University of Southern California, Astronautical Engineering Department, Viterbi School of Engineering

ASTE 527 Graduate Space Architecting Studio

Unleash Creativity & Refine Presentation Skills - Project Focused Curriculum

Spring 2024 Team Project Theme – Exploration and Habitation of Lunar Pits and Lava Tubes

Look up Studio archives here: ASTE 527 Home (google.com)

It has long been established that lunar lava tubes would offer several advantages over surface habitats, especially for building and servicing permanent settlements. They include protection from solar and galactic cosmic radiation, micro-meteoritic showers, moderately steady temperature (-20 C) throughout the extreme lunar diurnal cycle, and perhaps a much less dusty interior floor and surface, devoid of the "gardening" process caused by the constant pummeling of micrometeorites and electrostatic charging by the solar wind. It is possible that lunar lava tubes also have features and resources that could support long term human habitation.

Innovative ways to circumvent past subsurface communication and navigation difficulties have been demonstrated in analog lava tube exploration on Earth. Technologies like LIDAR and autonomous navigation have been developed, and systems and protocols tested, fielded and refined to reliably map the interiors of subsurface cavities such as lava tubes.

Most of the literature and proposals on lunar habitats to date have focused on lunar surface habitats and their evolution into permanent lunar surface settlements. Artemis and Gateway are current NASA programs planning to return humans to the Moon. The 2024 Spring studio will study strategies and create innovative concepts for lunar pits and lava tube exploration and habitation. Creative concepts for cislunar transport, lunar habitats, crew & cargo landers, surface systems & communication infrastructure are also sought.

American Hero & Apollo 11 astronaut Buzz Aldrin was guest of honor at Finals

Studio in the news :

2008 - http://viterbi.usc.edu/news/news/2008/from-the-earth.htm

2008 - http://news.usc.edu/29302/Making-Space-for-Some-Big-Plans/

2011 – Aldrin Visit to studio http://viterbi.usc.edu/news/galleries/slideshow_20111220.htm

2011 – NASA: http://www.nasa.gov/pdf/716069main_Khoshnevis_2011_PhI_Contour_Crafting.pdf

2012 – Lunar Super Computer, Wired http://www.wired.com/2012/10/supercomputer-moon/

2012 – NASA NIAC Award USC Engg. and USC Architecture, https://arch.usc.edu/topics/nasa-research

2013 – 3D Printing Space Food, Wired http://www.wired.com/2013/02/3-d-food-printer-space/

2016 – MOBIUS Lunar Tourism http://spaceref.com/missions-and-programs/nasa/nasa-future-in-space-operations-mobius---supersynchronous-earth-orbits-for-lunar-missions.html

2018 – ADAM Project - https://www.youtube.com/watch?v=j1ysNVULmxI

https://www.nextbigfuture.com/2019/01/usc-space-design-class-2018-final-presentations.html

2022 - BuzzCraft Earth-Moon Cycler - Buzzcraft for Earth Moon Cycler Transport | NextBigFuture.com

*****Spring 2024 Enrollment in progress*** Contact instructor** mthangav@usc.edu