



## Table of Contents: Astronomy

- 1) What is Astronomy? (Introduction)
- 2) Check it Out! The story of Astronomy student, Dennis Lamenti (Navajo/Zuni)
- 3) Native American Constellation Stories
  - Ursa Major: Iroquois
  - Ursa Major: Blackfoot
  - Pleides: Cherokee
  - Draco: Multiple cultural stories
  - Orion: Tewa
- 4) Explore More (Resources)
- 5) Activity 1: Making your own Planisphere
- 6) Activity 2: Film Can Spectrometer  
What's Happening Here? (Background information for Spectrometer observations)
- 7) Activity 3: Constellation T-Shirt



# iSTEM ■ What is Astronomy?

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Astronomy is the study of **SPACE** and the changes that take place in and around all objects moving through space. It's more than just Earth and our Solar System. The study of astronomy covers every planet, object, and bit of energy flowing through the universe.

## Careers/Jobs Related to Astronomy

- School Science Teacher
- NASA Aerospace Technologist
- Astronomer
- Astrophysicist
- Space Scientist
- Astronaut
- Mission Specialist
- Astronomy or Physics Professor
- Aerospace Technician
- Community Science Educator (Museum, Children's Museum, Planetarium)
- Head of Public Programming, Museums
- Data Analyst/Research Technician
- Science Writer



## Education After High School

**Associate's Degree** in Astronomy: Pima Community College (2 years after high school).

**Bachelor's Degree** in Astronomy, University of Arizona, Arizona State University in Phoenix; in Physics and Astronomy, Northern Arizona University in Flagstaff (4-5 years after high school).

**Master of Science** in Astronomy, University of Arizona; in Earth and Space Exploration, Arizona State University (6-7 years after high school).

**PhD** in Astronomy, University of Arizona; in Astronomy and Astrophysics, Arizona State University (8-10 years after high school).

## Possible Employers

- Observatories
- Research laboratories
- Schools and universities
- Science museums
- Technology companies
- Planetariums
- National Aeronautics and Space Administration (NASA)
- Government agencies
- Media outlets



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## CHECK IT OUT!



Dennis Lamenti, (Navajo/Zuni) is a graduate student at the University of Indiana. He hopes to bring more Native Americans to the field of astronomy while introducing his culture's astronomic heritage to the world.

Lamenti grew up near Tuba City, Arizona on the Navajo Nation Reservation. He did not go to college immediately after high school. In the 1990s, he started participating in Navajo ceremonies and decided he wanted to better understand his Creator. "And the way to do that for me was to learn more about the creation," he said.

The physics and mathematics model appealed to Lamenti, so, in 2002, at almost 45 years old, he enrolled at San Francisco State University (SFSU) to pursue a bachelor's degree in physics. He gravitated toward astronomy in his sophomore year when he was accepted into an internship program at Lawrence Berkeley National Laboratory and placed into its astrophysics division. Now 53, Lamenti is enrolled at Indiana University-Illinois, Bloomington, where he has completed his master's degree and is close to completing his Ph.D. in astronomy.

Read more at <http://indiancountrytodaymedianetwork.com/article/the-native-astronomer-46049>

*Lamenti would like to make himself available to any Native American students interested in astronomy or who need advice getting into college, or just staying in school. Write him an email!*

[dlamenti@astro.indiana.edu](mailto:dlamenti@astro.indiana.edu)



## Ursa Major: Iroquois Tribe



Long ago, the Great Bear wandered freely throughout the sky. His massive paws took him far across the unlimited ceiling of the world. He hunted and fished, finding food in the many rivers of the sky. All throughout the first spring he did this, until his belly was full and happy.

He did not know that three young braves had discovered him feeding that spring. They sought his pelt and meat to feed their families in the long winter that they knew was coming soon.

Without warning, the braves ran out after the bear, trying to catch and kill him. The Great Bear ran, trying to escape from the hunters. All through the long summer he ran, always trying to get away. The braves, however, were very cunning and strong. Eventually they caught up with him. In the first autumn, their arrows pierced the Great Bear and he died.

The blood of the bear spilled out of the sky and tinged all the leaves with red and orange. The trees then dropped all of their leaves in sadness for their friend, the Great Bear.

The Great Bear was reborn the following spring, as is the way of bears, and the braves set out after him again. They do this each year. If you look into the sky and watch, you can see the braves trailing behind the Great Bear as he runs toward the horizon, only to do it again and again with the coming of each spring.

## Pleides

### Cherokee Tribe

There were seven boys who would not do their ceremonial chores and only wanted to play. The boys would run around and around the ceremonial ball court in a circle so many times that they eventually rose up into the sky. Only six of the boys made it to the sky; the seventh was caught by his mother and fell to the ground with such force that he sunk into the ground. A pine tree grew over his resting place.

