

# ASTRONOMY WORKSHOPS FOR ELEMENTARY/MIDDLE/HIGH SCHOOL STUDENTS

Description

The Physics and Astronomy Department at UCR has designed workshops for students following California's Next Generation Science Standards (NGSS).

Through visual and spoken presentations the students will be exposed to astronomical themes, understand the objective of the activity, and then have a hands-on experience that will use and emphasize on STEM subjects.

Activities are also available for deaf and blind students.

English is the main language for the workshops, but upon request, we can deliver them in Spanish.

	Grade	Deaf	Blind
TOUCHING THE UNIVERSE [p. 2]	K +	✓	
THE SPIRAL UNIVERSE [p. 3]	1+	✓	
EXTRATERRESTRIAL LIFE [p. 4]	1 +	✓	
STARS WITH ORIGAMI [p. 5]	5 +	✓	
SOLAR SYSTEM MOBILE [p. 6]	3 +	✓	✓
SMELLING THE UNIVERSE [p. 7]	5 +	✓	✓
SOUNDS OF THE UNIVERSE [p. 8]	5 +	✓	
<b>New</b> GRIDFIRE-CALIFORNIAN WILDFIRES [p. 9]	8 +		
WATER ROCKET [p. 10]	8 +	✓	
SOLAR TELESCOPE OBSERVATIONS [p. 11]	3 +	✓	
NIGHT TELESCOPE OBSERVATIONS [p. 12]	3 +	✓	
ASTROPHOTOGRAPHY [p. 13]	8 +	✓	

If interested contact Dr. Mario De Leo at [mariodlw@ucr.edu](mailto:mariodlw@ucr.edu)  
Workshops must be requested 4 weeks in advance.



## Description

[20 to 60 min. hands-on activity] Students will be able to touch and see 7 different types of meteorites. Some made out of iron, others of rock, one is mostly crystal, some come from the moon, others from Mars. By comparing weights, color, magnetic properties, appearance, transparency, students will describe objects based on their physical characteristics while learning about the Universe.

Kindergarten: Common Core Science Standards  
 NGSS First Grade: PS4.B  
 NGSS Second Grade: ESS1.C; PS1.A

## School facilities

Video projector, projection screen, tables and chairs

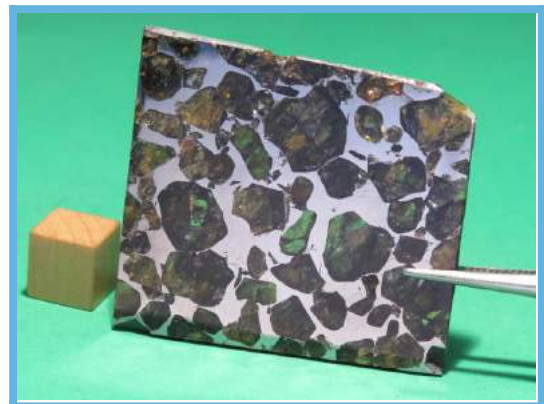
## Materials &amp; Cost

All materials provided by UC Riverside

## Students per session

20 - 30

ASTRONOMY  
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Description

20 min. talk] We start with a brief computer-based presentation of the Earth’s position in the Milky Way, the nature of galaxies and the particular patterns of spiral galaxies.

[40 min. hands-on activity] Students will draw-paint reproducing spiral galaxies on paper and creating a little exhibit of these wondrous cosmic structures.

