RECRUITMENT FALL ‘23
Upperclassmen application due:
Aug. 31st @ 11:59pm
First-year application due:
Sept. 28 @ 11:59pm
tinyurl.com/cmrFA23firstyear
tinyurl.com/cmrFA23upperclassmen
Equipment Servicing

"perform several dexterous operations on a mock-up equipment system"

Rover must:

- Push buttons
- Flip switches
- Turn knobs
- Operate a screwdriver
- Type on a keyboard
- Open latches
Extreme Delivery Mission

"pick up and deliver objects in the field, and deliver assistance to astronauts"

Given GPS coordinates needed to:

- Pick up and deliver objects (ex. screwdrivers, hammers, toolboxes, rocks)
- Traverse a wide variety of terrain (ex. soft sandy areas, rock and boulder fields, vertical drops)
"conduct in-situ analysis with the rover, including life detection testing of samples"

- Investigate sites of biological interest
- Conduct analysis of samples entirely on board the rover
- Determine the presence or absence of life at designated sites
- Present results, analysis, and conclusions
Autonomous Traversal

"autonomously traverse between markers in this staged mission across... difficult terrain"

As given GPS coordinates get increasingly vague, operators give commands from the base station to:

- Locate AR Tags
- Avoid obstacles
Drives

- Rocker bogie and shock Suspension
- Airless Wheels - 3D printed and cast
- Sheet Metal frame/ecore
• **Structure** - Lightweight and stiff supports

• **Joints/Gearboxes** - Power/move the arm while achieving zero backlash

• **End Effector** - Allow arm/rover to grip and manipulate a variety of objects

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**Custom Cycloidal Gears**

**ANSYS Modal Analysis**

**Parallel End Effector**

**Arm Extension Animation**

**Big/Mini Arm Holding End Effectors**
AstroTech

- Short for “Astrobiological Technology”
- Developing an on-board life-detection lab for the science mission
- Collection, mixing, centrifuge, and analysis subsystems

**Collection**
Rotating scoop array

**Mixing**
Magnetic stir bars and compartmentalization

**Analysis**
On-board test tubes and sensors
AstroTech Research

- Focus is to look for extinct, extant, and present life!
  - Soil analysis for organic compounds coupled with
  - Geological analysis for essential inorganic minerals
- Explore the presence of a potential biosphere using
  - Surface geology
  - Atmosphere
  - Biomolecules
- Experimental testing and data analysis to which knowledge about chemistry, biology, and geology, can be applied!

We are looking for chemists, biologists and geologists!
• Develop rover electronics from the ground up
• Build flexible systems to meet a wide range of mechanical and CS requirements
• Circuit Design and Analysis, PCB Design, Microcontroller Programming, Motor Control, Sensors, Embedded communication protocols
Software

We work with a variety of languages and frameworks to design and implement controls software for operating the rover.

- Autonomy Stack: AR Tag detection system using LIDAR for obstacle detection
- Arm control via inverse kinematics
- Design and implement interfaces for controlling the rover and its various functionality
- ROS - the industry standard (meta) OS for robotics
- Building controls interfaces in React
- Initialization & operation scripting in Python
Business & Design

- Web design, graphic design, social media, video editing, and finance
- Fundraise, budget, market, work with large scale sponsors, and reach out to other students and the local community
Where We Work:
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APPLICATION

First-year

Upperclassmen
THANK YOU!
ELL TOUR TO FOLLOW

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Cornell Mars Rover
Cornell Mars Rover Team