**What makes for a good landing site?**

Mars 2020 Mission

Goal: Search for evidence of past life on Mars. Collect samples that could eventually be returned to Earth with a future mission.

What do you think are the most important factors for NASA to consider when selecting a landing site for this Mission? First make an individual list and then discuss it with your group to make a group list.

Individual List:

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**Let’s Pick a Landing Site on Mars**

NASA would like to find out if there is life on Mars now, or if there has been in the past. Researchers use rovers to collect and analyze samples of rocks and soil while looking for signs of life. To pick an exploration site, we will consider the top three landing sites that NASA has considered for the MARS 2020 mission. Next, you will look at three criteria that NASA scientists have actually used to evaluate landing sites on Mars. You will take on the role of a NASA scientist providing input on which landing site is best. Good luck with your Mission!

Goal: Search for potential evidence of past life and pick a landing site based on **habitability**, **preservation**, and **safety**!

Criterion A: Ancient **habitability** refers to the past environment’s ability to have life. For example, an ancient lake or river is more likely to have had life than the mouth or slopes of a volcano because the superheated lava, rocks, and gases coming down the sides of a volcano can destroy life.

Criterion B: **Preservation** of ancient rocks refers to areas where rocks have not been destroyed by heat (lava), pressure (impacts), or erosion (wind and sand).

Criterion C: Appears to be a **safe** region for the rover.

Ideally scientists would like a location that scores the highest in all three criteria: (1) **habitability** of that area in Mars’ ancient past, (2) **preservation** of ancient rocks, and (3) a location that keeps the rover **safe**.

First NASA would like to find out which criterion you think is the most important and why. Circle your rating for each criterion, where 1 is the least important and 3 is the most important. Circle each number only once.

Criterion A: Ancient habitability Least Important 1 2 3 Most Important

Criterion B: Preservation of ancient rocks Least Important 1 2 3 Most Important

Criterion C: Rover safety Least Important 1 2 3 Most Important

Explain your reasoning for these three ratings:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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On the next page you will use the three criteria to evaluate the quality of each of the three finalist landing sites.

For each landing site below, read the description and then put a number in the box showing how well the landing site meets that criterion. Your ratings can range from 1 (lowest quality) to 10 (highest quality). For example, if you think a particular landing site is kind of dangerous you might give it a 2 showing that it is low quality for safety, but it may be a 7 for habitability.

**Jezero Crater and Delta:** “Water filled and drained away from the crater on at least two occasions. More than 3.5 billion years ago, river channels spilled over the crater wall and created a lake. Scientists see evidence that water carried clay minerals from the surrounding area into the crater after the lake dried up. Microbial life could have lived in Jezero during one or more of these wet times. If so, signs of their remains might be found in lakebed sediments.” – NASA

Criteria A: Ancient **habitability**

Criteria B: **Preservation** of ancient rocks

Criteria C: Rover **Safety**

Explain your reasoning for these three ratings:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Northeast Syrtis: “**Volcanic activity once warmed Northeast Syrtis. Underground heat sources made hot springs flow and surface ice melt. Microbes could have flourished here in liquid water that was in contact with minerals. The layered terrain of NE Syrtis holds a rich record of the interactions that occurred between water and minerals over successive periods of early Mars history.” - NASA

Criteria A: Ancient **habitability**

Criteria B: **Preservation** of ancient rocks

Criteria C: Rover **Safety**

Explain your reasoning for these three ratings:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Columbia Hills (inside Gusev Crater)**: “Mineral springs once burbled up from the rocks of Columbia Hills. The discovery that hot springs flowed here was a major achievement of the Mars Exploration Rover, Spirit. The rover's discovery was an especially welcome surprise because Spirit had not found signs of water anywhere else in the100-mile (160-kilometer)-wide Gusev Crater. After the rover stopped working in 2010, studies of its older data records showed evidence that past floods that may have formed a shallow lake in Gusev.” - NASA

Criteria A: Ancient **habitability**

Criteria B: **Preservation** of ancient rocks

Criteria C: Rover **Safety**

Explain your reasoning for these three ratings:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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After reviewing all three landing sites which landing site do you think is the best. Circle your rating for each landing site, where 1 is the worst landing site and 3 is the best landing site. Circle each number only once.

Jezero Crater and Delta: Worst Landing Site 1 2 3 Best Landing Site

Northeast Syrtis: Worst Landing Site 1 2 3 Best Landing Site

Columbia Hills (inside Gusev Crater): Worst Landing Site 1 2 3 Best Landing Site

Explain your reasoning for the one you think is the best compared to the other two possible landing sites.

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