NGSS Second Grade: ESS1.C

School facilities

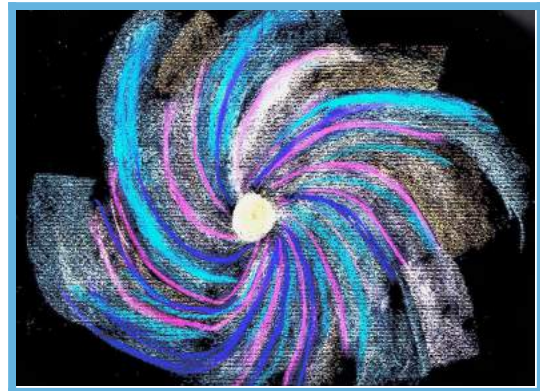
Video projector, projection screen, tables and chairs

Materials & Cost

\$15.5 Black construction paper [\[link to buy ↗\]](#)  
 \$28.5 Sticks (96) of colored chalk [\[link to buy ↗\]](#)  
 Total: \$44 for first 30 students, \$30 for additional 30

Students per session

20 - 30



## Description

[20 min. talk] We start with a brief computer-based presentation of discovered extrasolar planets and the possible colors of animals and plants, as suggested by science, depending on their host star's light emission.

[50 min. experience] Hands-on experience strengthens learning. We guide students to build their extraterrestrial life form following knowledge acquired from the presentation.

Further reading: [Kiang, et al., 2008](#); [O'Malley-James, et al., 2012](#)

NGSS First Grade: LS1.A; LS1.B; ESS1.A; ESS1.B

## School facilities

Video projector, projection screen, tables and chairs

## Materials &amp; Cost

\$3 for [clothespins](#) [[link to buy ↗](#)]

\$18 for [colored pipe cleaners](#) [[link to buy ↗](#)]

\$6 for [wiggly eyes](#) [[link to buy ↗](#)]

\$13 for [colored tissue paper](#) [[link to buy ↗](#)]

\$10 for [color markers](#) [[link to buy ↗](#)]

\$31 for [24 scissors](#) [[link to buy ↗](#)]

Total: \$81 for first 25 students, \$10 for additional 100

## Students per session

20 to 30

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Description

[15 min. talk] Stars follow a “life cycle”, they form in nebulae, shine using gas as fuel, and die. Astronomers infer the temperature and age of star by viewing its color. We start with a brief computer-based presentation of this cycle and examine what each color tells scientists about stars.

[60 - 90 min. experience] Hands-on experience strengthens learning. We guide students to build their own star through origami [folding paper] using colors to characterize each type of star. They get to keep the star.

Further reading: [stellar classification](#)

NGSS Fifth grade: ESS1.A; ESS1.B; PS1.A.

NGSS Eight grade: ESS1.A; ESS1.B; PS2.B; PS3.A.

School facilities

- Video projector
- Projection screen
- Tables and chairs

Materials & costs

8 colored origami sheets per student  
 \$15.00 for [500 sheets of origami paper](#) [link to buy ↗]

Students per session

20 to 30



The activity is suggested for 3<sup>rd</sup> graders and up, although material was covered during 1<sup>st</sup> grade.

[15 min. talk] We start with a brief computer-based presentation of the Sun, planets, major moons and their characteristics.

Description [90 min. experience] Hand-on experience strengthens learning. We guide students to build their own hanging mobile composed of the planets and elements of the Solar System.

Related to material seen in:  
 NGSS First Grade: LS1.A; LS1.B; ESS1.A; ESS1.B  
 NGSS Fifth grade: ESS1.A; ESS1.B; PS1.A.

School facilities Video projector, projection screen, tables and chairs.

Materials & Cost \$15 for 152 crayons/markers/colored pencils [[link to buy ↗](#)]  
 \$4.5 for 400 yards of thread [[link to buy ↗](#)]  
 \$14 for paper glue [[link to buy ↗](#)]  
 \$22 for one scissor per student [[link to buy ↗](#)]  
 \$10 for wooden dowels [[link to buy ↗](#)]  
 \$6 for scotch tape and dispenser [[link to buy ↗](#)]  
 Total: \$72 for first 25 students, \$20 for 100 more

Students per session 20 to 30

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## Description

Complex molecules have been detected throughout the Universe. The Moon, the Milky Way's center, the atmosphere of Mars, and the International Space Station (ISS) have smells which have been paired with foods and products found on Earth.

