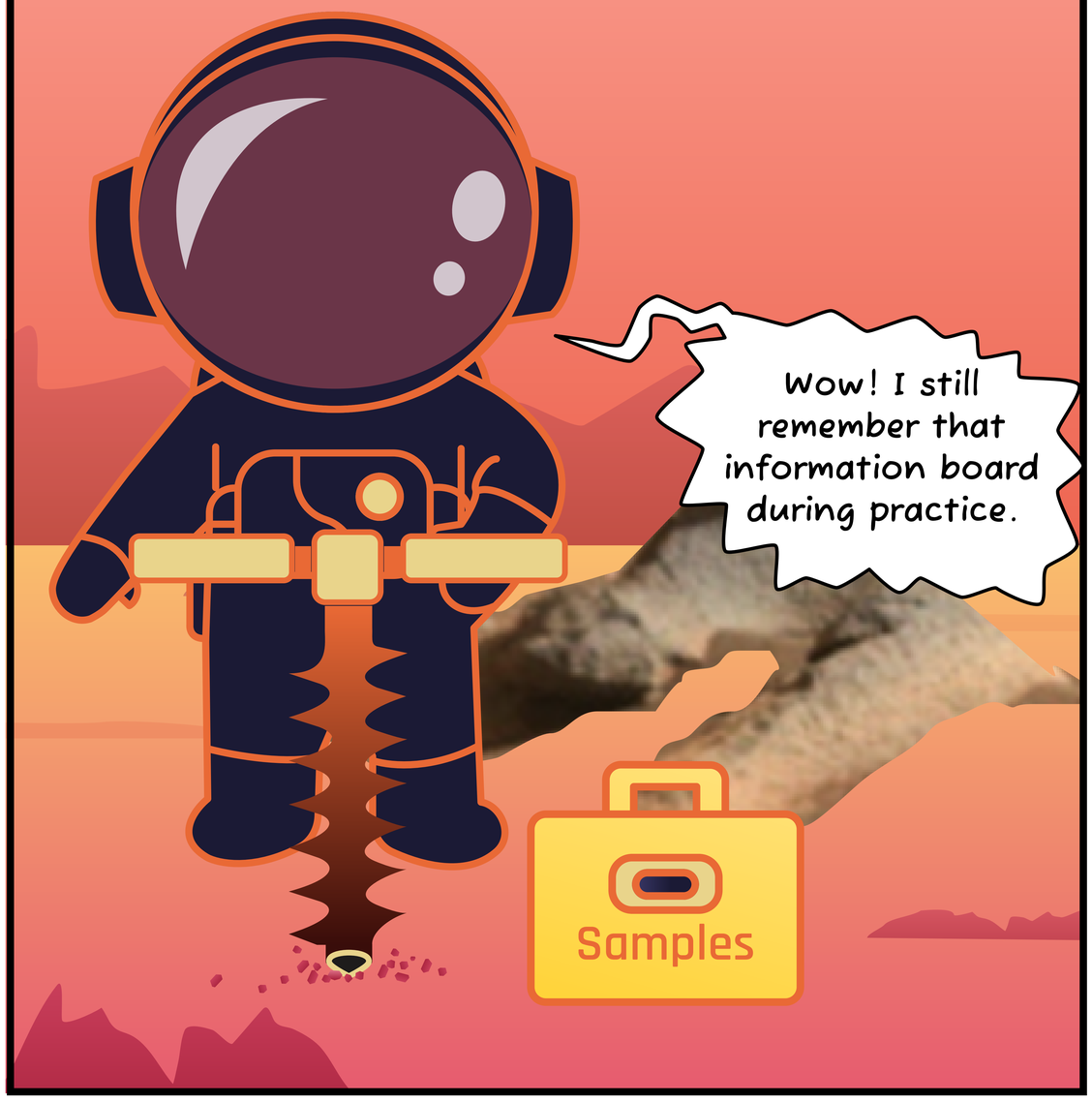


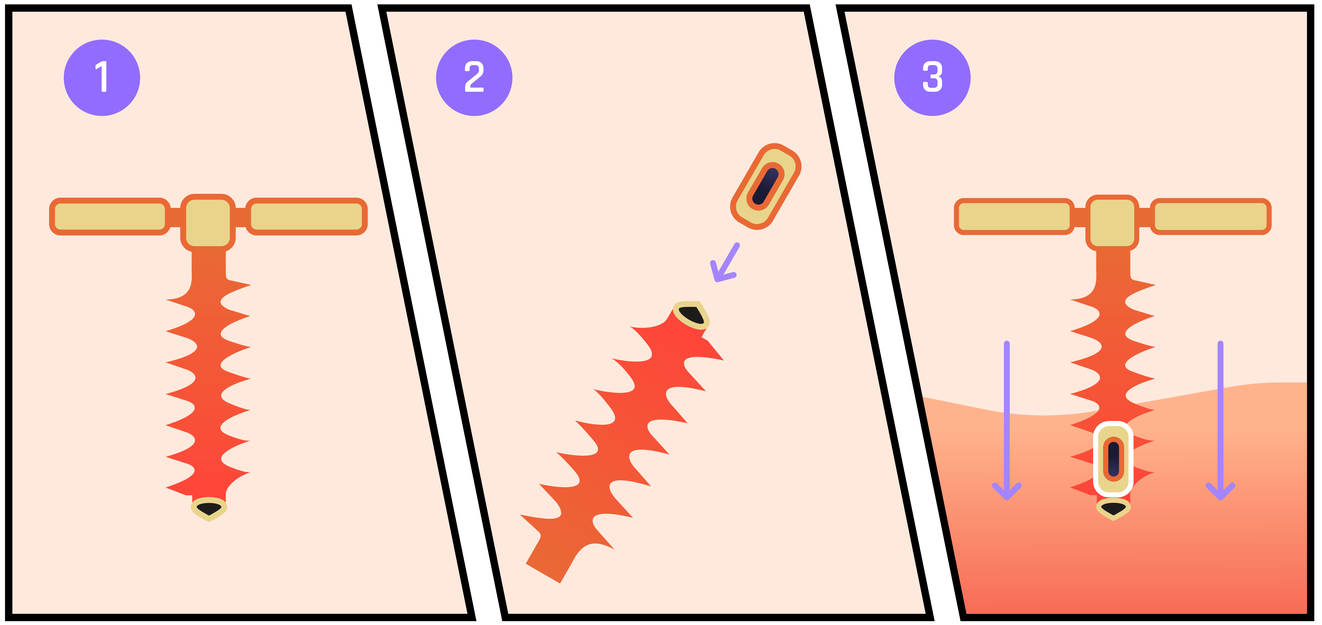
An astronaut select on tablet UI that sample was packed to the tube number 1.
All data such as coordinates, collection method and date are added automatically.

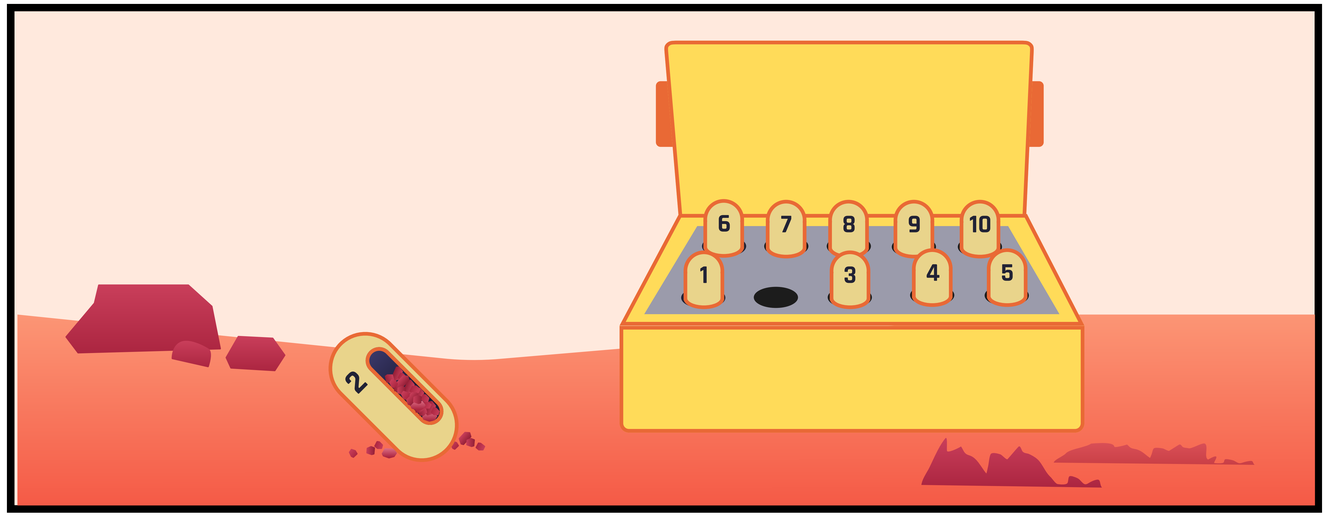
STEP 5: THE CREW SELECTED PLACE ON THE MAP BY GREEN BUTTON ON SENSOR

STEP 6: THE ASTRONAUT EXTRACTS A SAMPLE BY DRILLING

Meanwhile, Max extracts a sample following a 5-step sequence. He takes the equipment, then inserts a special tube into the drill, which allows him to collect a sample right during drilling. After that, the astronaut plunges the equipment into the soil and begins to drill. The collected sample is placed in a special container.