### Hopi

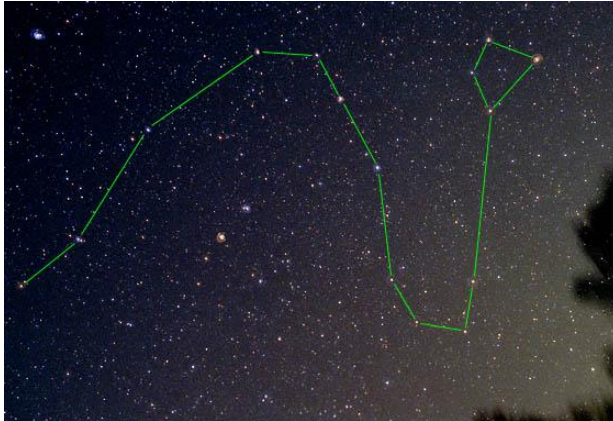
The Hopi built their underground kivas for many uses. The most important of which was a ceremonial meeting place. Access was through a ladder in a small hole in the roof of the kiva, and during certain ceremonies, the night passage of the Pleiades over the center of the opening was a direct signal to begin a certain ceremony. Most of the cultures used the angle of the Pleiades in the night sky as a time telling device.



### Blackfoot Tribe

To the Blackfoot tribe the Pleiades were known as the Orphan Boys. The fatherless boys were rejected by the tribe, but were befriended by a pack of wolves, who became their only companions. After a while, they boys were still so saddened by their lives on earth they asked the Great Spirit to let them play together in the sky, and so he set them there as a group of small stars. As a reminder of the tribe's cruelty to the boys, every night the tribe had to put up with the howling of the wolves, who howled in sadness after their lost friends.

## Draco: The Dragon Constellation



- Ancient sky watchers believed that the Earth revolved around the constellation Draco. Dragons and other similar creatures often played a role in creation myths. In these stories, the Gods would often battle such creatures for control of the Earth. When defeated, the dragons were flung up into the skies.
- Roman myth calls this dragon, Ladon. He guarded the golden apples on a tree in a garden tended by the Hesperides, the daughters of Atlas. Hercules was sent to obtain the apples while under pledge to Eurystheus. He learned from Nereus that he could not pluck the apples himself, but must get help from Atlas. Hercules shot and killed Ladon with an arrow, making way for Atlas to enter and pluck the golden apples. The goddess Hera was greatly distressed by the death of Ladon and placed the dragon in the heavens.
- A Greek legend tells the story of Draco as a horrible dragon that guarded a sacred spring and killed the soldiers of Cadmus (first king of Thebes) who had been sent to gather water. Cadmus then fought the dragon and won. After the dragon died, Athena appeared and told Cadmus to sow the ground with the creature's teeth. The teeth immediately sprang up as a group of armed soldiers who helped Cadmus found Thebes.
- A Babylonian creation story tells of Tiamat, who turned herself into a dragon but was later defeated and split into two parts. One part became the heavens and the other, the Earth.



## (Draco: The Dragon Constellation: Continued)

- A Chinese tale sees the stars as the dragon who eats the Sun or Moon (possible represented by the north star Polaris) in an eclipse. During a real eclipse, ancient Chinese would make as much noise as possible, banging on pots and pans to try and scare away the dragon which was eating the Sun or Moon.
- A Norse creation myth tells of a dragon who gnaws at the roots of Ygdrasil, “the tree that covers the world.”
- Around 800 BC, the prehistoric Adena people who lived in the Ohio area of the United States created Serpent Mound which is believed to mirror the constellation Draco. This huge mound is nearly a quarter mile long.
- The Ancient Persians referred to Draco as a man-eating serpent called Azhdeha.
- In early Hindu worship, Draco is given the form of an alligator known as Shi-shu-mara.

*From: [http://starryskies.com/The\\_sky/constellations/draco.html](http://starryskies.com/The_sky/constellations/draco.html)*

## Orion: Long Sash (Tewa Tribe)



According to the Tewa people (Pueblo Indians from Arizona and New Mexico), the constellation of Orion was their hero Long Sash, named for the long belt he wore. Long Sash was a wise and loved leader. He led his people in a time of great peace and prosperity. But then there came a time of troubles. The crops died. There was sickness and famine. Their enemies were attacking, and times were hard. The people went to Long Sash and said "Lead us away from here! Lead us away from this bad place before we all die!"

Long Sash thought for a moment and replied "My people, times are bad now, but things may yet improve. If you wish to go on this journey, the way will be long and dangerous. Stop, think, ask yourselves: do you want to take that risk?"