[15 min. talk] We start with a brief computer-based presentation of cosmic phenomena (moons, galaxies, planets).

[25 min. experience] Students will be asked to imagine the smells of wondrous cosmic phenomena and then handed out containers with the approximate smells of Mars, the galactic center, the Moon, and the ISS, smells are produced with regular and safe household items.

Further reading: [Belloche, et al., 2008](#); [Belloche, et al., 2009](#); [Fecht \[Popular Science\]](#); [Schiffman \[Popular Science\]](#)

NGSS Fifth grade: ESS1.A; ESS1.B; PS1.A; PS1.B.  
 NGSS Eight grade: ESS1.A; ESS1.B.  
 NGSS Ninth grade: ESS1.A; ESS1.B.

## School facilities

Video projector, projection screen, tables and chairs

## Materials &amp; Cost

\$2 for vinegar  
 \$4 for [raspberry flavoring \[link to buy ↗\]](#)  
 \$5 for [rum flavoring \[link to buy ↗\]](#)  
 \$12 for charcoal  
 \$10 for beef jerky  
 Total \$90 to set up for as many students as possible

## Students per session

20 to 30



Description

Either through the interpretation of frequencies from cosmic phenomena into audible sound waves or actual radio readings from different sources, the Universe can become an acoustic experience.

[30 min. Talk] Students sit and listen cosmic sounds, and are asked on what they think they are hearing, astronomical descriptions ensue, and comparison with their surrounding world. Analogies will be drawn between everyday and cosmic sounds. Available material includes the Sun, Saturn’s storms, interstellar plasma, Earth’s atmosphere, the temperature of the Universe, etc.

NGSS Fifth grade: ESS1.A; ESS1.B.

NGSS Eight grade: ESS1.A; ESS1.B; PS3.A; PS4.A; PS4.B.

School facilities

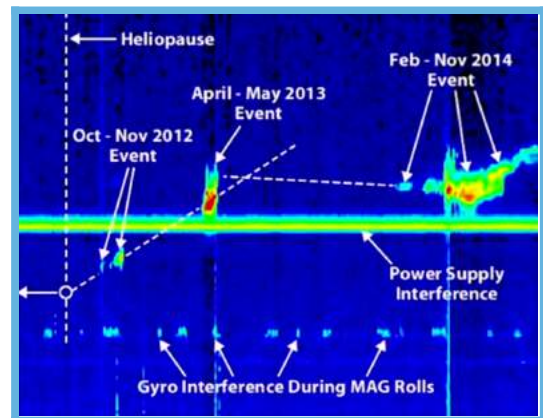
- Video projector
- Projection screen
- Tables and chairs
- Audio system

Materials & Cost

None

Students per session

20 to 30





Description

GRIDFIRE is a fun, interactive, web-based, and educational tool that allows students to play with real physics and satellite data to understand the spread of Californian wildfires.

[20 min. Talk] Students listen to the basics of wildfires.

[25 min. Experience] Through computers or tablets, students work with the web-based interactive tool to understand how fires spread easier as they change weather parameters such as wind, humidity and temperature.

NGSS Fourth grade: PS3-3; PS3-4; ESS-1; ESS-2  
 NGSS Fifth grade: PS1-3; PS1-4  
 NGSS Sixth, Seventh and Eighth grade: PS1-4; PS1-6; ESS2-5; PS3-4; ESS3-2; ESS3-5

School facilities

- Video projector
- Projection screen
- Tables and chairs
- One laptop or tablet per student

Materials & Cost

None

Students per session

20 to 30



Description

How do forces come together to send a rocket into space? Propulsion, drag and pressure are some of the concepts applied in the construction of a water powered rocket in a race to see who can send it higher.

[20 min. talk] Brief talk on the physics involved on the water rocket construction and launch (drag, gravity, propulsion, forces).

[100 min. experience] Teams build their own water rocket and the subsequent launching to see who produced the best design according to the laws of physics.

