

4-H



JOURNEYS

IN ASTRONOMY

Issue 4

A diagram of the solar system with the Sun at the bottom left and planets on elliptical orbits. The planets shown are Mercury, Venus, Earth, Mars, Jupiter, Saturn, and Uranus. The background is a starry space with a faint Milky Way galaxy.

EXPLORING OUR SOLAR SYSTEM



UNIVERSITY OF GEORGIA
EXTENSION



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Journeys is a magazine for middle school students produced by Georgia 4-H. This issue, *Journeys in Astronomy: Exploring our Solar System*, is the fourth edition of our Georgia 4-H Middle School publication series. A journey is described as a trip, expedition, or tour. While this *Journeys* magazine won't allow you to physically take a trip, expedition, excursion or tour, we do hope it allows your mind to explore the content and concepts shared in the pages ahead.

The Chinese philosopher, Laozi, is credited with the saying, "A journey of a thousand miles begins with a single step." We hope this magazine begins a journey of exploration for you. Georgia 4-H can offer you many paths to explore in hopes of finding one that is of interest to you. In the pages ahead, you will read about individuals who credit Georgia 4-H for helping them find a path to their chosen career or college major. Through independent project work, content or subject exploration, public speaking experience, service to your community, and efforts to be part of a team, Georgia 4-H is excited to be a small part of your journey toward becoming a leader.

Join us on this journey to learn more about our solar system, career opportunities related to astronomy, and how you can help our Earth through service to your community.



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Georgia 4-H is a partner in public education and strives to incorporate relevant Georgia standards in education materials for in-school use. The following Georgia Performance Standards for Science are correlated to the content included in this publication.

S6E1: Obtain, evaluate, and communicate information about current scientific views of the universe and how those views evolved.

S6E2: Obtain, evaluate, and communicate information about the effects of the relative positions of the Sun, Earth, and Moon.



Think Green! Not just 4-H Green...but let's help do our part to recycle and reuse. Save this book, reread it or pass it along to a friend. If it's too worn, please recycle it.

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Did you know...

A solar system has a central star and a smaller group of celestial bodies (planets, asteroids, comets, and meteoroids) that revolve around it. Our solar system's central star is the sun and consists of eight major planets.

Let's learn more together!



Saturn is a gas giant and is the sixth planet from the Sun. It is most well known for its 7 beautiful rings made of ice and rock, but also has at least 53 moons! Saturn has a thick atmosphere of hydrogen and helium and is unable to support life.



Uranus is an ice giant, made of flowing icy water, ammonia, and methane above a solid core. It has 13 faint rings, at least 27 moons, and rotates on its side and backwards compared to the other planets. Uranus is unable to support life.



Mercury is the smallest planet and is closest to the Sun. Its thin atmosphere causes it to have drastic temperature changes from 427° Fahrenheit during the day to -173° Fahrenheit at night! It has no moons or rings and is unable to support life.



Earth is the third planet from the Sun, and the sun's light takes 8 minutes to reach our planet's surface! Earth has an atmosphere made up mostly of nitrogen and oxygen and is the only planet in our solar system that is capable of supporting life.



Neptune appears blue because of the methane in its atmosphere. It is an ice giant and is the farthest planet from the sun. Neptune has 6 faint rings, at least 13 moons, and is unable to support life.



Mars is considered the “Red Planet” and has a terrestrial, rocky surface with inactive volcanoes. Humans have sent rovers to explore the surface, and we hope to one day send humans! Mars has 2 moons and is unable to support life.



Venus is the second planet from the sun and is considered “Earth’s Toxic Twin.” Venus rotates very slowly on its axis, so a day on Venus (one axis rotation) is longer than a year on Venus (one full revolution around the sun). It is about the same size as Earth and has similar surface features like volcanoes, mountains, and ridges. The atmosphere on Venus is toxic and unable to support life.



The Sun is a yellow dwarf star and is the center of our solar system. The Sun is classified as a main sequence star because it has a hot, dense core which fuses hydrogen into helium to produce energy. The Sun’s energy makes life on Earth possible.

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Jupiter is a gas giant and is the biggest planet in our solar system, more than 11 times the size and 300 times the mass of Earth! It has a very thick, active atmosphere made mostly of hydrogen and helium. Jupiter has faint rings, at least 79 moons, and is unable to support life.

Spotlight on Careers

Astronaut



◀ **Dr. Peggy Whitson** is a retired NASA astronaut. She was the first to accomplish many things in space. She was the first woman commander of the International Space Station and the first non-military Chief of the Astronaut Corps. She has spent more time in space than any other American and holds the record for the most spacewalks as a female at 10 space walks! But how did she wind up on this record-breaking journey?

