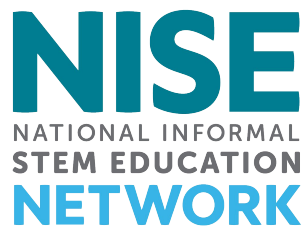


Earth & Space Project-Based Professional Learning Community



Bringing Perseverance to the Blind and Deaf Communities

Caitlin Ahrens, PhD

NASA, Goddard Space Flight Center

Recorded in April 2022 as part of the Earth & Space Project-Based Professional Learning Community Convening

Plenary Keynotes

Bringing Perseverance to the Blind and Deaf Communities



Caitlin Ahrens, PhD

Postdoctoral Fellow
NASA, Goddard Space Flight Center
Greenbelt, MD

CAITLIN AHRENS,
PH.D.
NASA
POSTDOCTORAL
PROGRAM FELLOW
NASA GSFC

Bringing Perseverance to the Blind and Deaf Communities





MARS
2020 ENTRY
DESCENT
LANDING

NASA's Eyes

PRE-LANDING SIMULATION



Swipe up for next phase

Cruise Stage Separation

2,203.89 miles from landing site.

Altitude: **970.12** miles

Velocity: **10,421.94** mph

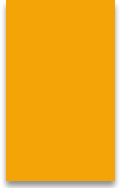
The spacecraft sheds the cruise stage, which houses the solar panels and fuel tanks.

Touchdown in **0:16:37**

De-Spin in 1:08



3/17/2021 Interview with Mr. Saylor,
Blind YouTuber and Game Designer Consultant



Q: *How did you “view” the Mars 2020 Landing Event?*

3/17/2021 Interview with Mr. Saylor,
Blind YouTuber and Game Designer Consultant



Q: How did you “view” the Mars 2020 Landing Event?

A: It was **amazing** to listen to for small bits of it. It took me a while to realize what was going on, though. I definitely knew what was going on during the 7-Minutes of Terror...

3/17/2021 Interview with Mr. Saylor,
Blind YouTuber and Game Designer Consultant



Q: How did you “view” the Mars 2020 Landing Event?

A: It was **amazing** to listen to for small bits of it. It took me a while to realize what was going on, though. I definitely knew what was going on during the 7-Minutes of Terror...

But you know what would be cool? **I should be able to **feel** the experience.** Like radio dramas or sports commentaries over the radio. **Audio for the imagination. Like StarTalk-esque podcasts.**




NASA blind deaf resources



 All

 News

 Images

 Videos

 Shopping

 More

Tools



NASA blind deaf resources



All



News



Images



Videos



Shopping



More

Tools

About 1,600,000 results (0.52 seconds)

https://www.nasa.gov/foreducators/features/F_NA...

NASA Dedicated to Students With Disabilities

Oct 28, 2004 — The **NASA** educational community recognizes the need for the development of educational **resources** for those who teach students with disabilities.

<https://www.nasa.gov/news/features/deafblindcamp>

A Tactile Tour of Goddard | NASA


Jun 13, 2013 — Some 100 campers from the **Deaf-Blind** Camp of Maryland visited Goddard on June 12 to learn about **NASA** with a variety of hands-on activities.

<https://www.nasa.gov/press-release/students-to-sign-...>

Students to Sign and Speak to NASA, ESA Astronauts in Orbit

May 17, 2021 — Space-savvy students from across the nation who are **deaf, blind**, hearing and **visually impaired** and their mentors will have a unique ...

Missing: **resources** | Must include: **resources**



CORE also offers a list of open and closed captioned products for the hearing impaired. Topics include Space Science, Mathematics, NASA CONNECT™ shows for grades 6-8, NASA Science Files™ shows for grades 3-5, Destination Tomorrow™ videos for adults, the Liftoff to Learning video series and many other titles. Visit this section of CORE's Web site for the list of open and closed captioned products:

[+ View site](#)

CORE's collection of materials also includes videos that use descriptive audio for the sight impaired. Audience levels range from third grade to the adult learner. That collection is available at:

[+ View site](#)



This site can't be reached

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+ [View site](#)

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+ [View site](#)

Central Operation of Resources for Educators

June 30, 2013

The NASA-sponsored Central Operation of Resources for Educators (CORE) has closed. CORE was operated through a cooperative agreement with Lorain County Joint Vocational School in Oberlin, Ohio. The cooperative agreement, which provided funding for CORE, ended on June 30, 2013.

A wide variety of NASA educational materials, video clips, and links to other NASA educational websites can be found using the NASA education materials finder: <http://www.nasa.gov/education/materials>.

