Advanced Teen Astronomy Camp
Required Essay

Admission to the Advanced Camp requires an original, typewritten essay of at least 1,200 words. As described below, first-time applicants must choose one of two required topics, and previous Advanced Campers must propose an appropriate research project involving other Campers.

Please recognize that we cannot accept everyone who applies to "Camp," even though their qualifications are excellent. Not being accepted does not imply inferiority or a lack of competence! As in professional science, excellent proposals are often declined for reasons beyond an applicant's control such as, in our case, available dormitory space. If you are not accepted this year, we truly hope you will reapply next year. We highly respect your decision to write this essay and hope you will not sacrifice important school work, sleep, etc.

We Want to Learn About YOU, not AI

At the Advanced Camp, we seek students who demonstrate a hunger to improve personal skills in science, technology, engineering, and math (STEM) as well as associated skills in critical thinking, curiosity, writing, and presentation. We do not require a background in astrophysics or perfect skills in English composition - only your desire to grow. The required essay is our means of gauging this desire. So, we want to get to know YOU, not your parents, friends, or computer algorithms. Therefore, AI-generated assistance in writing the essay is not acceptable, and you must begin your essay by with the following signed **AI-related statement** …

"I affirm that the essay submitted below is entirely my own work, and I have not used Artificial Intelligence (AI) composition tools to generate any text or information."
Applicant's Signature: _____

Similarly, we promise to read each essay carefully and not to use AI tools for evaluation.

First-time Applicants to the Advanced Camp

The essay must merge known specific information with imagination and incorporate a quantitative approach throughout. Students should (a) choose one of the two topics below, (b) research existing knowledge, and (c) use that background as a basis for creative extrapolation. Below, we suggest some references to assist your thinking, but students should also dig deeper than articles in the popular press and use information and ideas from at least two published scientific articles written by astronomers.

The essay must (a) begin with a creative title; (b) include the signed AI-related statement; (c) incorporate an original, schematic illustration as described below; and (d) cite all references used in researching the topic.

As an example (but without the illustration), we provide a previous Camper's essay for topic #2 entitled "A Star So Close, Yet So Far Away" (R. Rosener, 2018). NOTE how the author incorporates specific characteristics about the star system throughout the essay to predict conditions on the orbiting planet.

Topic #1: Pretend you are responsible for choosing a world outside our Solar System to explore and colonize. Where would you go, why did you choose that location, and what would you hope to learn, or accomplish, there? How, and why, would life on that planet differ from that on Earth?

You may choose either (a) a known exoplanet that has been confirmed to orbit a star(s) or (b) a confirmed, or hypothetical, planet in a known binary star system.

Utilize known properties of both the parent star(s) and the exoplanet (e.g., mass, temperature, diameter, luminosity, orbit, composition, age, axis tilt, tides, etc.) to predict expected physical conditions on the exoplanet and explain how life has adapted to those conditions.

Include your own scale drawing showing the star-planet system (i.e., diameter of star, diameter of planet/moon; orbital shape and separation). Use labels to indicate important physical characteristics, and locations mentioned in the essay. Refer to that drawing throughout your essay.

Sample resources:
#1. "The Exoplanet Follow-up Observing Program (ExoFOP)," https://exofop.ipac.caltech.edu/tess/
#2. "NASA Exoplanet Archive," https://exoplanetarchive.ipac.caltech.edu/
#3. "Encyclopaedia of Exoplanetary Systems," https://exoplanet.eu/home/
#4. "Planets in Binary Systems," https://exoplanet.eu/planets_binary/
#5. "What Happens When a Planet Orbits Two Stars at Once?"
https://www.skyatnightmagazine.com/space-science/exoplanet-orbit-two-stars-what-happens
#6. These two links provide access to published papers at no expense …
(a) NASA Astrophysics Data System (ADS)
https://ui.adsabs.harvard.edu/classic-form
(b) arXiv - astro-ph (Astrophysics archive)
https://arxiv.org/archive/astro-ph

Topic #2: Pretend you are the assistant of a well-known astronomer (past or present). Describe a research project with which you are both involved and how it has impacted your life. Incorporate biographical information about the astronomer and specific (quantitative) details about his/her/your research progress, accomplishments, and interests.

Include your own "concept map" of an astrophysical concept that's fundamental to the research project. For example, the drawing could be a flowchart showing logically, and systematically, how your team measured the intrinsic astrophysical properties of an object or perhaps an optical design of the telescope-instrument invented and used to make your observations.

Sample Resource:
#1. "20 Great Astronomers Ranked," (plus 10 physicists), M. Bakich, Astronomy magazine, Oct 2023,
https://www.astronomy.com/science/meet-20-great-astronomers-who-made-the-history-books/

Students Applying to Repeat the Advanced Camp

Since many qualified students are expected to apply for the first time, it is likely that no more than two repeating Campers will be accepted. Each year's Advanced Camp has a different theme for daily activities, but our primary nighttime focus will still be research projects conducted by teams of students using the equipment in our collection.

Students wishing to reapply must write an observing proposal similar to, but more detailed than, the proposals they wrote during a previous Advanced Camp. Based on your experience with our instruments, you should be able to describe a new project which you could lead with other Campers during the one

week of Camp. As usual, we expect to use the Submillimeter Telescope (SMT) of the Arizona Radio Observatory as well as CCD/CMOS electronic cameras and spectrometer on the 8, 24, 32, and 61-inch optical telescopes on Mt. Lemmon and Mt. Bigelow.

Could promote to other Campers and help them accomplish as though you were a member of the Camp's staff,

Resources: description of Astronomy Camp's telescopes & facilities

Please feel free to email Camp's Director for technical information and for guidance in general. You do not have to solve any mysteries of the Universe, just propose something which interests you, utilizes Camp's equipment, and would interest other students. Your project should be challenging but also realistic.

You must include the following ingredients in your proposal and have a specific, quantitative approach:

1. Signed AI-related statement (above)
2. Title
3. Abstract
- A concise paragraph summarizing your goals.

4. Scientific Description
- Why is this project interesting and what do you hope to learn from the observations?
- Be sure to list published references to provide scientific context for your proposal and cite any articles, etc. you used in preparing your proposal.

5. Scientific Method
- How will you obtain and analyze your data?
- What telescopes and instruments do you require?
- How much observing time is necessary?

6. A "Concept Map"
- A drawing showing logically, and systematically, how your team will achieve its scientific goals by measuring the intrinsic astrophysical properties of the target object(s). Check out examples at the link above.

7. Team Management

As the leader of your project:
- How will you promote the project to the full group of Campers?
- How will you deal with the fact that new Campers may not understand your topic but are eager to learn and participate?
- How will you teach, encourage, and manage the research team throughout the week?
- How will you involve your teammates in specific aspects of the project?

8. References