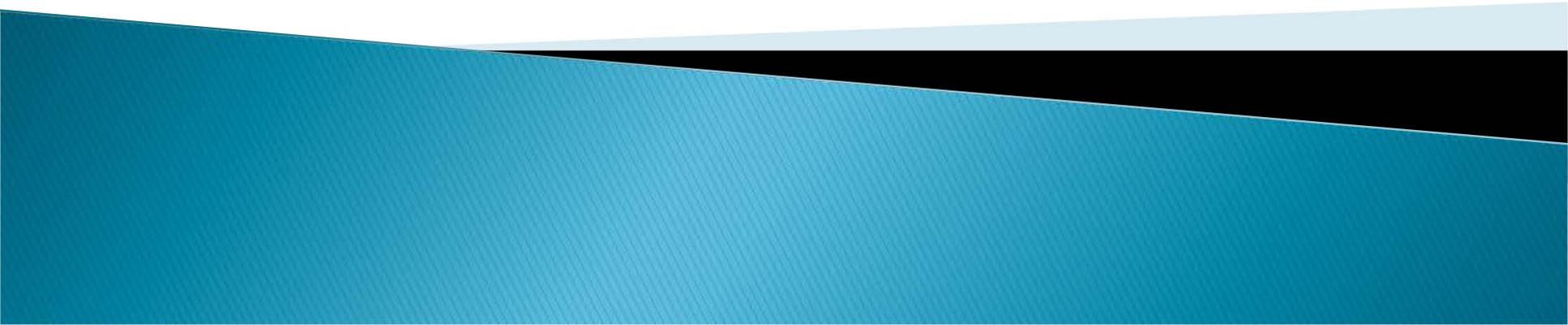


# Global Lunar Topographic Map

By: Adam Weinstein



# Agenda

- ▶ 1. Introduction
  - ▶ 2. Background
  - ▶ 3. Goal of the Project
  - ▶ 4. Purpose of the Product
  - ▶ 5. My Responsibility
  - ▶ 6. Challenges
  - ▶ 7. Overview
  - ▶ 8. Improving the Process
  - ▶ 9. Overall Experience
- 

# Introduction

- ▶ Entering 12<sup>th</sup> grade at Brentwood School
  - ▶ Passionate about Math and Science
  - ▶ Completed an astronomy summer program through John's Hopkins Center for Talented Youth
  - ▶ Worked as an intern in UCLA Photonics Lab
  - ▶ 8 week internship at JPL through SpaceSHIP program
- 

