

RETH



Resilient ExtraTerrestrial Habitats

Antonio Bobet ▶

Professor,
Civil Engineering

Shirley Dyke ▶

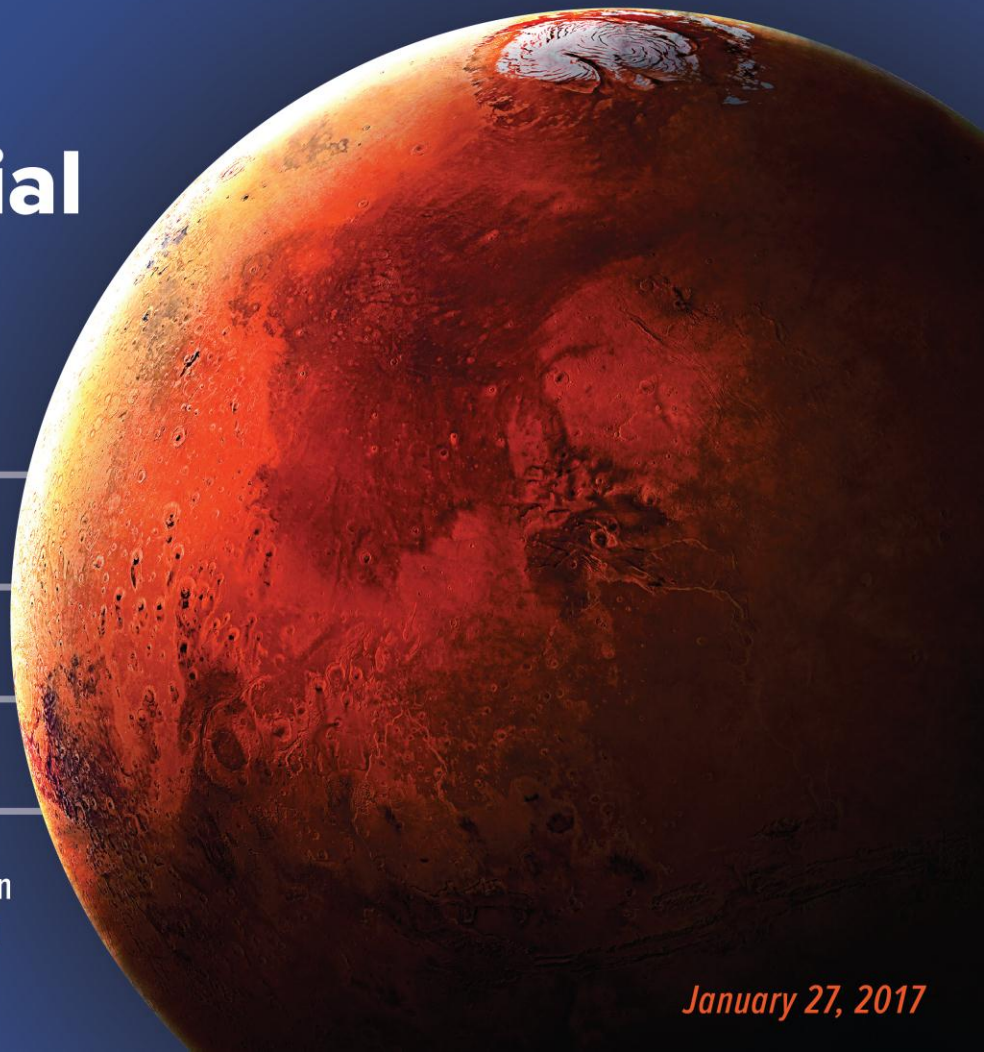
Professor,
Mechanical and Civil Engineering

Jay Melosh ▶

Distinguished Professor,
Earth, Atmospheric and Planetary Sciences

Julio Ramirez ▶

Professor, Civil Engineering,
Center Director of the Network Coordination
Office for the National Hazards Engineering
Research Infrastructure