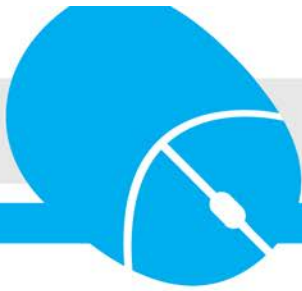
But the people were firm. So Long Sash led them on this dangerous journey. As they traveled, sometimes the people would argue and get into fights. Sometimes they would even start to hit each other. This made Long Sash very sad. He said to his people "STOP! You are hurting each other worse than your enemies have! If you are to come to a place to call your own, there must never be violence among you. So I will build two campfires, and whenever you have a problem with one of your brothers or sisters, go to these two camp fires and talk about your problems peacefully.

The stars that form the heads of the Gemini twins are those two campfires. You may notice one of the stars is a little brighter than the other. And that is because the Gemini stars became known as the place of decision making. Long Sash wanted to remind his people that real choices are seldom easy. Sometimes, one path or decision may look brighter or easier than another, but that doesn't always mean it's the best way to go.



## ***(Orion, continued)***

Guided by this wisdom the people continued on their journey until they reached a land so new not even Long Sash had seen it before. This was the middle place, called Earth, and it would be their new home. The people settled down, they had children, and grew older. But Long Sash knew he wasn't going to be with his people forever, so he said "In the sky I will place my head dress as a bright, comforting cluster of stars. So should you ever needed to be reminded of my wisdom, look upon these stars and think of me. The constellation we call the Pleiades is really Long Sash's head dress. And even after he died, he still remained in the sky to watch over his people.



# iSTEM ■ Explore More (Resources)

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1. Build your own space mission!  
<http://www.jpl.nasa.gov/education/BuildMissionGame.cfm>
2. Awesome gallery of space images  
<http://spaceplace.nasa.gov/gallery-space/en/>
3. Who was Neil Armstrong? Learn all about him!  
<http://www.nasa.gov/audience/forstudents/5-8/features/who-was-neil-armstrong-58.html>
4. NASA Space picture dictionary  
<http://www.nasa.gov/audience/forstudents/k-4/dictionary/index.html>
5. Bill Nye: How do we find planets? (video)  
<http://www.youtube.com/watch?v=uC3xDPF8uyI>
6. Bill Nye: Planets and Moons (video)  
[http://www.youtube.com/watch?v=6f6maa9xPDM&playnext=1&list=PL7EAB39072895CE73&feature=results\\_video](http://www.youtube.com/watch?v=6f6maa9xPDM&playnext=1&list=PL7EAB39072895CE73&feature=results_video)
7. Astronomy Hangman  
<http://www.kidsastronomy.com/fun/hangman.htm>
8. Hubble Telescope: see what it sees! (pictures)  
<http://www.rochesterforkids.com/hubble.htm>
9. National Geographic: How our solar system was born (video)  
[http://www.youtube.com/watch?feature=player\\_embedded&v=B1AXbpYndGc](http://www.youtube.com/watch?feature=player_embedded&v=B1AXbpYndGc)
10. Lego man in Space!  
Video : <http://www.universetoday.com/93070/toronto-teens-launch-lego-man-in-space/>
11. Learn about planets and take quizzes!  
<http://www.planetsforkids.org/>
12. Constellation hunt  
[http://www.kidsastronomy.com/astroskymap/constellation\\_hunt.htm](http://www.kidsastronomy.com/astroskymap/constellation_hunt.htm)
13. Keep yourself updated with the latest Astronomy news!  
<http://www.sciencenewsforkids.org/tag/astronomy/>



## Activity 1: Building your own Planisphere

What you will need:

- Circular star map
- Outer sleeve
- Scissors
- Stapler

### Activity Directions

1. Take the star wheel and cut off the gray corners.
2. Take the sleeve and cut out the white oval and the white border in the middle.
3. Take the sleeve and fold the white rectangle at the bottom backwards so it is underneath the front.
4. Staple it where you see the two tiny white lines.
5. Place the circle star wheel inside the sleeve so that the star map can be seen through the oval.
6. To use the star wheel, match the date and time at which you want to observe the sky. Turn the star wheel so it matches the cardinal direction (N, S, E, W) you are facing and look at the oval. This oval will show the constellations you should see in the night sky.



### TRY IT!

*Example:* Let's say it's tonight at 8:00PM. Face east and turn the wheel so the current date is aligned with 8:00PM. In your journal, write down the names of 3 constellations you would see.



## Activity 2: Film Can Spectrometer

What you will need:

- Empty plastic film canister
- Diffraction grating film
- Black electrical tape
- Light sources (incandescent bulbs, “blacklight bulbs”, fluorescent lights, neon lights, etc)



## Activity Directions

1. Get the film can and place two pieces of tape across the first opening to make a very thin slit.
2. Tape a piece of the diffraction grating film over the hole in the can. Make sure to properly align the film on one side of the can and the slit on the other side.
3. Pick a cool light source and look through the film can, making sure that the tiny slit points to the light source.
4. To see the spectrum of the light source, keep the can pointed at the light and try looking sideways left or right on the inside walls of the can. When you see a lot of colors, this will be the light spectrum.
5. Use the information on the What’s Happening Here, page (next page) to identity which chemicals are used in the light sources.