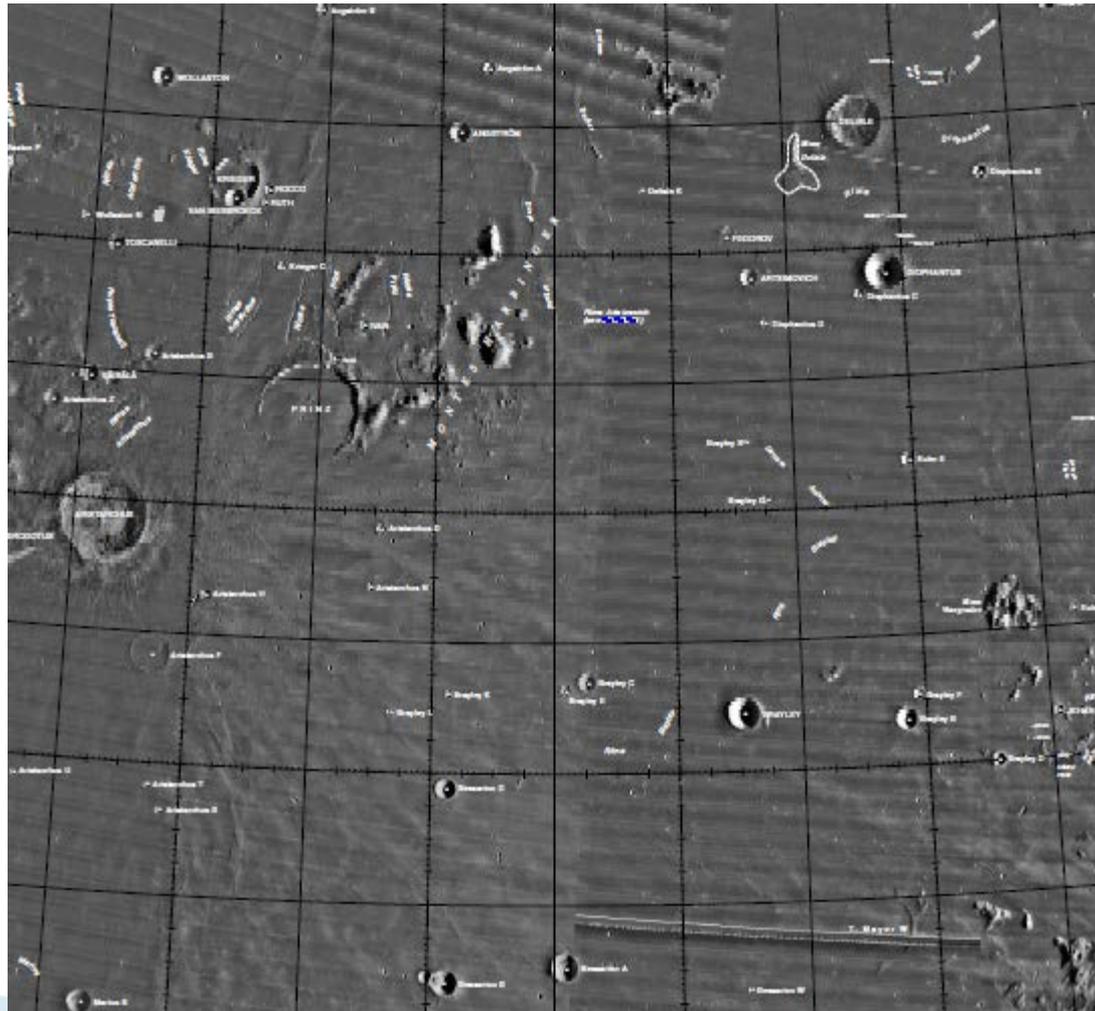
# Background

- ▶ International Astronomical Union (IAU) developed a naming convention for various topographic features, such as craters
- ▶ United States Geological Survey (USGS) records topographic data in a global and unified database

# Goal of the Project

- ▶ Map over 9,000 of the largest moon craters
    - Diameter ranging from less than 1km wide to 2,568 kilometers wide
  - ▶ Record the coordinates of the perimeters of those craters into a United States Geological Survey database
- 

# Current Map



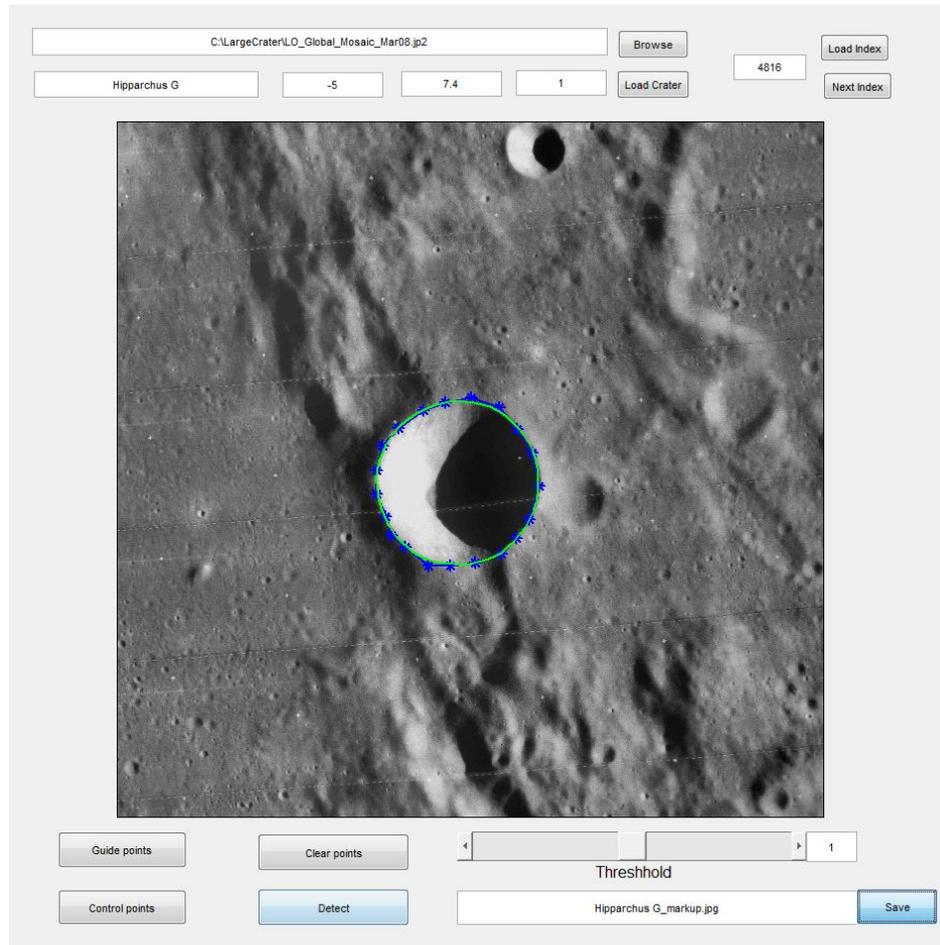
# Purpose of the Product

- Allow scientists to search for craters based on a crater's name, size, and location
  - Enable study of the moon on a global scale
    - Origins of moon and universe
  - Assist in landing site analysis process
- 