NGSS Eight grade: PS2.A; PS2.B; PS3.A; ETS1.A; ETS1.C.  
 NGSS Tenth grade: PS2.A; PS2.B.  
 NGSS Eleventh grade: PS3.A; PS3.B.

School facilities

Video projector, projection screen, tables and chairs, audio system and open area for launch.

Materials & Cost

\$2 Cardboard [[link to buy ↗](#)]  
 or \$12 Two corrugated plastic [[link to buy ↗](#)] sheets  
 \$20 Utility knives [[link to buy ↗](#)]  
 \$9 Duck tape [[link to buy ↗](#)]  
 Five 1 Lt or 1.5 Lt water bottles  
 Total \$36 for 20 students

Students per session

20



**Description**

The Sun gives us energy for everyday biological processes. our star has processes of its own: sun spots, mass coronal ejections, solar prominences. All are visible through our specialized H-Alpha and visible light filters for telescopes. The activity is suggested for 3<sup>rd</sup> graders and above, although material was covered during 1<sup>st</sup> grade.

[20 min.]  
Brief talk on solar phenomena to prepare students on what they are going to see through the telescope

[40 - 60 min.]  
Solar observation though specialized filters.

NGSS First Grade: LS1.A; LS1.B; ESS1.A; ESS1.B  
 NGSS Fifth grade: ESS1.A; ESS1.B; PS1.A.  
 NGSS Eight grade: ESS1.A; ESS1.B; PS2.B; PS3.A.  
 NGSS Ninth grade: ESS1.A; ESS1.B.

- School facilities**
- Video projector
  - Projection screen
  - Tables and chairs
  - Patio with clear horizons

**Materials & Cost**    None

**Students per session**    60 persons per hour



Description

Nebulae, open and globular clusters, the planets of the Solar System.

[20 min.]

Brief talk on the main astronomical objects available for observation that night to prepare students on what they are going to see through the telescope

[60 - 120 min.]

Observation through telescopes.

NGSS First Grade: LS1.A; LS1.B; ESS1.A; ESS1.B

NGSS Fifth grade: ESS1.A; ESS1.B; PS1.A.

NGSS Eight grade: ESS1.A; ESS1.B; PS2.B; PS3.A.

School facilities

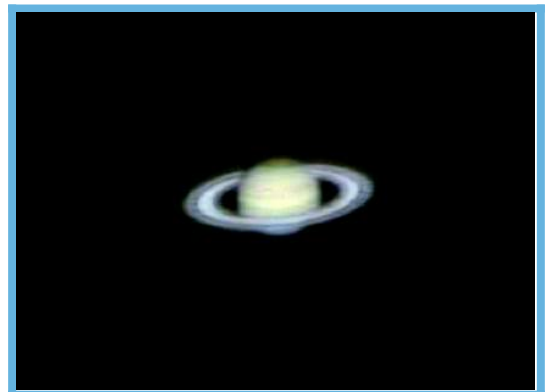
- Video projector
- Projection screen
- Tables and chairs
- Patio with clear horizons
- Access to electric power

Materials & Cost

None

Students per session

60 persons per hour per telescope



Description

How to photograph planets, star clusters and nebulae through a telescope.

[4 hours in 2 sessions]

Theoretical sesión: Introduction talk on the use and workings of telescopes, cameras, astrophotography, image reduction and image processing.

[90 min. at night]

Practical astrophotography session [use of telescope and cameras].

NGSS Eight grade: ESS1.A; ESS1.B; PS4.A; PS4.B.

NGSS Ninth grade: ESS1.A; ESS1.B.

NGSS Tenth grade: PS2.B.

NGSS Eleventh grade: PS3.A.

NGSS Twelfth grade: PS4.A; PS4.B; PS4.C.

School facilities

- Video projector
- Projection screen
- Tables and chairs
- Patio with clear horizons
- Three nights for practical and theoretical sessions

Materials & Cost

None

Students per session

4 persons per telescope  
Up to 8 persons