January 27, 2017



Antonio Bobet
Professor,
Civil
Engineering



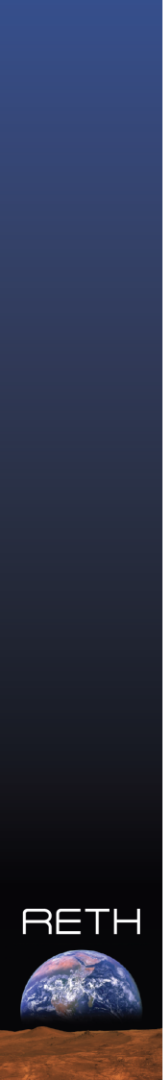
Jay Melosh
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Professor,
Civil Engineering
Director NCO, NHERI



The final frontier...



(<https://www.youtube.com/watch?v=BT49AiYFV98>)

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We are already there!

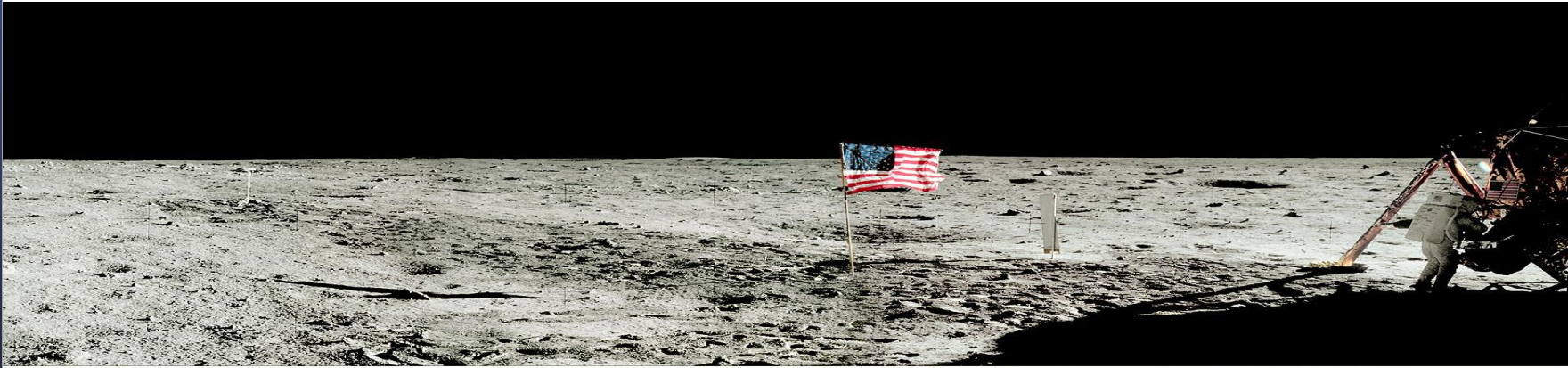


(nasa.gov)



We are already there!

(Apollo 11, nasa.gov)



(Apollo 17, nasa.gov)

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RETH



We are already there!



(nasa.gov)

We are already there!



(nasa.gov)