# My Responsibility

- ▶ View images of the craters and place points along the rims of those craters
    - Images taken from satellites
    - Sun helps to discern crater rim
  - ▶ Utilize algorithm in Matlab to create an approximation of crater rim
  - ▶ Save coordinates into database
- 

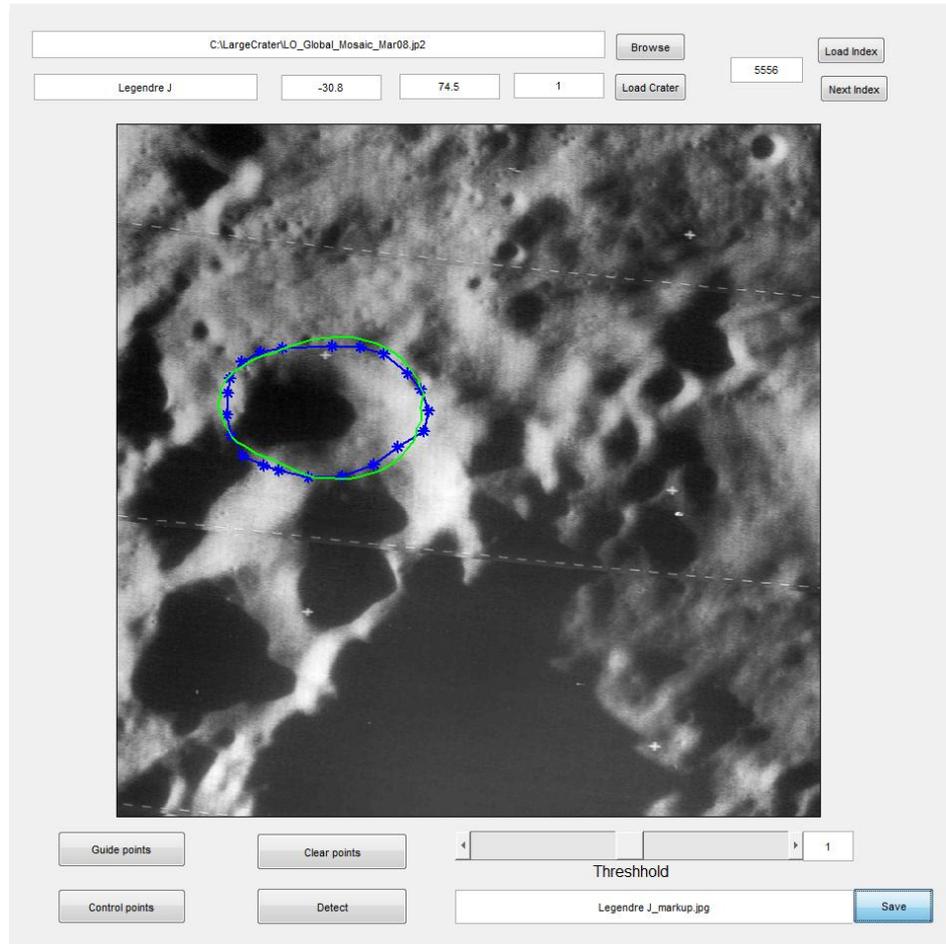
# Mapped Moon Crater: Hipparchus G



# Challenges

- ▶ Unclear which crater to choose
  - Craters have universalized names
  - Multiple craters in one image
- ▶ Unclear image
  - Blurry
  - Poor resolution