[Topics](#)[Missions](#)[Galleries](#)[NASA TV](#)[Follow NASA](#)[Downloads](#)[About](#)[NASA Audiences](#)[K-12 Educators](#)[Colleges and Universities](#)[Informal Education](#)[NASA STEM Engagement](#)Browse Topics For: [Students](#) ▾[Educators](#) ▾

Opportunities

[Contests and Challenges](#)[Internships and Fellowships](#)[Citizen Science](#)[International Participation](#)[Lectures and Webcasts](#)[Exhibits and Museums](#)

Grade Level

[K-4](#)[5-8](#)[9-12](#)[Higher Education](#)[Informal Education](#)

Types

[Lesson Plans/Activities](#)[Educator Guides](#)[Play and Learn](#)[Videos](#)[Interactive Multimedia](#)[Posters](#)[Mobile Apps](#)[Image Galleries](#)[Websites](#)

Subjects

[Careers](#)[Earth Science](#)[Engineering Design](#)[History](#)[Life Science](#)[Mathematics](#)[Physical Science](#)[Space Science](#)[Spanish](#)[Technology](#)[View All Educator Resources](#)

LUNAR

Interviews

- ▶ WV educator for blind/deaf and WV State Commission of the Deaf and HoH member: **“Braille books are super expensive and bulky.** There are books out there, but **not easily accessible.** Needs to be more accessible and verbal/captioned resources. **We make our own resources on very little budgets and time.”**
- ▶ Deaf/HoH educator: “The podcasts/YouTube on the JPL site [Perseverance] are great with captions and transcripts, but **very engineering jargon-heavy.**”
- ▶ Dr. Moore, NASA Marshall Space Flight Center: **“There’s potential for 3D printing** and large-print posters. And we **need more video captioning** and alt-descriptions in videos.”

What exists today?

- ▶ SCIVIS : Space Camp for Interested Visually Impaired Students
- ▶ SSERVI Center for Lunar and Asteroid Surface Science tactile books (C. Runyon, UCF)
 - ▶ *(need more resources and time)*

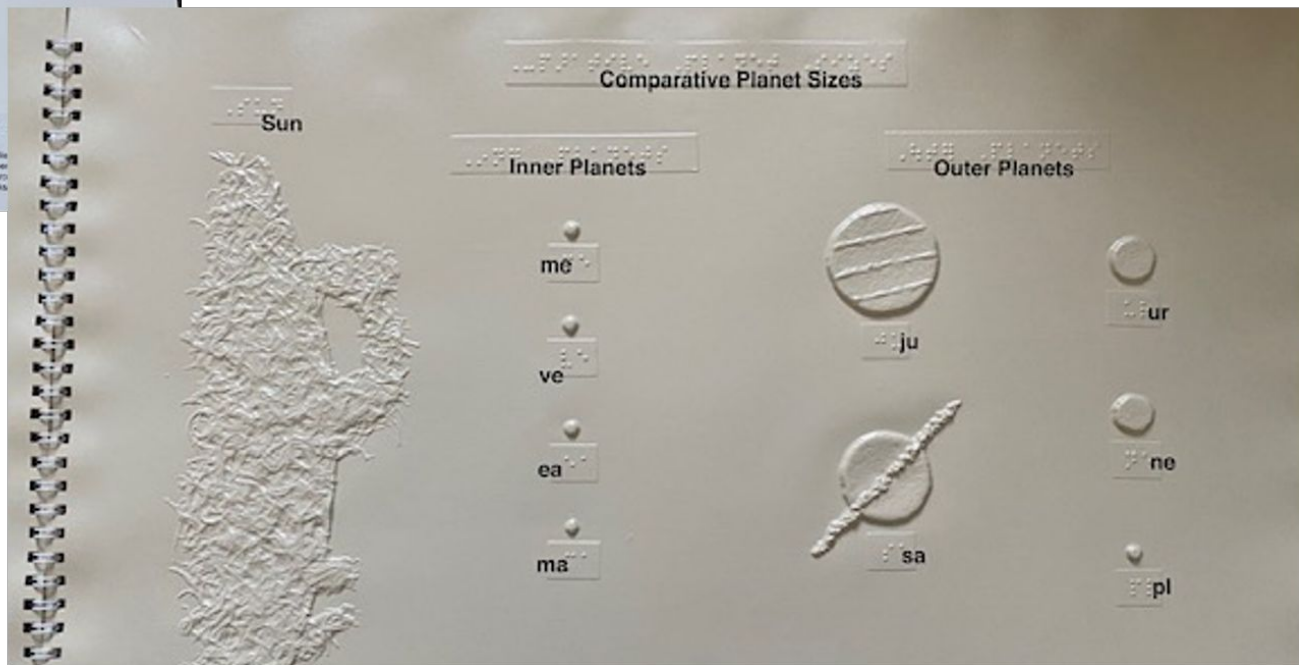


A Tactile Guide to the Solar System

SP-2020-03-02-ARC

www.nasa.gov

To access an audio file
description, and other
formats, scan the bar:
eservi.nasa.gov/books



Getting a Feel for Lunar Craters: Apollo 50th Commemorative Edition A Tactile View



Image: NASA AS1140-5878

SP-2019-07-02-ARC

To access an audio file, text descriptions and other resources
in multiple formats, scan the barcode to the right or visit:
<https://sservi.nasa.gov/books/>