Slide 7

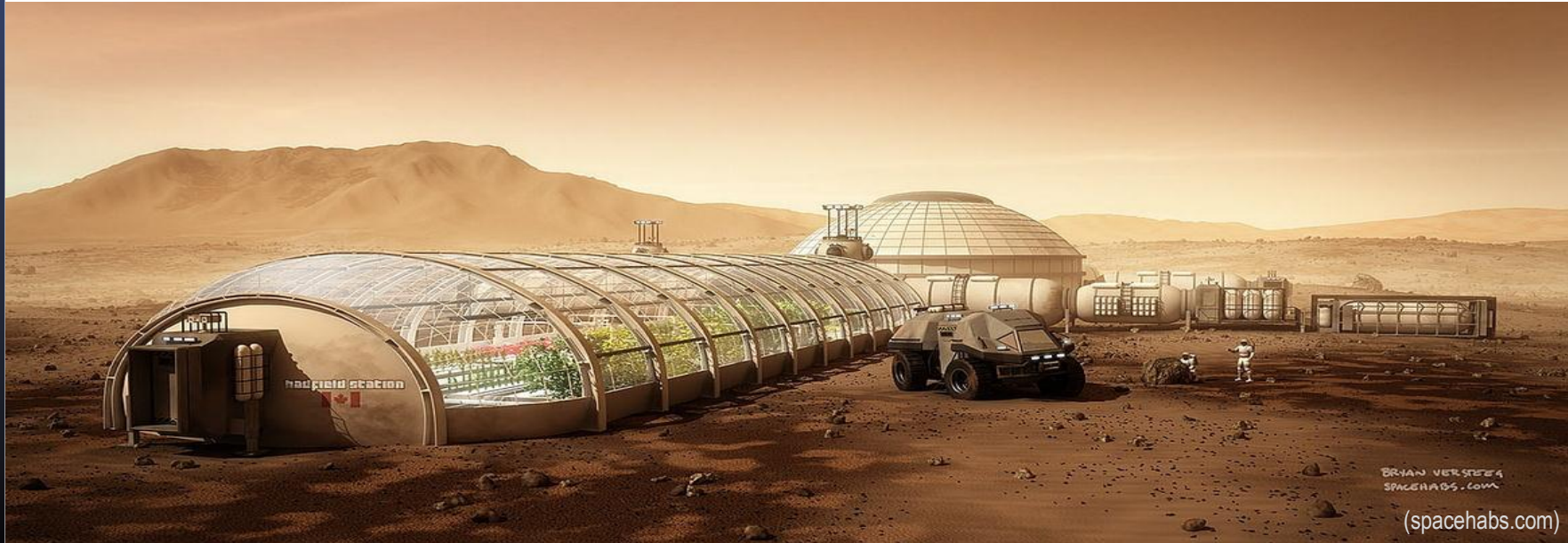
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Resilient ExtraTerrestrial Habitats

And now... what lies ahead?

Our Vision...



... We need the Science & Engineering

Resilient ExtraTerrestrial Habitats

Slide 8



Extraterrestrial Habitat Engineering

- Grand Challenges
- Opportunities
- Get Involved



Relationship between organisms, their habitat & non-Earth environment

Biosphere

- Organisms and their habitat fully isolated from the environment

Terraforming

- Changing the environment to become a life-friendly habitat

Genetic Engineering

- Changing organisms to become more compatible with the environment



The surfaces of the Moon and Mars are extremely hostile for humans



- Little or no air
- Cosmic radiation

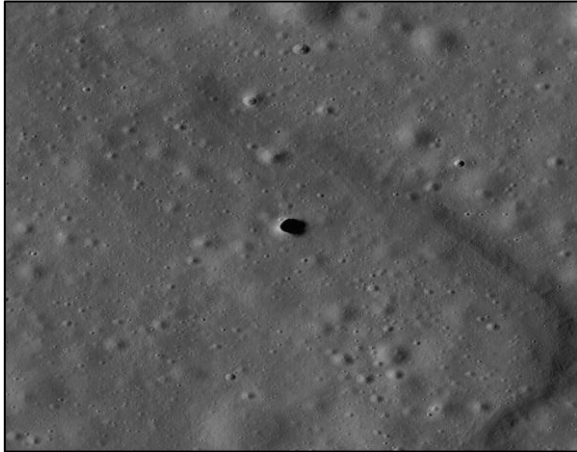
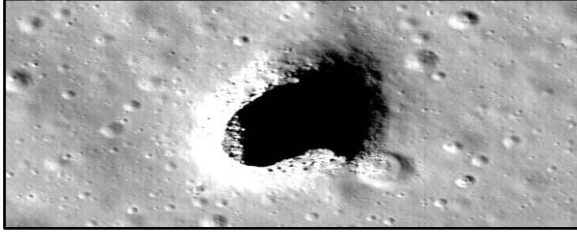


