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**Summary:** This mission will determine if Ceres possesses the qualities that could harbor life, if it were within the habitable zone of the Sun in the distant future.

**Rationale:** The three main building blocks for life are certain elements such as C H N O and S, energy, and temperature.

* **Water and Organic Elements:** Water and certain organic elements have already been detected on Ceres’ surface in an article recently published by Science Magazine[[1]](#footnote-0). The abundance of that water and organic elements would be where the potential for life would come from., and thus it would be a primary goal to determine the abundance of these molecules by sampling multiple geologically different sites.
* **Temperature:** Temperature change will come with time. In order to determine how much time, it will be a primary goal of this mission to determine the composition of Ceres surface. In determining the composition of Ceres surface, it can be determined by comparing the luminosity change of the sun over time with the specific heat capacity of the surface of Ceres to establish the amount of time that it would take to make Ceres a habitable planet.

**Mission Plan:** In order to determine both the abundance of organic molecules and the composition of the surface of Ceres, it will be necessary to send a rover with a mobile lab to different geological sites where the composition of the surface is different. This would help answer the questions regarding the specific heat capacity of the surface of Ceres, by analyzing samples of the surface. In order to determine the abundance of Organic Elements and Water, investigating below the outer shell of Ceres is necessary. By deploying a rover with the same mobile lab, it could be possible to determine the composition of Ceres surface, and if any organic molecules were present.

**Instrument List**

Command and Data System

Narrow angle camera

Wide angle camera

Imaging spectrometer

Scan Platform

Surface GPR

Nephelometer

Thermometer

Seismometer

Heat flow probe

Gas chromatograph/mass spectrometer

Organic molecule detectors OR Proton NMR

XRD-XRF detector- inorganic composition

Drill core sampler

Robotic arm

L1 Science Goals

1. Determine the composition of Ceres surface, and the abundance of materials.
2. Use small explosive to determine to interior composition of the Planet.
3. Look for potential organic compounds.

1. Sanctis, M. C. De, E. Ammannito, H. Y. Mcsween, A. Raponi, S. Marchi, F. Capaccioni, M. T. Capria, F. G. Carrozzo, M. Ciarniello, S. Fonte, M. Formisano, A. Frigeri, M. Giardino, A. Longobardo, G. Magni, L. A. Mcfadden, E. Palomba, C. M. Pieters, F. Tosi, F. Zambon, C. A. Raymond, and C. T. Russell. "Localized aliphatic organic material on the surface of Ceres." *Localized aliphatic organic material on the surface of Ceres* 355, no. 6326 (2017): 719-22. doi:10.1126/science.aaj2305. [↑](#footnote-ref-0)