To access an audio file, text descriptions and other resources
in multiple formats, scan the barcode to the right or visit:
<https://sservi.nasa.gov/books/>



Tactile 2 Tycho
1 cm = 8 km





Update on the PUNCH Outreach Program

Cherilynn Morrow, Consultant - Southwest Research Institute

NASA approved the 5-year PUNCH Outreach Program (POP) in late January 2021. The Heliophysics Division has publicly praised the submitted plan as a model for mission-embedded outreach. Parker Solar Probe is leveraging PUNCH Outreach by contributing resources for a short planetarium film and **for the development of tactile representations** of NASA heliophysics data. These and other enduring POP products and events will involve the close collaboration of the PUNCH and Parker outreach teams with mission scientists.

Eclipse Soundscapes: Citizen Science Project

What does your team hope to achieve?

- **Enrich the Science Activation ecosystem by developing and documenting blind and low vision (BLV) best practices, training the NASA SMEs involved in this project to utilize these best practices, and sharing out best practices.**

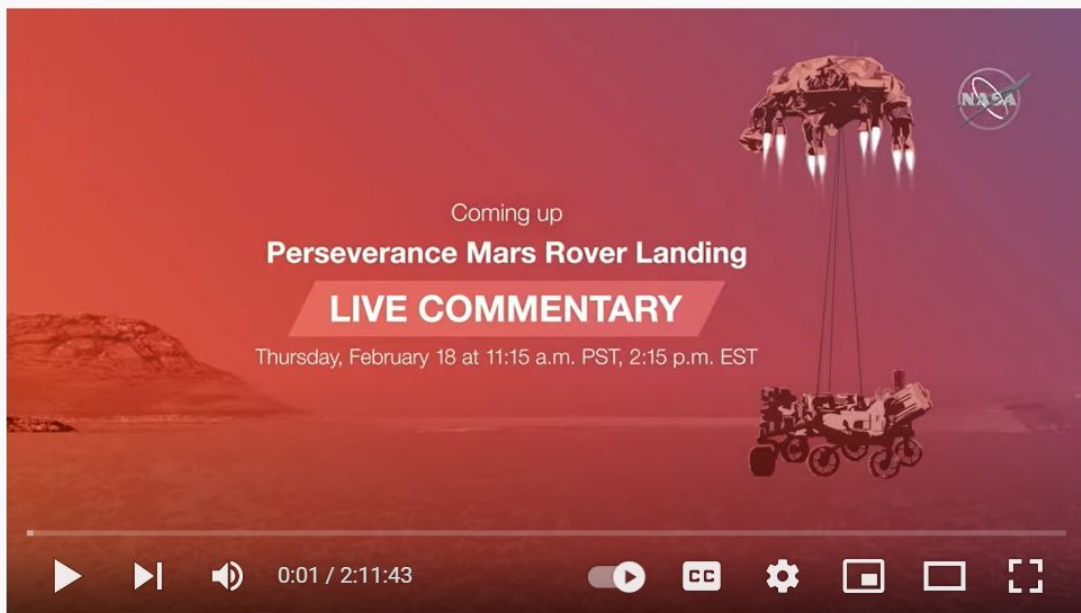
Listen to Audio From Perseverance



Listen to NASA's Ingenuity Mars Helicopter in Flight

May 7, 2021

For the first time, a spacecraft on another planet has recorded the sounds of a separate spacecraft. NASA's Perseverance Mars rover used its SuperCam



Watch NASA's Perseverance Rover Land on Mars!

Transcript

- 00:55 as the countdown to mars continues
- 00:57 the perseverance of humanity launching
- 00:59 the next generation of robotic explorers
- 01:01 to the red planet
- 01:43 welcome to nasa's jet propulsion
- 01:45 laboratory in
- 01:46 southern california we are gearing up
- 01:48 for nasa's perseverance rover to touch

English (auto-generated)

Welcome to International Observe the Moon Night, a global celebration of our Earth's natural satellite and to honor the cultural, personal, and exploratory connections to the Moon.

International Observe the Moon Night



NASA International Observe the Moon Night (Blind and Deaf Accessible)

Transcript



- 00:01 Welcome to International Observe the Moon Night, a global celebration of our Earth's
- 00:06 natural satellite and to honor the cultural, personal, and exploratory connections to the
- 00:12 Moon.
- 00:15 International Observe the Moon Night occurs annually in September or October, when the
- 00:21 Moon is around first quarter, which is when the Moon phase is only half lit from the reflection
- 00:27 of sunlight.

Welcome to International Observe the Moon Night, a global celebration of our Earth's natural satellite and to honor the cultural, personal, and exploratory connections to the Moon.

International Observe the Moon Night



NASA International Observe the Moon Night (Blind and Deaf Accessible)

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- 00:15 International Observe the Moon Night occurs annually in September or October, when the
- 00:21 Moon is around first quarter, which is when the Moon phase is only half lit from the reflection
- 00:27 of sunlight.