- Meteorite impacts, direct and secondary
- Extreme temperature variations



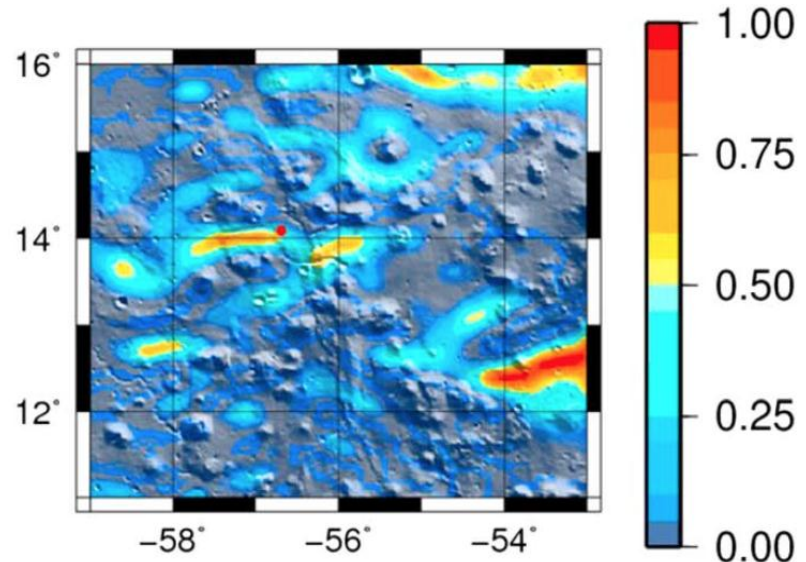
Purdue Discovery!

Large lava tubes on the Moon

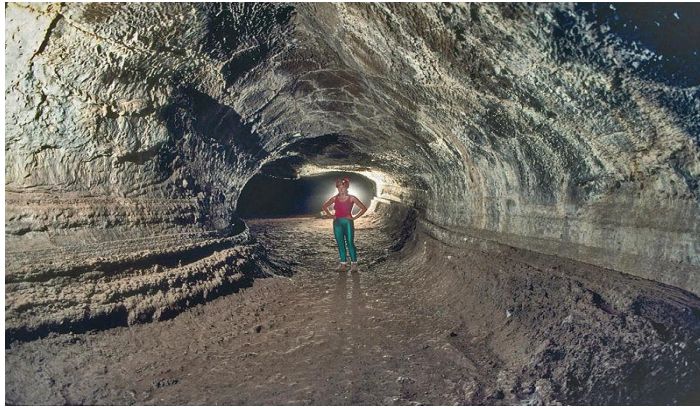


GRAIL Players from AAE and EAPS:

Rohan Sood, Loic Chappaz, Jay Melosh, Kathleen Howell, David Blair, Colleen Milbury

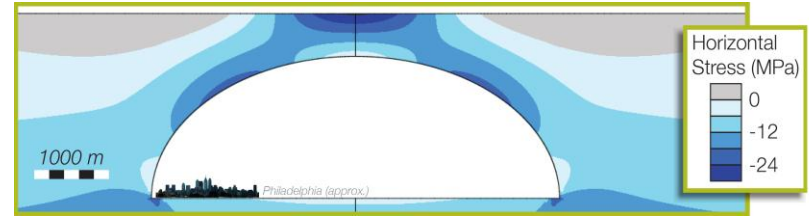


Terrestrial lava tubes are small, but we found evidence for much larger cavities beneath the Moon's surface



<http://tetrahedral.blogspot.com/2011/04/craters-of-moon-lava-tubes-in-idaho.html>

Earthly lava tube: Respectable size, but nowhere near what we infer for the Moon!