STEP 7: THE CREW MARKS THAT THE SAMPLE 2 COLLECTED AND GOES FOR THE NEXT

An astronaut select on tablet UI that sample was packed to the tube number 2.
All data such as coordinates, collection method and date are added automatically.

1 2 3 4 5

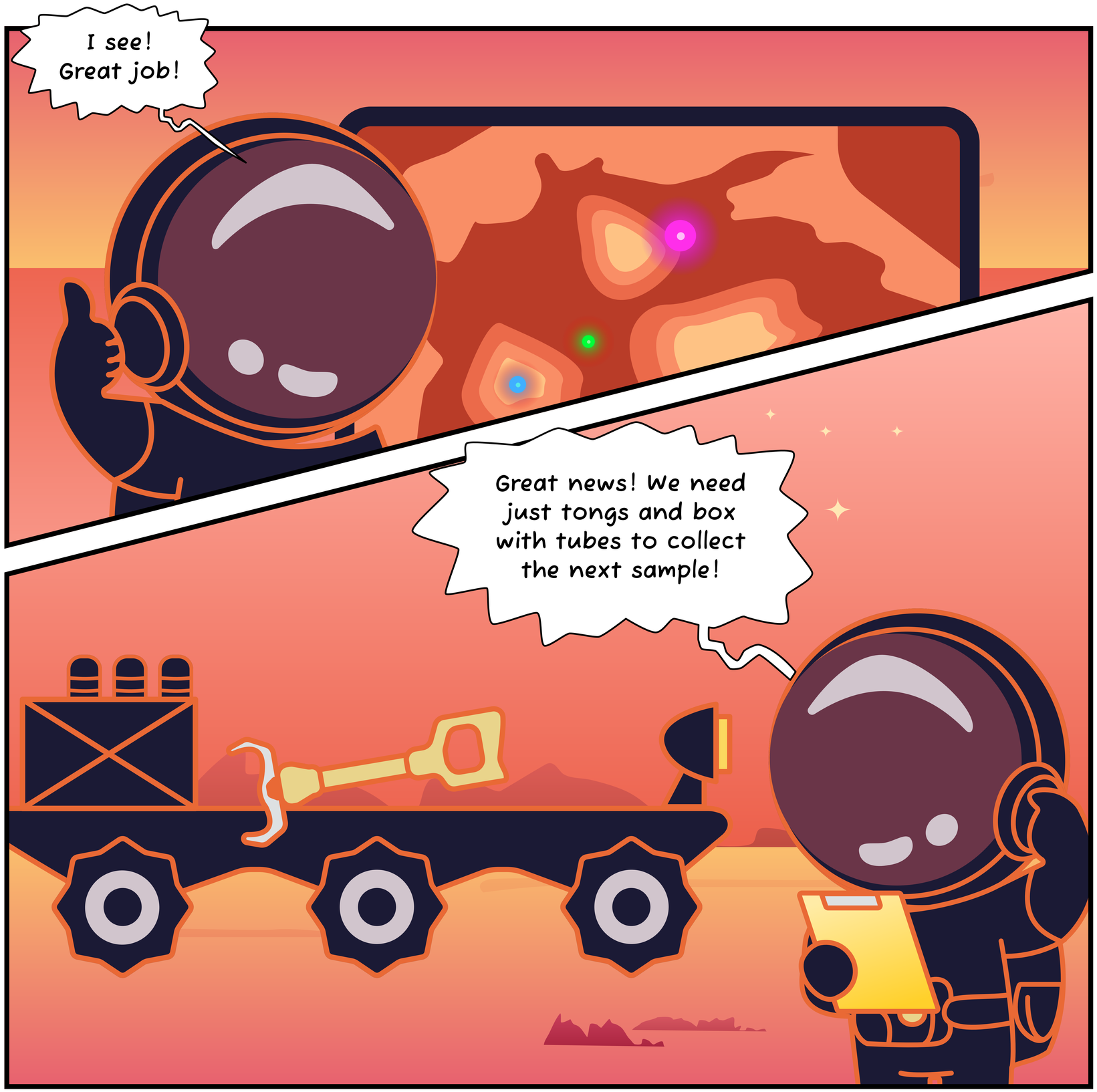
Date: 798Sol
Coordinates: 37,520 ° n.l. 40,717 ° w.l.
Sample num: 2
Method: Drilling