# Unclear Which Crater to Choose



# Unclear Image

C:\LargeCraterLO\_UVVISv2\_hybrid\_overlay50\_dd0\_ly.jp2

Browse

7818

Load Index

Schuster P

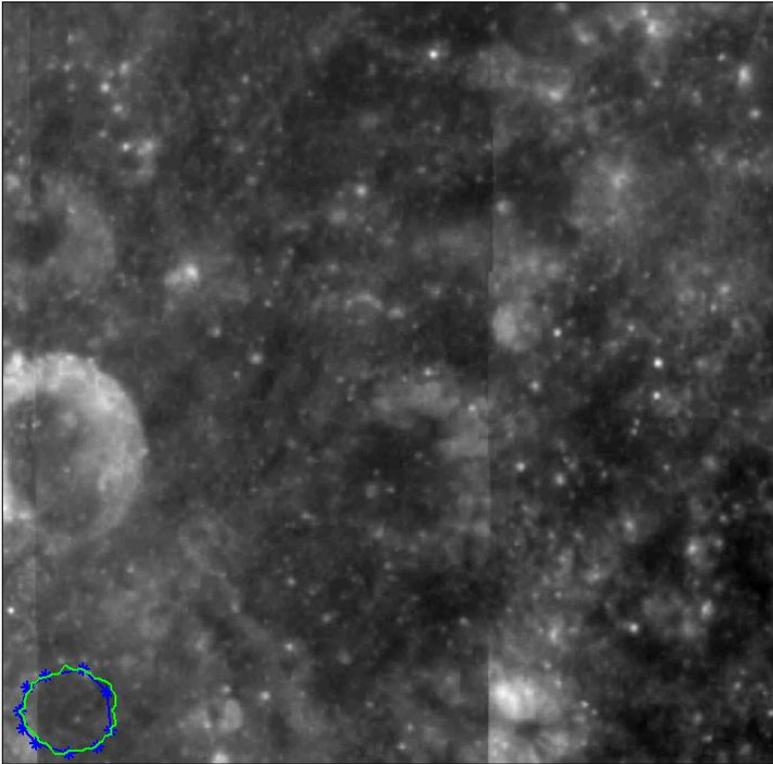
1.9

144.4

1

Load Crater

Next Index



Guide points

Clear points

Control points

Detect

Threshold

Schuster\_P\_markup.jpg

Save

1

# Overcoming the Challenges

- ▶ Make notes in excel spreadsheet
- ▶ If unclear which crater to choose, refer to landmarks and descriptions
- ▶ If unclear image, adjust satellite image
  - Change window size
  - Alter longitude and latitude coordinates
  - Change image

# Overview

- ▶ Previous intern mapped approximately 4,000 craters
  - ▶ I have mapped approximately 4,000 craters
  - ▶ Slightly under 1,000 craters remaining
- 

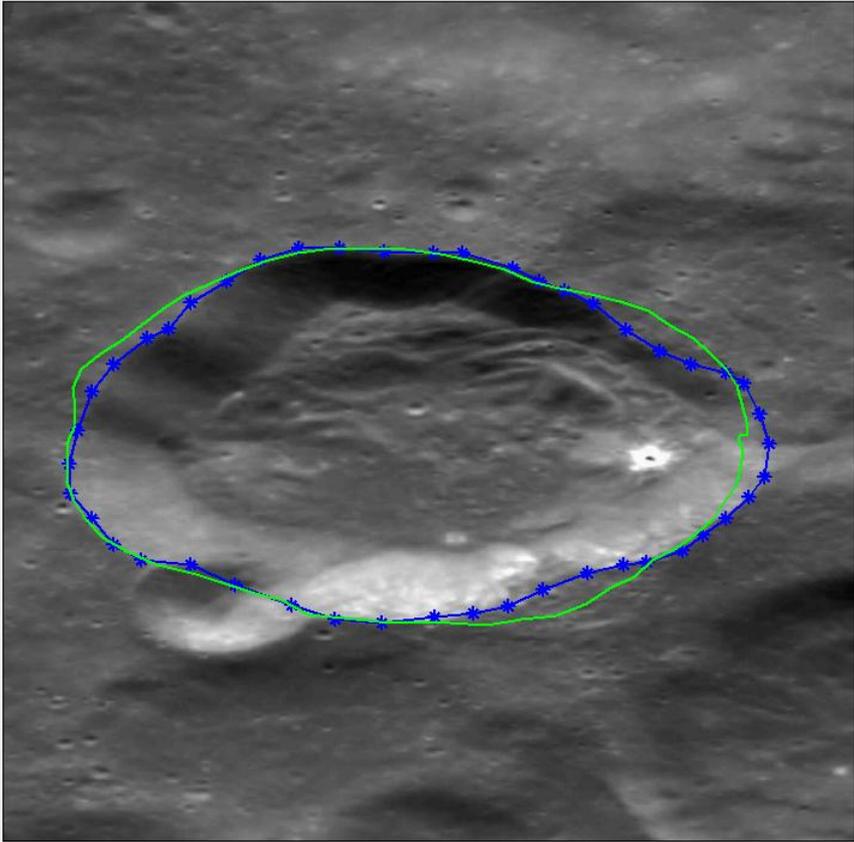
# Improving the Process

- ▶ There are automated methods to mapping smaller craters
- ▶ No automated method exists for mapping larger craters
  - Algorithm would need to take into account odd shape and unusual lighting of larger craters