Blair, Chappaz, Sood, Milbury, Bobet, Melosh, Howell, Freed, LPSC 2015

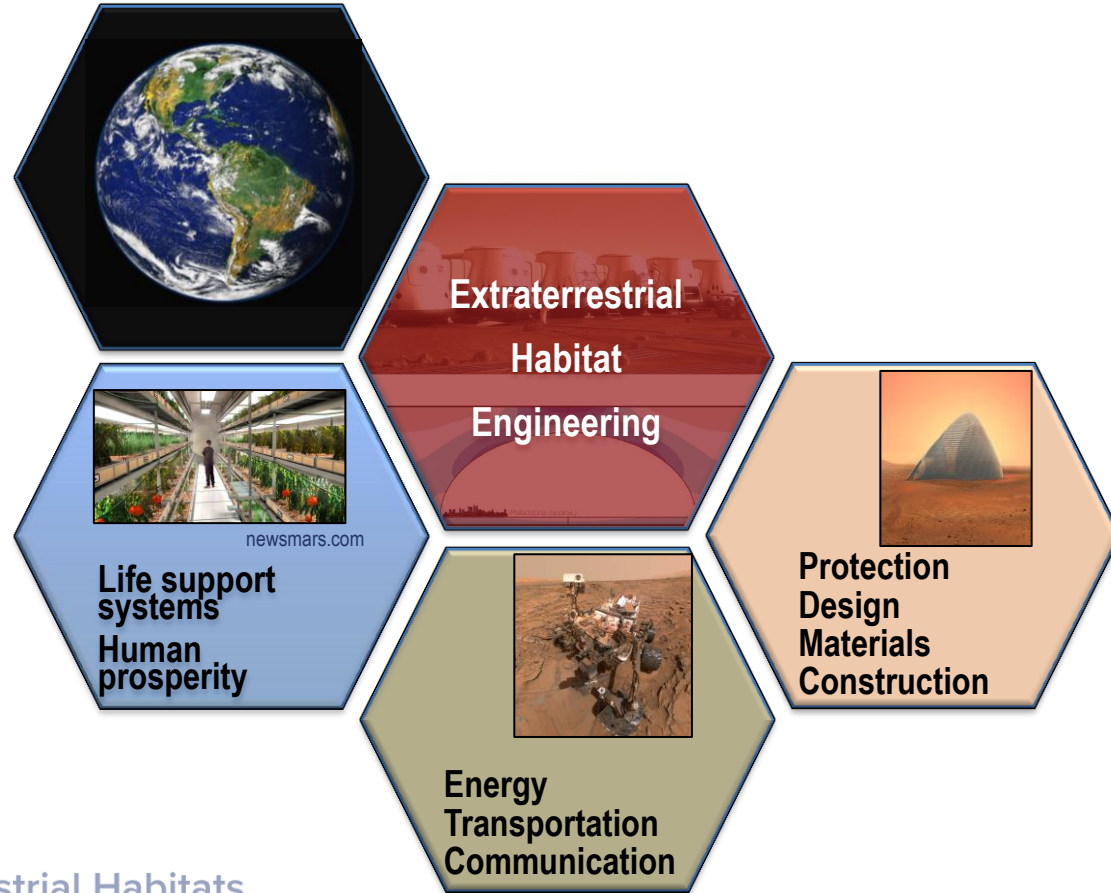


http://archive.wired.com/news/images/full/s114_f.jpg

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Grand Challenges & Technologies