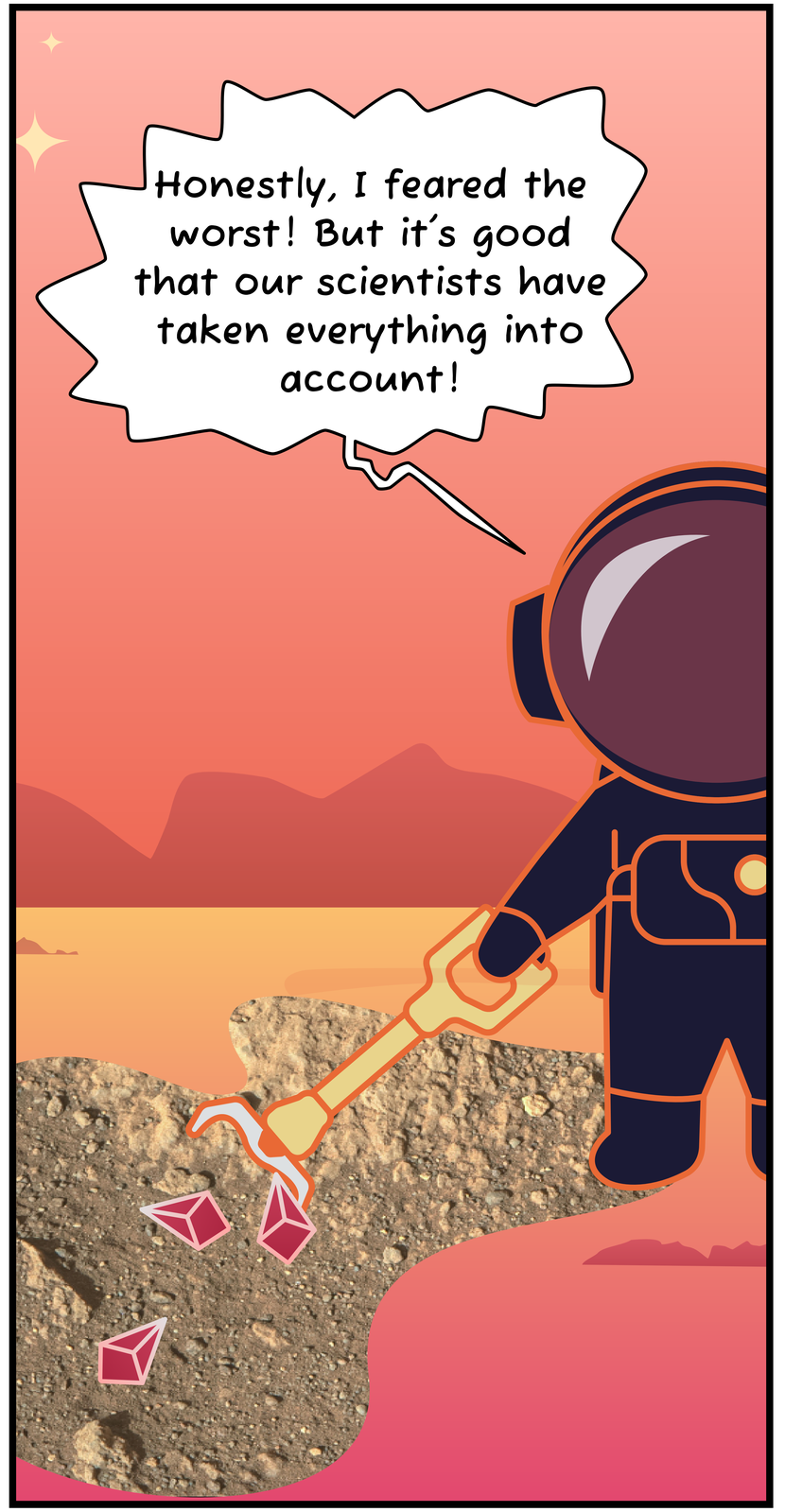
Hey captain! It's time to collect the third sample!

I'm on my way!

