After dusk when the sky goes dark, we are often able to see hundreds of stars. But what are we really looking at?

Humans have studied the night sky for as long as we can remember; using patterns in the stars to help us navigate, track the seasons, tell stories and feel connected to the universe.

**Astronomers** are scientists who study galaxies, stars, and planets. Stars are giant balls of burning gases in space. Although most people use the word constellation to describe a group of stars, it actually defines certain areas of the night sky - so the group of stars and anything else that is in that area. **Asterism** is the correct word to use to describe a group of stars. Are you familiar with the Big Dipper, Little Dipper, Orion, or Cassiopeia? People have long looked up at night and seen patterns in groups of stars, and named these groups, even making up stories connected to them. What asterisms do you know?

There is one star we can still see during the day… can you guess what it is? It's the sun! The sun is the star at the center of our **solar system**. Our solar system is part of a galaxy, which is a very, very, very large collection of dust, gas, billions of stars, and their solar systems. Our galaxy is called the Milky Way and is a **spiral** galaxy.

The sun is the star that is closest to us. It is made of gases that create heat and light when they react with one another. One of the gases is helium--yep, the same gas in your birthday balloon is also in the sun! The light from the Sun blocks our view of the other stars during the day, but we can see thousands of stars on a dark, clear night.

Humans can’t get too far away from the earth safely yet, so it is difficult to study space. We do have astronauts - specially trained people who go into space, but we also send satellites, telescopes, and robots into space to learn more!

**Vocabulary**

- **Asterism** - A grouping of specific stars.
- **Astronomer** - Scientists that study galaxies, stars and planets.
- **Constellation** - A specific area in earth’s sky.
- **Galaxy** - A giant grouping of gas, dust, and star systems, including planets.
- **Pattern** - A repeated design. Also; making something intelligible or recognizable.
- **Solar System** - The planets and other matter in orbit around our Sun.
- **Spiral** - A pattern that swirls around a center point.
- **Star** - A glowing, or luminous ball of gas and plasma in space that gives off energy in the form of heat and light.
- **Universe** - All of space and time, including stars, planets, galaxies, and everything in them and between them.
The human brain is so good at finding patterns, sometimes we see patterns where there weren't any! A pattern can also be defined as making something recognizable - which is what we do when we create star groupings into pictures - asterisms!

Can you find your own patterns in these stars? Connect the dots and name your own asterisms (star patterns)!

Example: The “Peppermint Candy” Asterism!
A spiral is a pattern that swirls around a center point, and can be recreated using mathematics. Spirals are easily found in nature, and often represent a Fibonacci Spiral, which is a mathematically perfect spiral. Some examples of spirals in nature are seashells and flower petals. This pattern can also be seen in the clouds of hurricanes and even in the spiral arms of our own Milky Way galaxy!

**Fibonacci Sequence**
The Fibonacci sequence in math starts with 0 and 1 and adds them together for the next number. It then takes the two previous numbers in the sequence and adds them together to come up with the next number. This continues forever, adding the two previous numbers for the next number...

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610...

0+1=1 | 1+1=2 | 1+2=3 | 2+3=5 | 3+5=8 | 5+8=13 | 8+13=21...

**Fibonacci Spiral**
The smallest curves occur in squares measuring 1X1, then continue into a square measuring 2X2, then a square that is 3X3, then 5X5, then 8X8...etc.

Of course, not every spiral is a Fibonacci spiral; there are all sorts of spirals! We can often find spirals in art. Here you can see a ceramic vessel with a spiral decoration (right) and a Japanese helmet made in a spiral, inspired by a conch shell (left!)

Below are images of the Andromeda and the M100 galaxies - spiral galaxies like our very own Milky Way galaxy! Scientists believe these galaxies all feature Fibonacci spirals!
Create: Patterns with Stamps

Today we will be making our own patterns using handmade stamps! We have two different ways to make stamps below, choose either one or both - up to you!

**Potato Print**

**Supplies**
- Pencil
- Marker
- Paper
- Potato, cut in half or 2” high slices
- Butter Knife or child’s knife
- Paper clips and a Quarter

**Directions**
1. On a piece of paper, sketch the design you’d like to make into a stamp. Keep it simple, as it might be hard to get fine details on your potato.
2. Draw your design onto one of the cut sides of your potato with a marker.
3. With a knife, carve away the parts of the potato that are not part of the design. Make sure to leave enough on the non-carved side to comfortably hold on to.
4. Add extra details like stripes by pressing into the potato with the end of a paper clip or the edge of a quarter. This can be done safely by a younger artist!

**Sponge Stamp**

**Supplies**
- Paper
- Pencils
- Marker
- Sponge up to 1½” thick
- Scissors

**Directions**
1. On a piece of paper, sketch out the design idea for your stamp. Keep it simple--one shape is the best option.
2. When you have a design you like, draw your design onto one side of the sponge. It does not matter which side you choose.
3. Using scissors, cut away the outer edges of the sponge that are not part of your design.

**Printing Patterns!**

**Supplies**
- Stamp(s)
- Paper to print on
- Ink or Tempera or Acrylic Paint
- Plate or palette
- Towels for cleanup
- Optional: Brush

**Directions**
1. Put about a tablespoon of ink or paint onto your plate or palette.
2. Either gently dip the stamp into the paint, or evenly spread the paint onto your design with a paintbrush. Make sure not to coat it too heavily.
3. On your paper, place your stamp paint side down to transfer your design!
4. Carefully remove the stamp from the paper without wiggling too much.
5. Repeat this process again and again to create a pattern!

This project was inspired by the piece “Bryant Park”, by Peter Gee, pictured to the right. It was made in 1968 and is a serigraph in colors on white wove paper. A serigraph is an image created using silk screen printing!
Across
1. Where the conch shell helmet featured in this lesson came from.
5. A glowing, or luminous ball of gas and plasma in space that gives off energy in the form of heat and light.
8. All of space and time, including stars, planets, galaxies, and everything in them and between them.
9. A person specially trained to travel into space.
10. The name of our own galaxy.
11. A pattern that swirls around a center point.
14. Scientists that study galaxies, stars and planets.

Down
2. The name of another spiral Galaxy mentioned in the lesson.
3. A repeated design or making something intelligible or recognizable.
4. A specific area in earth’s sky.
6. Our Sun, and the planets and other matter in orbit around it.
7. The name of a math sequence that starts 0, 1, 1, 2, 3...
12. A grouping of specific stars.
13. A giant grouping of gas, dust, and star systems, including planets.
Here is a coloring page of Stencil with Abstract Design from the Worcester Art Museum’s collection! It was made of brown paper in Japan in the 19th century. This stencil would have been laid over other paper or fabric and ink pressed through the white holes to apply then in a pattern. This piece has zigzag lines that cross over each other, making interlocking patterns. How will you color it?