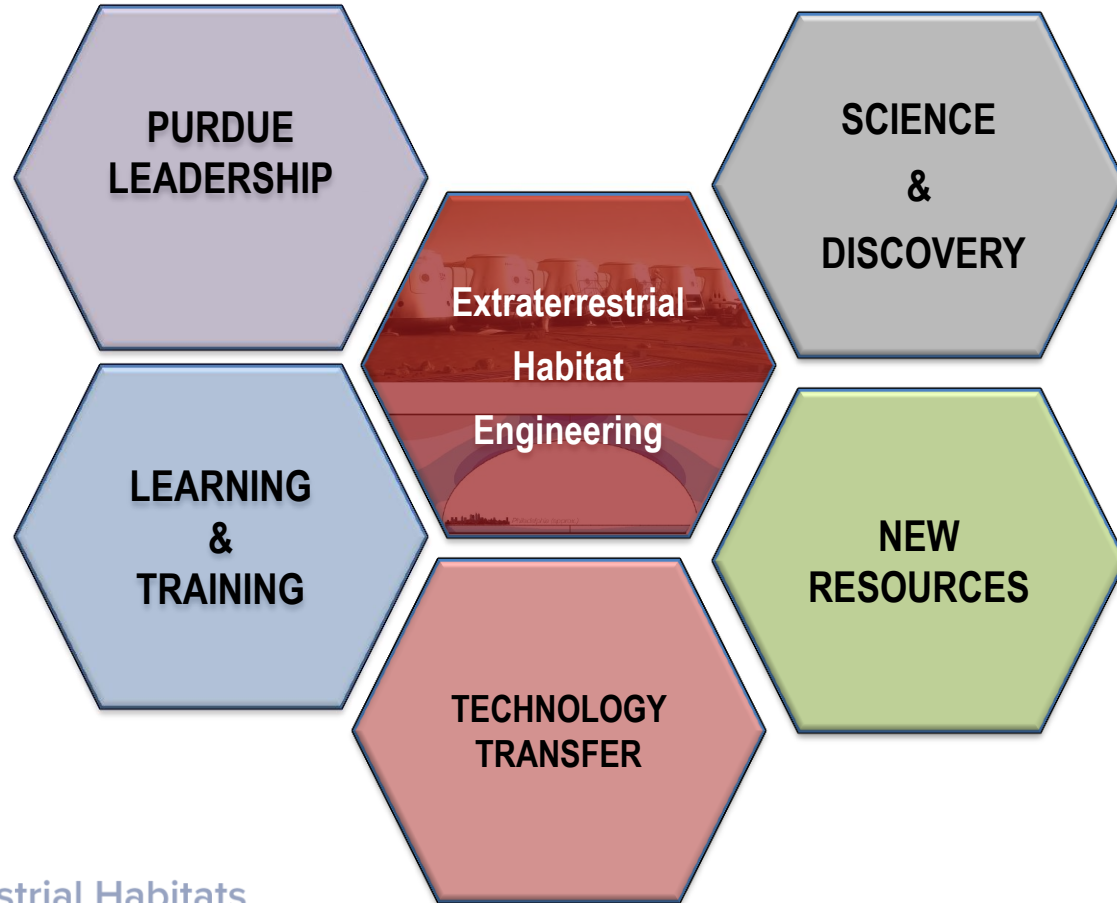


Extraterrestrial Habitat Engineering

- Grand Challenges
- **Opportunities**
- Get Involved



Opportunities



Startup companies are already planning to mine the Moon and asteroids:

Our program will create the expertise and train the men and women who will find jobs in this new industry



http://www.esa.int/var/esa/storage/images/esa_multimedia/images/2013/01/multi-dome_base_being_constructed2/12506598-1-eng-GB/Multi-dome_base_being_constructed.jpg