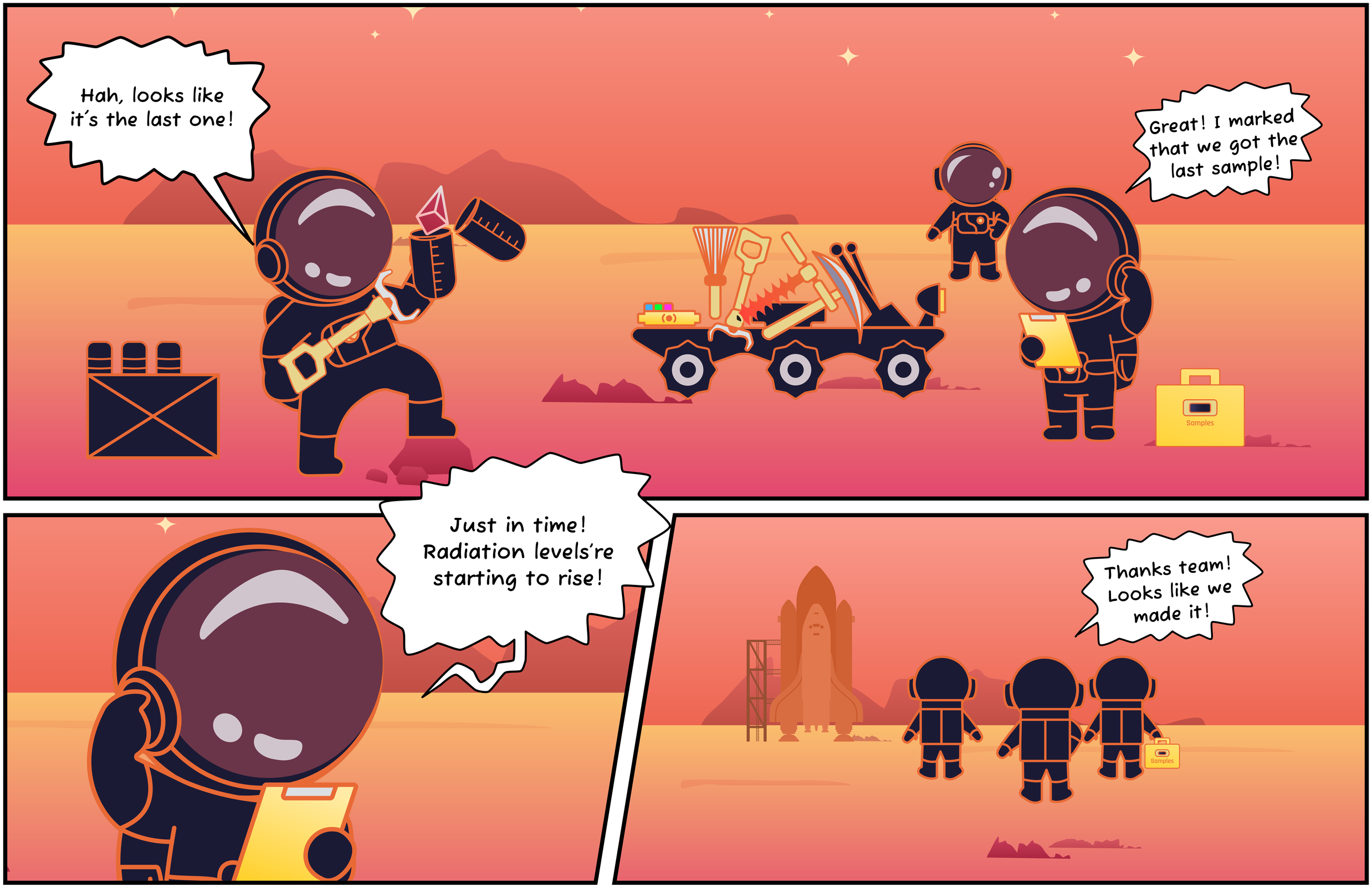
The location's already on the map!

STEP 8: THE CREW EXTRACTS THE LAST SAMPLE WITH A TONGS





STEP 9: SUCCESSFUL COMPLETION OF THE MISSION!



WHAT COULD POSSIBLY GO WRONG

EQUIPMENT FAILURE

- The drill bit becomes stuck;
- The drill handle breaks;
- The drill bit breaks;
- Tube for sample is contaminated;
- Drilling deeper than planned.

COMMUNICATION FAILURE

- GPS Sensor or tablet does not work.
- Loss of communication with the crew.

LIMITED MOBILITY

- Moving around Mars can be difficult due to low gravity and the uneven terrain of the planet, which can make it difficult to collect rock samples from multiple locations.
- Astronaut physically unable to get to sample collection point.

THANK YOU FOR ATTENTION!

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