Visual images

Audio

Accessible

Short

Captioned

Transcript

Non-jargon

Descriptive Transcript

What's Next?

- ▶ **Perseverance Entry, Descent, Landing & Jezero Crater YouTube video “test” to group of volunteer educators**
- ▶ Feedback to help shape what's missing, improve transcripts/audio-visuals
- ▶ “Descriptive audio” videos to describe the EDL, Rover, Jezero crater
- ▶ Use this as a “**template**” for other projects/missions
 - ▶ Dragonfly Team is already interested. Potential for Artemis missions.
 - ▶ Dedicated YouTube section on NASA YouTube Page?
- ▶ ***Deaf, HoH, Blind resources page on NASA STEM Engagement website?***

Plenary Keynotes

Improving Diversity, Equity, and Inclusion in Space Science



Derrick Pitts, Sc.D.

Chief Astronomer
The Franklin Institute
Philadelphia, PA

The background is a deep blue gradient with a subtle pattern of white stars. Overlaid on the left side are several concentric circles and a large circular scale with degree markings from 140 to 260. Some circles have arrows indicating a clockwise direction, while others are dashed. The overall aesthetic is technical and futuristic.

AD ASTRA

PATHWAYS TO GREATNESS

NISE NET APRIL CONVENING

DERRICK PITTS

THE FRANKLIN INSTITUTE

DERRICK H. PITTS, Sc.D.

Astronomer, Space
Scientist, NASA Solar
System and
Astrobiology
Ambassador, Advisor -
world's largest
telescope, National
radio Astronomy
Observatories; Science
Communicator





ENDLESSLY
FASCINATING





STUNNINGLY
BEAUTIFUL





MYSTERIES WE CAN
UNRAVEL TO
UNDERSTAND THE
UNIVERSE



GUION S. BLUFORD, JR.

5522 Media Street Ac.
S.A., A.A., Captain of Chess Team,
Delegate, Ping Pong Team, Teacher's
Aide, Science Club, Record Book Staff,
Alternate.

Puzzles, girls and athletics rate high
on "Bunny's" special likes . . . if not
playing chess or ping pong he can be
found in the refrigerator . . . hopes to
become an aeronautical engineer.



DID YOU KNOW?

THIS IS
EMORY CONRAD MALICK,
A Native Philadelphian!

FIRST LICENSED
AFRICAN-AMERICAN PILOT –
1912!



FIRST LICENSED AFRICAN-AMERICAN PILOT
F.A.I. LICENSE #105
MARCH 20, 1912

FIRST AVIATOR TO FLY OVER
NORTHUMBERLAND AND SNYDER COUNTIES
PENNSYLVANIA

FIRST AFRICAN-AMERICAN PILOT TO EARN A
FEDERAL AIRLINE TRANSPORT LICENSE
FEDERAL TRANSPORT LICENSE #1716
APRIL 30, 1927



BLACK MILITARY AVIATORS, 1945

Far Left, Top Row, Dr.
Eugene Richardson



ROBERT LAWRENCE, SR.,
ASTRONAUT CANDIDATE.





'HIDDEN FIGURE'
KATHRYN JOHNSON,
NASA
MATHEMATICIAN





CHARLIE
BOLDEN,
STS
Commander
and NASA
Administrator
under Pres.
Obama





LELAND MELVIN,
EX-NFL STAR!





STEPHANIE
WILSON, more
hours in space
than any other
African-American
female astronaut.



Victor Glover –

Representative of
the new vanguard
of space explorers.













12 Principles of Green Chemistry

Anastas & Warner

1. **Prevention**
Do the job right the first time to avoid generating waste.
2. **Atom Economy**
Design syntheses to maximize the incorporation of all materials used in the process into the final product.
3. **Less Hazardous Synthesis**
Use the least hazardous substances and conditions possible.
4. **Design for Safer Chemicals**
Design products to be effective while being as non-toxic as possible.
5. **Renewable Feedstocks**
What is the lifecycle of this product or process, and could I use materials that are renewable?
6. **Reduce Derivatives**
Have I reduced waste as much as possible in this product or process?
7. **Catalysis**
Have I used a renewable catalyst to create a product or process rather than a toxic chemical?
8. **Design for Degradation**
Am I designing a product that will biodegrade in the environment after its useful life?
9. **Real-Time Analysis**
What plan do I have in place to constantly monitor my process and make sure I am doing it in the best way possible?
10. **Accident Prevention**
Have I designed a process and product that reduces the possibility of accidents occurring when workers might be making it in a manufacturing facility?