http://www.explainingthefuture.com/images/asteroid_base_480x270.jpg

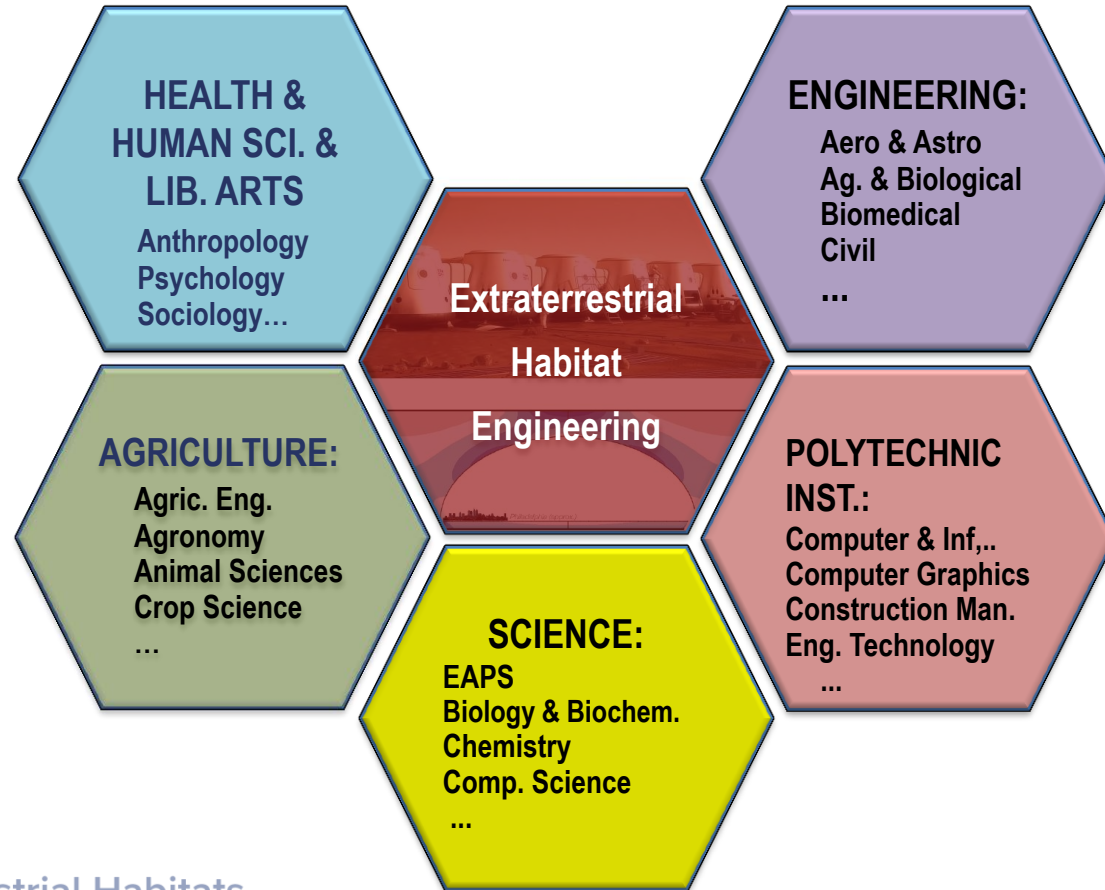


Extraterrestrial Habitat Engineering

- Grand Challenges
- Opportunities
- **Get Involved**



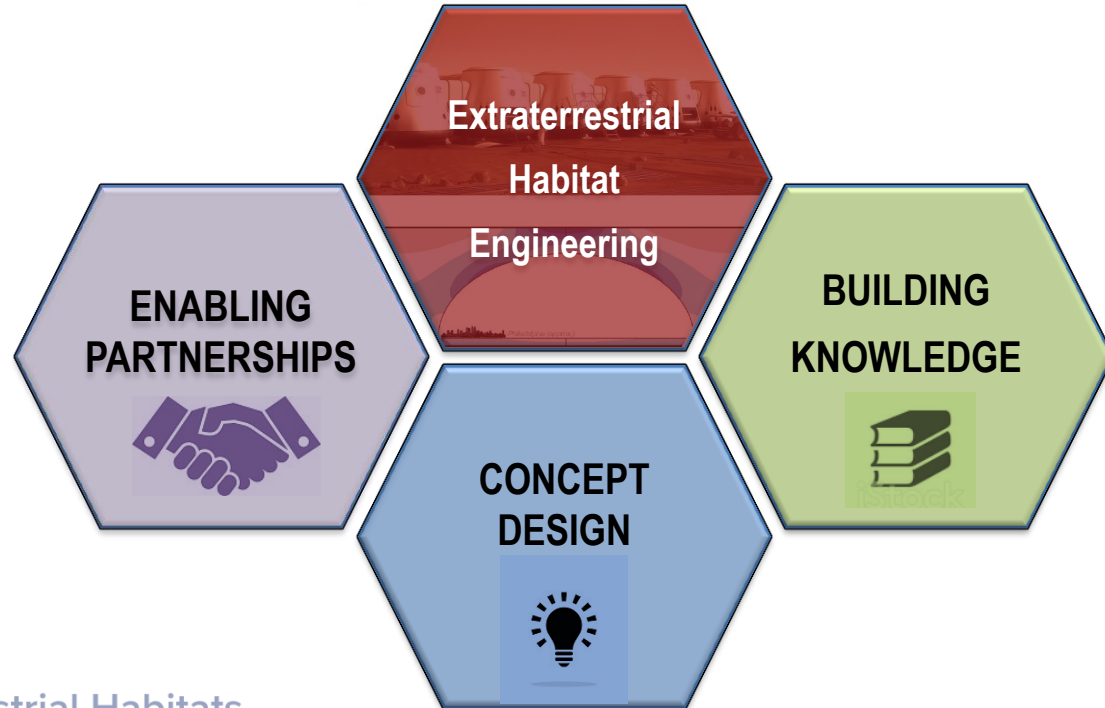
Engagement inside Purdue



Engagement inside Purdue



reth@purdue.edu



Activities on Campus

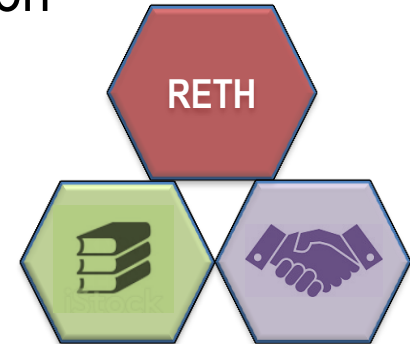
Seminar Series

- Beginning later this semester
- Explore and refine research questions



New Programmatic and Curricular Directions

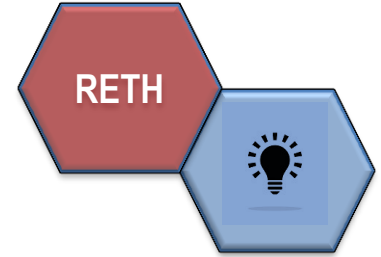
- Path to a minor involving broad participation
- Design competitions (**IEPICCS**® , capstone courses,...)



Activities on Campus

Concept Design

- Interdisciplinary !!
- Aboveground & Underground Habitats
- Student involvement:



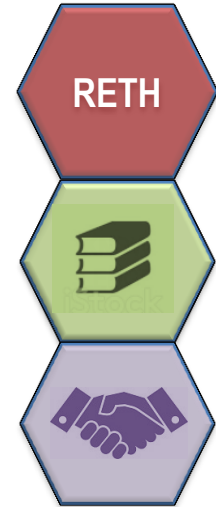
Activities on Campus

Hosting an International Workshop

- Early in year 2
- Invite thought leaders
- Open discussions about the research questions
- Opportunities for involvement

Establishing a Center

- Involvement on and off campus
- Collaboration and building partnerships



Reaching out

Dissemination

- reth@purdue.edu
- Youtube channel
- Website: in development



Together, we can build safe, comfortable and resilient habitats on the Moon or Mars



RETH



Together, we can build safe, comfortable and resilient habitats on the Moon or Mars



<https://storiesbywilliams.files.wordpress.com/2014/09/marsgreenhouse2-e1411247524653.jpg>

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Together, we can build safe, comfortable and resilient habitats on the Moon or Mars

Get Involved –



reth@purdue.edu



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