




ASTR 4800 - Space Science: Practice & Policy

Today: *Guest lecture by Dr. AJ Germer, start-up Colorado company Lunar Outpost.*

- **Next Class:** *Guest lecture by Prof. Fran Bagenal on the Juno Mission to Jupiter.*
- **Reading:** See Juno website linked to class webpage for Nov. 14.
- **Exam 2** on Nov. 16. Covers all readings, class lectures, & homework between Oct. 12 to Nov. 14. You may bring 1 page (front & back) of notes to the Exam.
- **Homework #3** is due on Monday.

Astronomy 4800 - Space Science: Practice & Policy


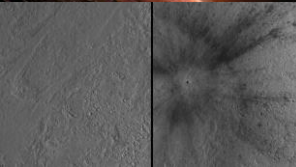
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Space in the News

Tom Chumash

- Magnitude 4 Marsquake from meteoroid 16-40 ft wide, creating crater about 490 ft wide
- One of the largest craters ever observed in real time
- Uncovered buried water ice near Martian equator

Class Discussion
Do you think that this discovery of water ice near the equator will change the way that we approach potential missions to Mars?

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Commercial Space Entrepreneurship


ASTR 4800 - Space Science: Practice and Policy
November 11th, 2022
AJ Germer, CTO



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Lunar Outpost creates fully autonomous robots and software for conquering extreme environments



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My Background

- Other speakers - "When you were 10, did you dream of being [fill in the blank]?"
 - Carpenter, race car driver, astronaut
 - When I was 16: "What do you think about dust in space?"
- Grew up in Green Bay, Wisconsin
- Middle & High School: not particularly focused on college prep
 - Motorcycle, tractor, boat mechanic
 - ASE-certified collision repair (auto body); competitions, etc.
 - Not much entrepreneurship; Various side hustles
 - Graduating class of 777; only 7 went out-of-state
 - Academic advisor discouraged both myself and Heidi
 - Did not consider myself good at math
- CU in 2006
 - Knew I wanted to do something with space, and with entrepreneurship
 - Was able to work on a Cubesat as a freshman that went to space
 - Made many great friends along the way - was always thinking in the back of my mind: who would I want to start a company with?
 - Taking risks, trying new things, not afraid to fail
 - Rocket made lab in ASEN 111L
- 2008: LMCO Engineering Entrepreneurship Management Program





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2006-10 -B.S. Aero
-LASP
-LM EELMP
-HELPS vehicle

2010-12 -M.S. MechE
-Medtronic
-CU NVC

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Now CTO, Lunar
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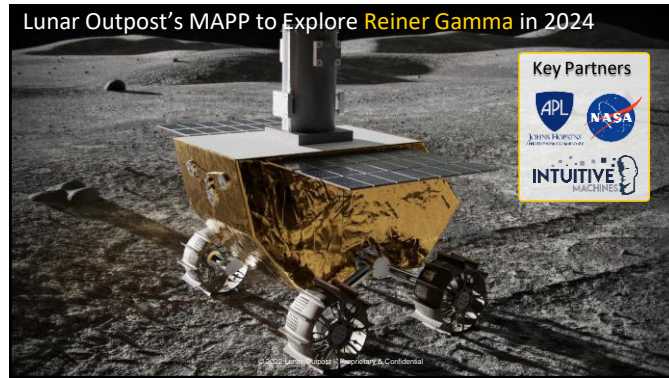
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Lunar Outpost's MAPP to be the first rover on the lunar south pole Q2 2023

Key Partners
NOKIA
INTUITIVE
MACHINE

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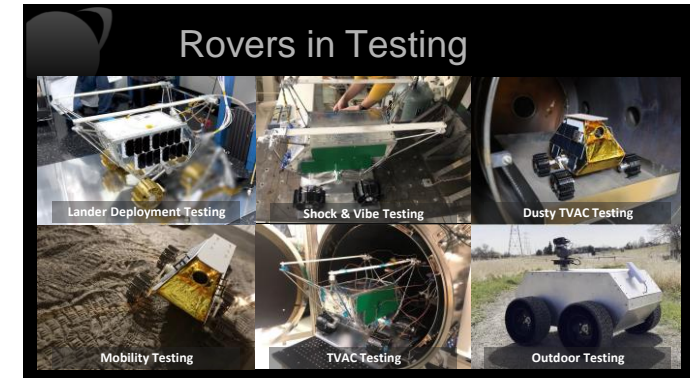


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Lunar Rover Lineup

	M1-MAPP	COLD-MAPP	Erebus	HL-MAPP
Bounding Envelope	435x483x350mm	435x483x350mm	1 x 1 x 1m	1.5x1.3x1.3m
Chassis Mass	5.5kg	12kg	67kg	200kg
Payload Mass	6.5kg	5kg	30kg	100kg
Total Mass	12kg	17kg	97kg	301kg
Peak Payload Power	35W	38W	150W	250W
Operational Lifespan	14 Earth Days	1+ Years	4+ Years	4+ Years
Lunar Night Survival	No	Yes	Yes	Yes
Temperature Range Survival	-70 C to +130 C	-230 C to +130C	-230 C to +130C	-230 C to +130C
Maximum Surface Speed	10cm/s	10cm/s	1 m/s	40cm/s
Flight Ready Date	Q2 2021	Q3 2022	Q1 2023	Q1 2023

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Lunar Outpost Expands



Startups raise millions for lunar rovers and asteroid mining



Lunar Outpost, testing the MARS rover on Earth, plans to use a landing rovers to support work on a larger rover. Credit: Lunar Outpost



Lunar Outpost EU Opens in Luxembourg




June 2, 2022 - Lunar Outpost Inc. is proud to announce that it has established a new European HQ in Luxembourg. The company is certified Lunar Outpost EU and will focus on cutting-edge thermal technologies complementary to its primary mobility and robotics platforms. For the MARS lunar rover, built and tested by Lunar Outpost in the United States.


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