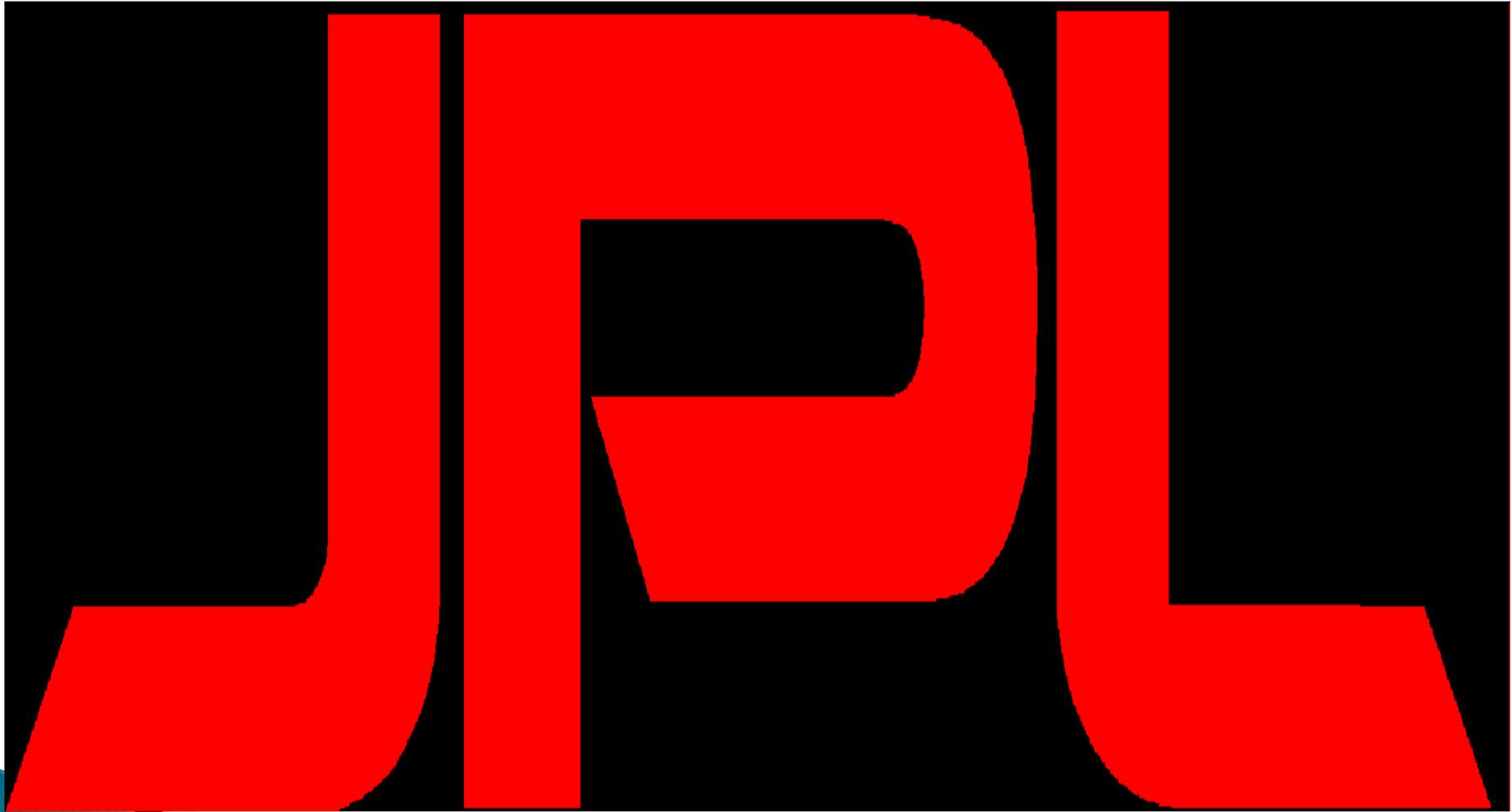
# Unusual Crater Shape

C:\LargeCrater\UVVIS\_Clementine\_Basemap\_v2\_ly.jp2

Hommel B



My Experience at



# Acknowledgements

- Mentors
  - Yang Cheng
  - Adnan Ansar
- SpaceSHIP Administrators
  - David Siedel
  - Jenny Tieu
  - Arpine Margaryan
  - Amy Dickinson
  - Ota Lutz