enDesign.org

PACTS





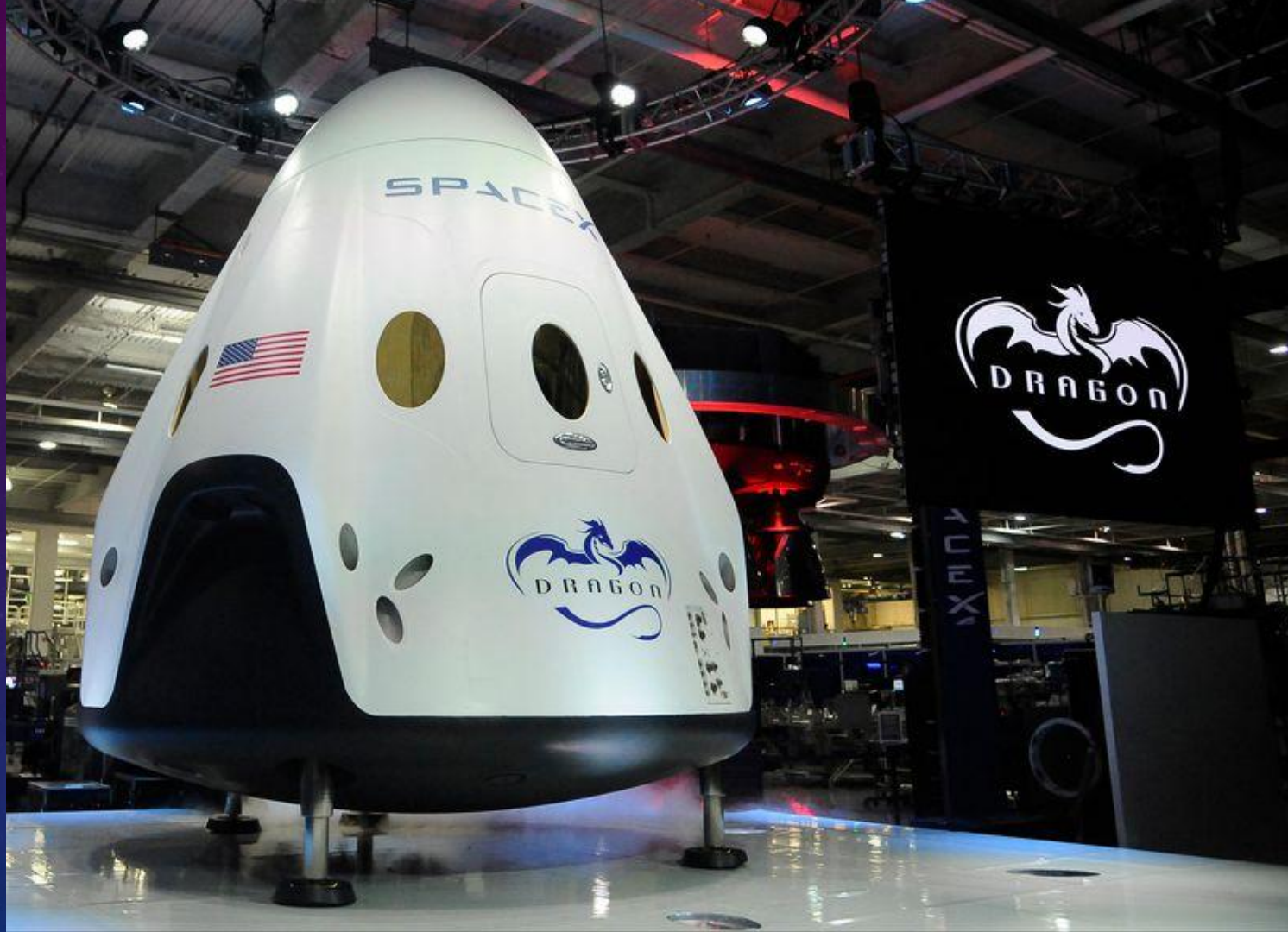
International Space Station – Dominating the NEO since
2000



