LCAP Field Studies
Astro Explorers Camp
August 4, 2019 – August 9, 2019

Syllabus for: Astro Explorers' Camp
The Learning Center at PARI
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We welcome you to the 2019 Field Study "Astro Explorer's Camp" at the Learning Center at PARI (LCAP).

Our team will provide you with the exciting opportunity to explore the methods used to measure geographical features on the Moon and Mars, how to work with them in a three dimensional space, and design and produce models that offer accessibility to a variety of people including those with sight impairments.

Course Description

Above and Beyond is a one week experience that is designed to immerse middle school students in the multi-faceted world of space science and research. Participants will explore the universe through astronomy, remote-sensing, three dimensional thinking, geography, and 3D modeling. They will complete a project to design an accurate representation of a portion of the Moon or Mars and label it with Braille to provide accessibility to differently sighted learners.

Using data from the Lunar Reconnaissance Orbiter and Mars Reconnaissance Orbiter, students will learn how to recognize different landforms like craters, volcanos, rifts, and signs of water. After learning how to work with this information, and how it is recorded from satellites, they will explore the terrains of these planets and find places that interest them to further investigate.

The realm of 3D spatial thinking and manipulation will be explored by working with movement, scaling, and rotation in three axis both in real live and in a virtual computer environment. Students will learn how ideas like latitude, longitude, and elevation can be tied to X, Y, and Z axis to produce accurate scaled models of the real world. They will learn the basics of a real 3D modeling and animation software suite called Blender, used by professionals around the world.

Humans use and interact with data in a variety of ways. Some reveal things that would otherwise be hidden, some focus on an individual point. Some cater to people with different learning styles or abilities. After exploring these, students will experience data tactilely with 3D printed models that include Braille writing, and focus specifically how people can learn through touch. They will create their own models using techniques that allow this tactile learning, making their final products accessible to people who may have difficulty taking in information through sight.

LCAP Site

Students will stay at LCAP, a 200+ acre campus at 3000 feet in elevation in the heart of the Pisgah National Forest. This unique setting in the land of waterfalls gives access to a beautiful natural world where memories are waiting to be made. Once a satellite tracking station for NASA, the site provides access to radio telescopes, optical telescopes, a planetarium, a world class archive, and an array of other instruments. LCAP staff, science advisory board, and partner organizations bring a wealth of knowledge and experience.

Objectives

- Learn fundamental concepts in the field of Geology and recognize them on the surface of other planets.
- Learn about radio and optical telescopes and understand their purpose as they relate to the fields of physics, astronomy, and astrobiology.
- Develop skills in three dimensional spatial thinking, valuable in design and engineering.
- Gain an understanding of the different ways people use and experience data.
- Learn the Braille alphabet.
- Become familiar with a specific feature of the Moon or Mars.
- Learn the basics of 3D design software.
- Gain an understanding of 3D printing and how it works and its uses.

Packing List

- Pens, pencils, notebooks.
- Flashlight & extra batteries.
- Rain Gear & Layers (Temperatures can range from 50^{o}-85^{o} on some days with rain most afternoons).
- Shoes appropriate for hiking.
- Day pack or book bag.
- Water bottle.
- Bathing suit.
- Shoes suitable for getting wet (required for tubing trip).
- Bug spray.
- Sun Screen.
- Games, puzzles, books, etc. (There is no TV service at LCAP).
- Linens (sheets, towels, washcloths, pillow & pillow case, blanket).
- Toiletries, a plastic tote is suggested for them as showers and bathrooms will be shared. Shower shoes or flip flops also recommended.
- If you bring extra snacks, they will be stored in a container with a sealable lid.

Considerations

- Most cell phones do not work at LCAP due to remoteness and natural radio shielding (this is what makes it a great place for radio astronomy). Plan to use alternate services like Skype if you anticipate the need to make calls while here. Additionally, cell phones, tablets, and other electronic devices may be prohibited in certain locations or during certain activities.
- Because some astronomy is done at night, be aware that there may be a few days when your sleep schedule is irregular.
- We have a gift shop, so come prepared to find some great souvenirs.

Contact us with any questions or concerns. We are happy to help you prepare for an excellent summer!

Schedule

This schedule is an outline of the order and general structure of the session. It may change based on weather and astronomical events.

Day	Time	Activity
Sunday, August 4 (Arrival)	Afternoon	Arrival 3pm to 5pm @ Building One
	Evening	House Sorting (In Smiley's, after dinner) Orientation Site Safety Wildlife Site Tour Campus Life and Camper Responsibilities Ice Breakers
Monday, August 5	Morning	Lesson: • Introduction to Project / Camp purpose • How do 3D printers work? • Examples and Failures • Geographical Features – general • Latitude and longitude parameters • Laser Altimeters / MOLA / LOLA
	Afternoon	Lesson/Activity: Holodeck • XYZ Axis • Basic 3D Manipulations • G – Grab (move) • R – Rotate • S – Scale • Camera versus Object (1,3,7) Lesson: Introduction to Blender **(Blender)** • XYZ in Blender • A, Del, Esc, … • First Object Creation • Saving and Naming • Exporting Activity: 3D Manipulation Practice (plot route to dinner)
	Evening	Activity: • Sight Impairment glasses - exploration • Braille exploration / tactile Ice Cream Social
Tuesday, August 6	Morning	Team Creation (Command Experts!) Lesson: Moon and Mars Specific Geography Activity: Choose Terrain Activity: in Holodeck • Paper crater on grid / bounds of object • Measuring via Axis • Bounds of chosen crater Longitude, Latitude and Elevation relation to X,Y,Z
	Afternoon	Lesson: Braille Labels in Blender **(Blender)**
	Evening	Activities
Wednesday, Aug. 7	Morning	Tubing Trip 9:30 – 1:30
	Afternoon	Lesson: Light and Spectroscopy Lesson: Modeling Lunar or Martian Terrain **(Blender)**

	Evening	Lesson: Modeling Lunar or Martian Terrain continued (if necessary) **(Blender)** Activities
Thursday, August 8	Morning	Lesson • Group 1: Radio Astronomy • Group 2: Minerals/Meteorites (hold one)/NASA exhibits Switch Groups for same
	Afternoon	Activity: Summarize learning, create terrain fact sheet Activity: Present Facts and terrain to group Activity: T-Shirts? Activity: Play of 3D Manipulation Guest Speaker: Geologist Sean Price from a volcano in Iceland
	Evening	Bonfire Night
Friday, August 9	Morning	Room Walkthroughs Departure Gift Shop and B1 open to campers and families.