Peggy always loved science growing up and was inspired, like many others, by the first walk on the moon. Peggy grew up on a farm in Iowa, and she participated in 4-H as a kid! As part of 4-H, she showed heifers, did woodworking, sewing, and baking; she found the most value in developing her public speaking skills as a 4-H member. The presentations she did as a teenager helped her learn how to effectively communicate, which helped her get to where she is today.

Peggy pursued biology and chemistry in college and graduate school and applied to be an astronaut after graduating. She didn't get the job of astronaut on the first try, though. She applied and was rejected by NASA for 10 years before finally getting a fellowship, which led to a contract position, and eventually her dream job working for NASA directly. Despite those rejections, Peggy persevered and never gave up on her dream. In fact, she says that those 10 years of waiting made her a leader and, in turn, a better astronaut.

Peggy shared some advice for youth interested in STEM or Astronomy during an interview with the National 4-H Council:

"First, find what motivates you in science and learn all you can. NASA looks for astronauts in all kinds of fields, including science and engineering."

"Second, you need to be a team player! Sometimes being an astronaut means cleaning toilets on the ISS or even supporting other astronaut missions from the ground for five to seven years between your own space missions."

"And finally, being in space requires you to adapt, so being an expert in one thing and a jack-of-all-trades in others can also help you succeed!"



Photo courtesy of NASA

4-H prepares youth to be "Beyond Ready" for life by encouraging them to explore their sparks and build meaningful relationships with peers and adults. Being "Beyond Ready" also means thinking about your future and learning about careers!



Beyond Ready

United States Space Command Mobilization Assistant

▶ **Brigadier General Damon S. Feltman** is the Mobilization Assistant to the Director of Operations for the United States Space Command. He has been a part of space missions of the Department of Defense for the last 30 years and currently leads the planning of space operations. His passion about space and “space things,” like satellites, started as a young boy. He has had tremendous fun in his education and career working with spacecraft engineers, astronomers, rocket designers, physicists, and astronauts of all ages, backgrounds, and cultures.

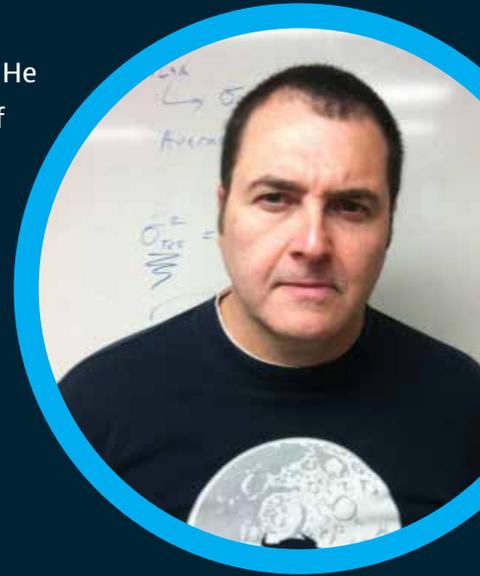
While the work can be challenging and tedious at times, Brigadier General Feltman will always remember training crews and working on his first spacecraft launch, attending his first rocket launch, observing asteroids and planets through a telescope, and working with teammates to solve really hard problems.



Astronomy Professor

▶ **Dr. Loris Magnani** is a Professor of Astronomy at the University of Georgia. He teaches Physics and Astronomy classes and conducts research with the help of graduate and undergraduate students. Dr. Magnani uses large radio telescopes to study the cold, diffuse, interstellar gas in the Milky Way galaxy. As a child, he was fascinated by the mystery and vastness of space beyond our solar system and worked as a scientist at the Arecibo Observatory in Puerto Rico before coming to UGA.

“My advice is to study science and math in high school very carefully. Try to learn as much as you can about these topics... Remember that mathematics is the language of science and the more mathematics you know, the more sense the science will make to you.”



DETOUR

Here are some career-related questions for you to think about...

- Have you ever considered a career related to astronomy?
- What skills do you have that can be applied to careers related to astronomy?
- What might you do to gain more experience in the area of astronomy?

Earth

Earth is the only planet in our solar system that can sustain life that we know of –

but what makes Earth so special?

Large, terrestrial planet with liquid water – Earth is the largest terrestrial planet with a radius of 2,959 miles across. It has a central core, a rocky mantle, and an active solid crust with many mountains, valleys, and volcanoes. Earth is the only planet in our solar system with liquid water on the surface, which is essential to supporting life. Over 70% of our planet is covered in water, and scientists believe life began in our oceans 3.8 billion years ago.