Orbital Correction Yesterday – Nov. 12

Second Generation - SpaceX

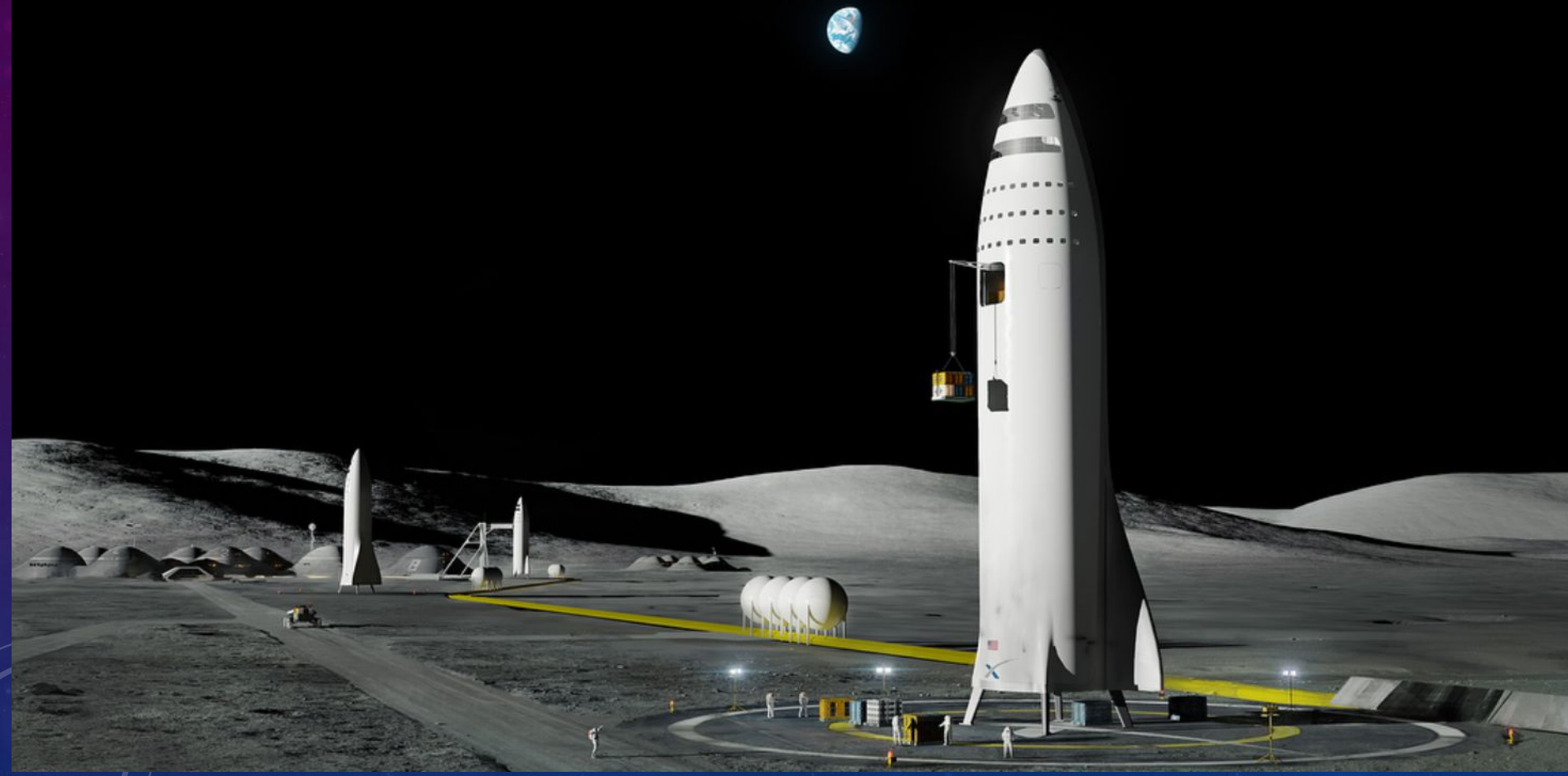


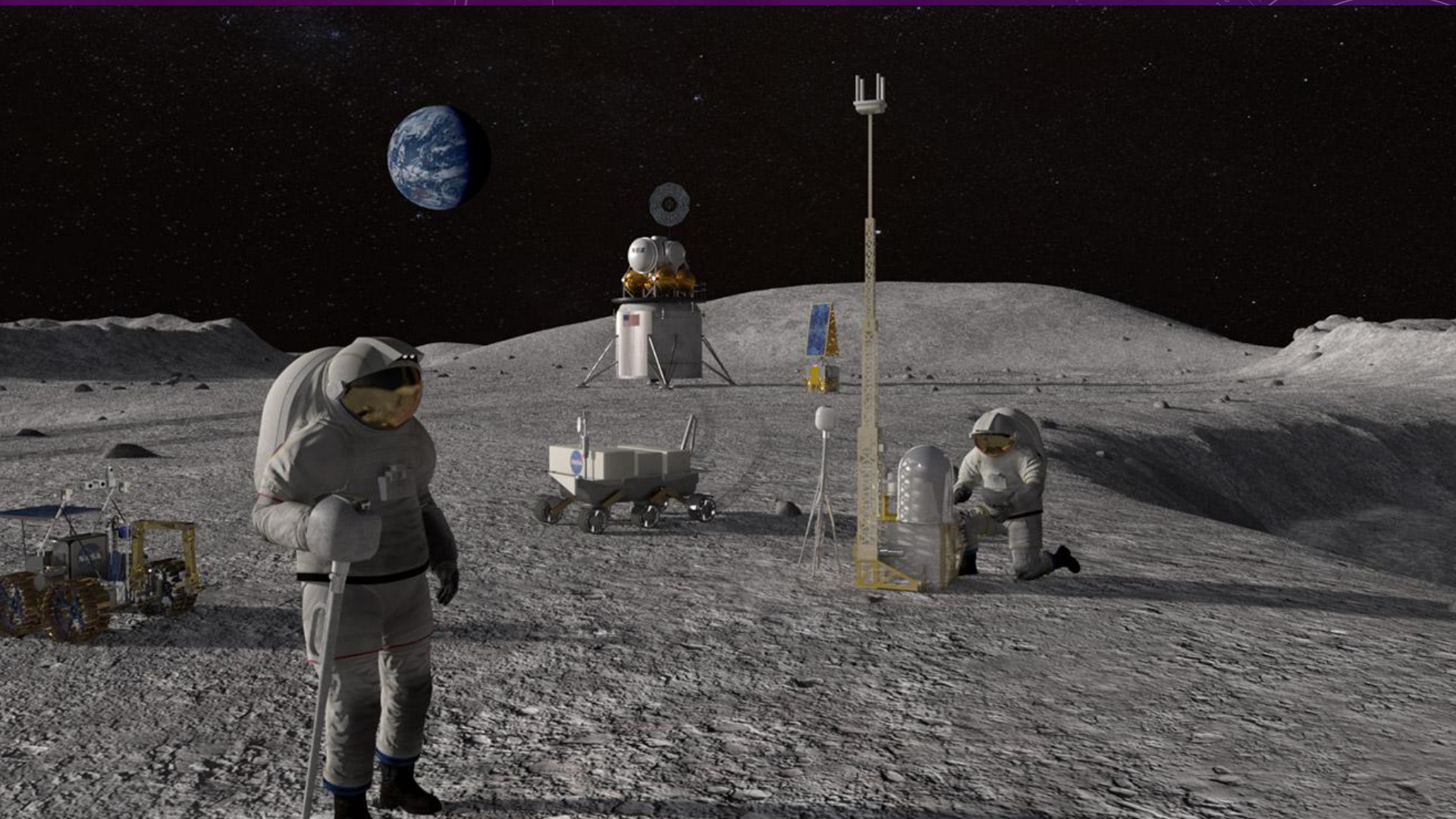