## Journal It!

Draw any exciting or unusual light spectrum you noticed during the activity!





## What's happening here?

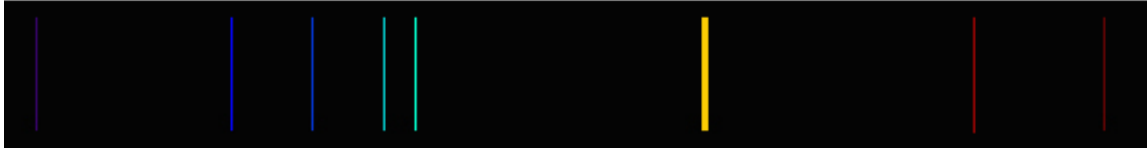
### Fingerprints in Light

- The extra or missing colors indicate certain chemical elements have affected the light
- Each chemical element changes the spectrum either by making certain colors brighter or removing certain colors
- Each chemical element has a different and unique pattern of colors, hence the "fingerprints"

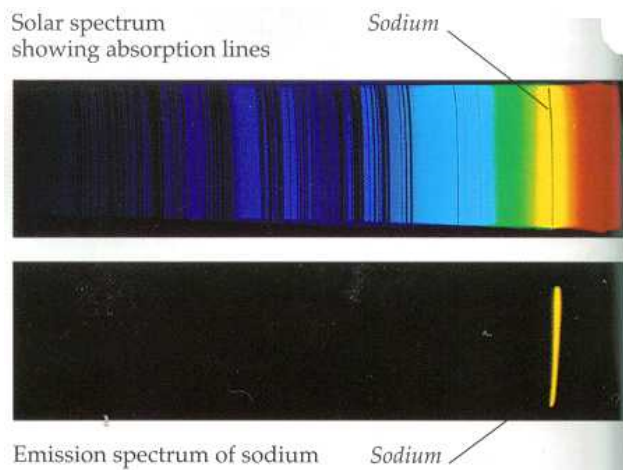
### Hydrogen Spectrum



### Helium Spectrum



### Sodium Spectrum



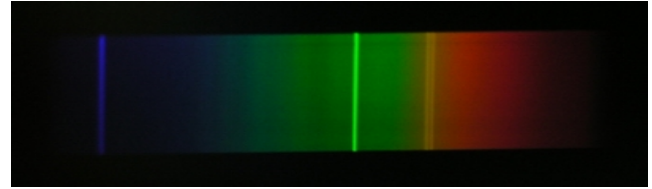


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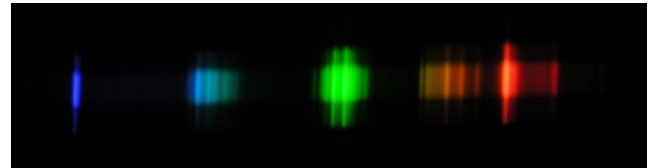
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- Fluorescent bulb, old style



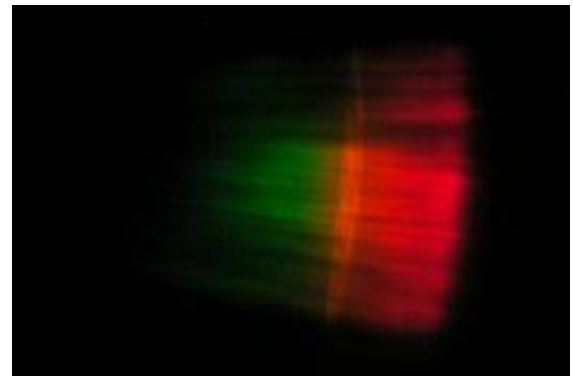
- Fluorescent bulb, new style



- Mercury



- The candle



- Sodium spectrum







### Activity 3: Constellation T-Shirt

What you will need:

- T-shirt
- Cardboard piece
- Stencil
- Glow in the dark paint
- Clothes pins

#### Activity Directions

1. Read about the stories that describe the different constellations and find one that is important or meaningful to you, then choose the stencil that matches that constellation.
2. Place your shirt over the cardboard piece so that it is centered in the middle of the shirt.
3. Use the clothespins to keep the shirt and cardboard piece in place by pinning the shirt onto the cardboard.
4. Take your stencil and using the paint, draw your favorite constellation onto your shirt.
5. Wear your shirt in the dark and glow like the stars in the sky!



#### Journal It!

- Write down your thoughts on the constellation stencil you picked for your shirt. What made you want to choose your constellation?
- Make up a story about your constellation!
- Ask a family member or elder if they know stories that relate to a constellation.