Capstone Project: Mission Proposal

Background:

Now that you have explored some of NASA's missions, your challenge is to design your own mission. During this club you learned about many NASA missions, including missions that study the Sun, the solar system, and distant stars and galaxies. These missions, collectively, help NASA create a more comprehensive understanding of the universe.

- Earth Science – missions that study Earth
- Heliophysics – missions that study the Sun and the heliosphere
- Planetary Science – missions that study objects in the solar system
- Astrophysics – missions that study objects outside the solar system
- Biological and Physical Science – missions that use the spaceflight environment to study phenomena in ways that can't be studied on Earth

There are a variety of different kinds of missions, depending on the destination and what scientists are interested in learning about. Here are the different types of missions, with examples of each type:

- **Missions with Physical Samples:** Genesis, OSIRIS-REx, Stardust
- **Missions with Surface Exploration:** Curiosity, Apollo 11, Perseverance, Huygens
- **Orbiting Missions:** Solar Orbiter, Juno, Mars Reconnaissance Orbiter (MRO), Messenger, Cassini, Galileo, Magellan
- **Flyby Missions:** Voyager, New Horizons, Mariner 10
- **Other Missions:** International Space Station, NASA Hubble Space Telescope, Kepler, TESS, James Webb Telescope

There are many phases involved in developing a mission. After NASA has a mission concept in mind, they put out a call for proposals to get the best group of people to accomplish the mission (and for the right price). Many different teams of scientists and engineers collaborate to develop a plan for how to best carry out the mission. The teams compete with other teams to get their ideas picked by NASA.

Directions:

Now you get to design your own mission. ***What questions do you still have? What places or phenomena would you like to learn more about?*** You will plan a mission to a destination of your choice. Consider what type of science experiments you want to conduct at this location and the type of spacecraft you need to reach the destination. When you have decided on some of the details, complete the **Mission Proposal Letter (page 84)**.

The Mission Proposal Letter is designed to convince the mission review panel to choose your mission design. This proposal letter will give the review panel the top-level details of your mission, including the mission's name, destination, the reasons you chose the destination for the mission, the type of mission and the data you want to collect, and a rough sketch of the design of the spacecraft that will carry out the mission.

Use the **Criteria of Success** below to help you design the best possible mission.

Criteria for Success:

	Expert Design	Intermediate Design	Beginner Design
Mission Destination	Mission destination is unique and innovative with a strong science focus. Destination shows thoughtful consideration to current and past missions.	Mission destination is a popular hotspot for scientific exploration. However, this location has already been heavily explored.	Mission destination is not necessarily of scientific interest.
Phase A: Mission Science	Mission has a strong science goal and a clear plan for collecting data.	Mission has a valuable science goal.	Mission's science goal is unclear.
Phase B: Mission Design (Engineering)	Mission has an efficient design that matches the challenges of the destination. Design provides details about how the spacecraft and its instruments will be protected from the challenges of the specific space environment of the destination.	Mission has a thoughtful design that takes into consideration the general challenges of exploring the space environment.	Mission design doesn't directly address the challenges of exploring the general space environment.