Crew Dragon Interior



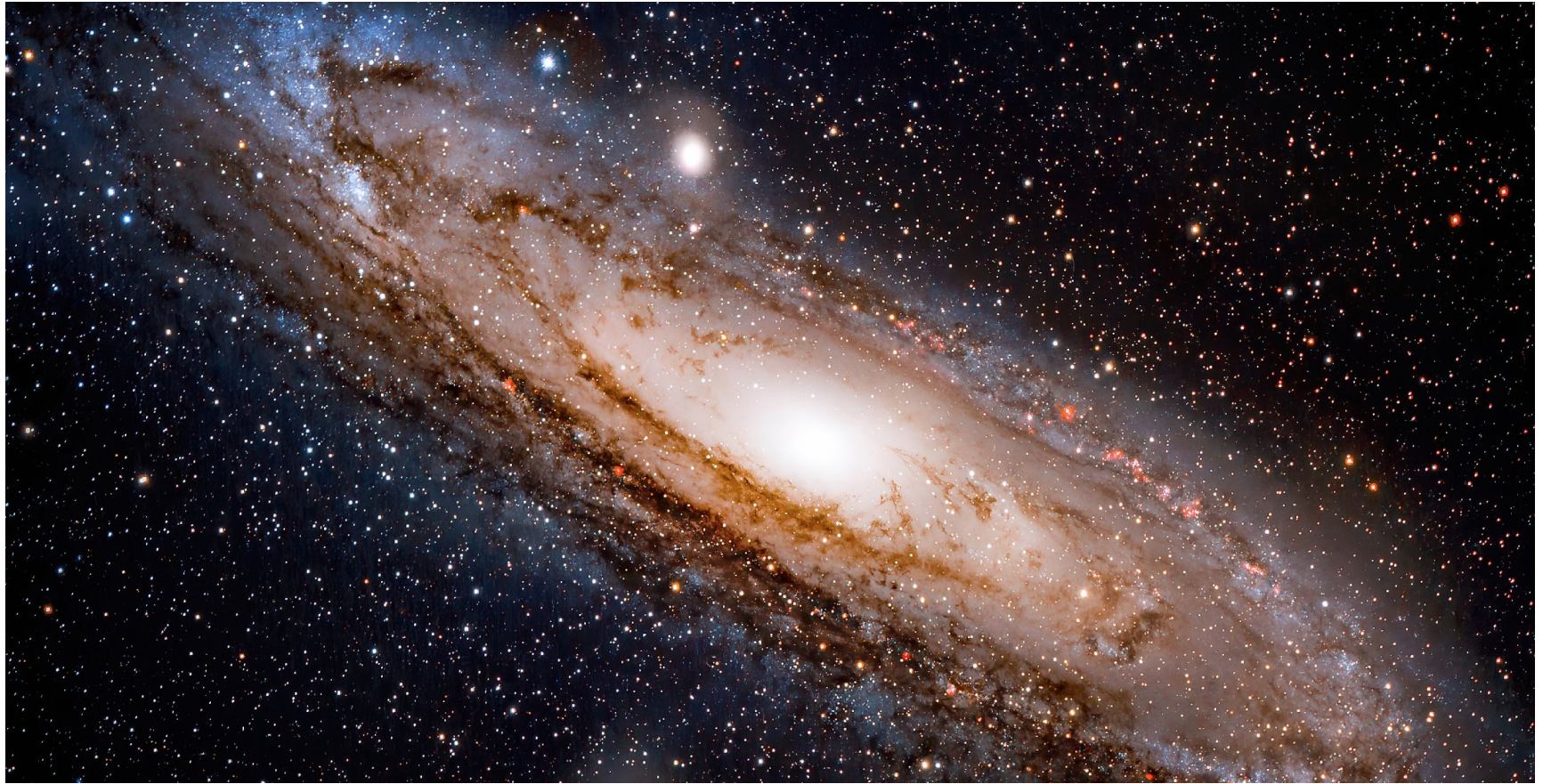
STARSHIP LUNAR BASE CAPABILITY





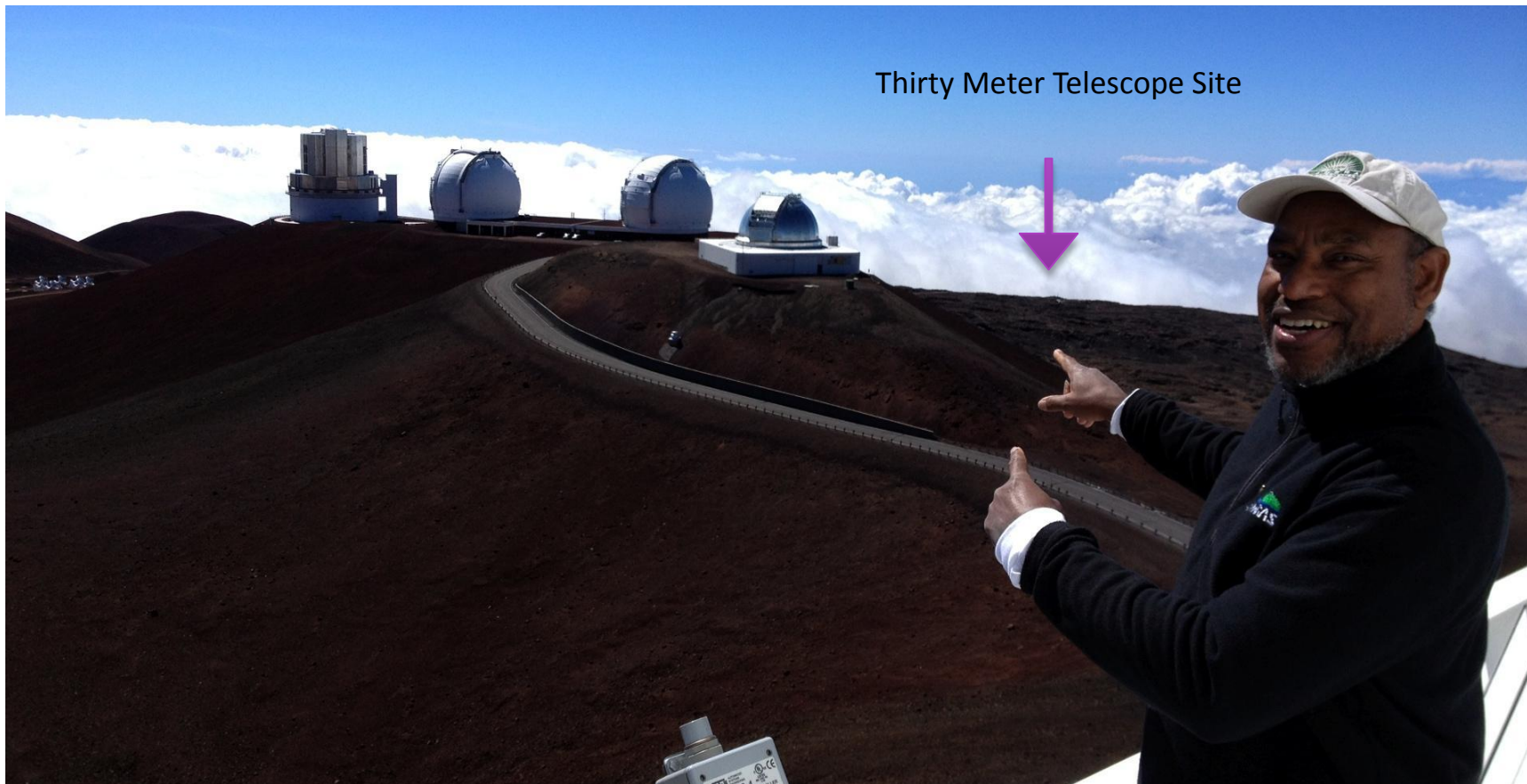
AND...YOU
GUESSED
IT...MARS BASE
CAPABILITY







Thirty Meter Telescope Site





EXPLORE HUMANS *in* SPACE

Leading Discovery, Improving Life on Earth



Thank You