Unique atmosphere – Earth's atmosphere is made up of 78% nitrogen, 21% oxygen, and 1% other gases like carbon dioxide, water vapor, and argon. This atmospheric composition is easy to breathe, but these gases also act as a blanket creating a greenhouse effect on the Earth's surface. It protects us from the Sun's harmful radiation and from incoming meteoroids, which break up before hitting the surface. The atmosphere also affects Earth's climate and weather patterns. Unfortunately, as humans add excess greenhouse gases to our atmosphere, we are affecting both our weather patterns and our Earth's ability to protect us.

Earth's Magnetic Field – Earth rotates so rapidly that it creates a magnetic field around the planet. This causes all compasses to point north, making navigation easier. But more importantly, this magnetic field shields the Earth from the Sun's solar winds, or high-energy particles. Some of these particles get caught in our magnetic field and appear as aurorae (or more commonly known as the northern lights or southern lights) at the Earth's poles.



The Moon – A moon is the natural satellite of a planet, typically visible at night by reflected light from the Sun. Earth is the only planet in our solar system that has a single moon. Our moon's name is Luna. Scientists believe that a large body collided with Earth about 4.6 billion years ago. This object was large enough to break into the mantle! Debris from the collision began to revolve around the Earth within a few hours. As the debris began to clump together, the moon began to form. Much later, the moon cooled and additional impacts created deep basins. Our moon is relatively large in comparison to our planet and is the fifth largest moon in the solar system. The moon creates our oceans' tides and helps stabilize the Earth's wobble, which makes our climate less variable. The moon's gravitational force is only about 17% of Earth's gravity, which means an object would weigh six times less on the moon than it does on Earth.

Now that you have learned how special Earth is,
here are some ways to help keep our Earth safe... *4-H style!*

I pledge my head to clearer thinking,

Learn more about global climate change and other threats to our planet by doing your own research. Stick to reliable websites that end in .org, .gov, and .edu to get the most accurate information. Start by searching "global climate change" on NASA, NOAA, EPA, and National Geographic's websites.

my heart to greater loyalty,

Remember that we cannot save our planet alone! Tell your family and friends about what you learn in your research and help them learn how we can be loyal to our planet together.

my hands to larger service,

There are many ways you can serve our beautiful planet! You can clean up trash on your next walk or trip to the park and recycle what you can, help plant some trees or a community garden, and be sure to invite others to participate, too!

and my health to better living,

Many activities that help us stay healthy are also good for our planet! Try taking your bike or walking places rather than driving, or carpool with your friends when you are headed out! Try to conserve water and choose non-toxic chemicals for your home. And always follow the **3 R's – REDUCE, REUSE, RECYCLE!**

First, try to **REDUCE** your use of plastic by switching to reusable bags and containers for shopping and food.

Second, **REUSE** any items that you can as much as possible before disposing and get creative! You may be able to repurpose them into something else by upcycling.

Third, **RECYCLE** any paper or plastic items that you cannot reduce or reuse.

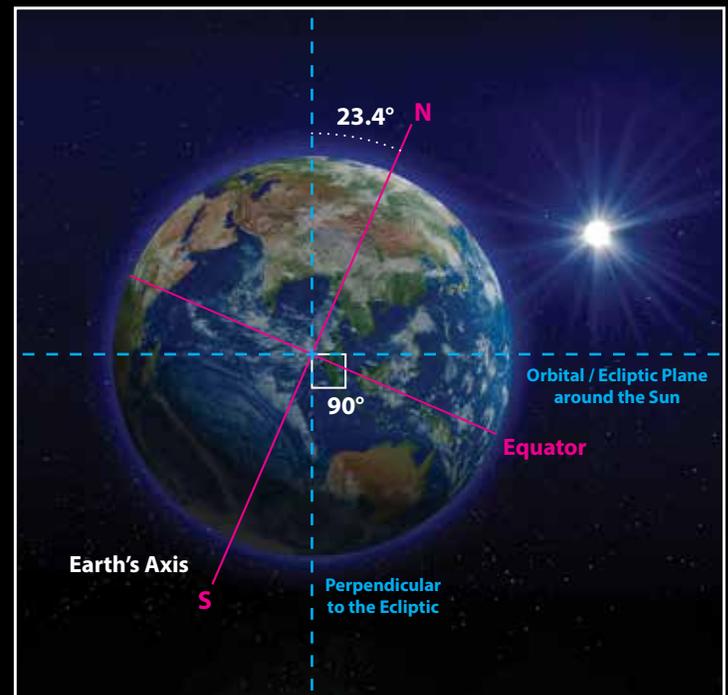
for my club, my community, my country, and my world.

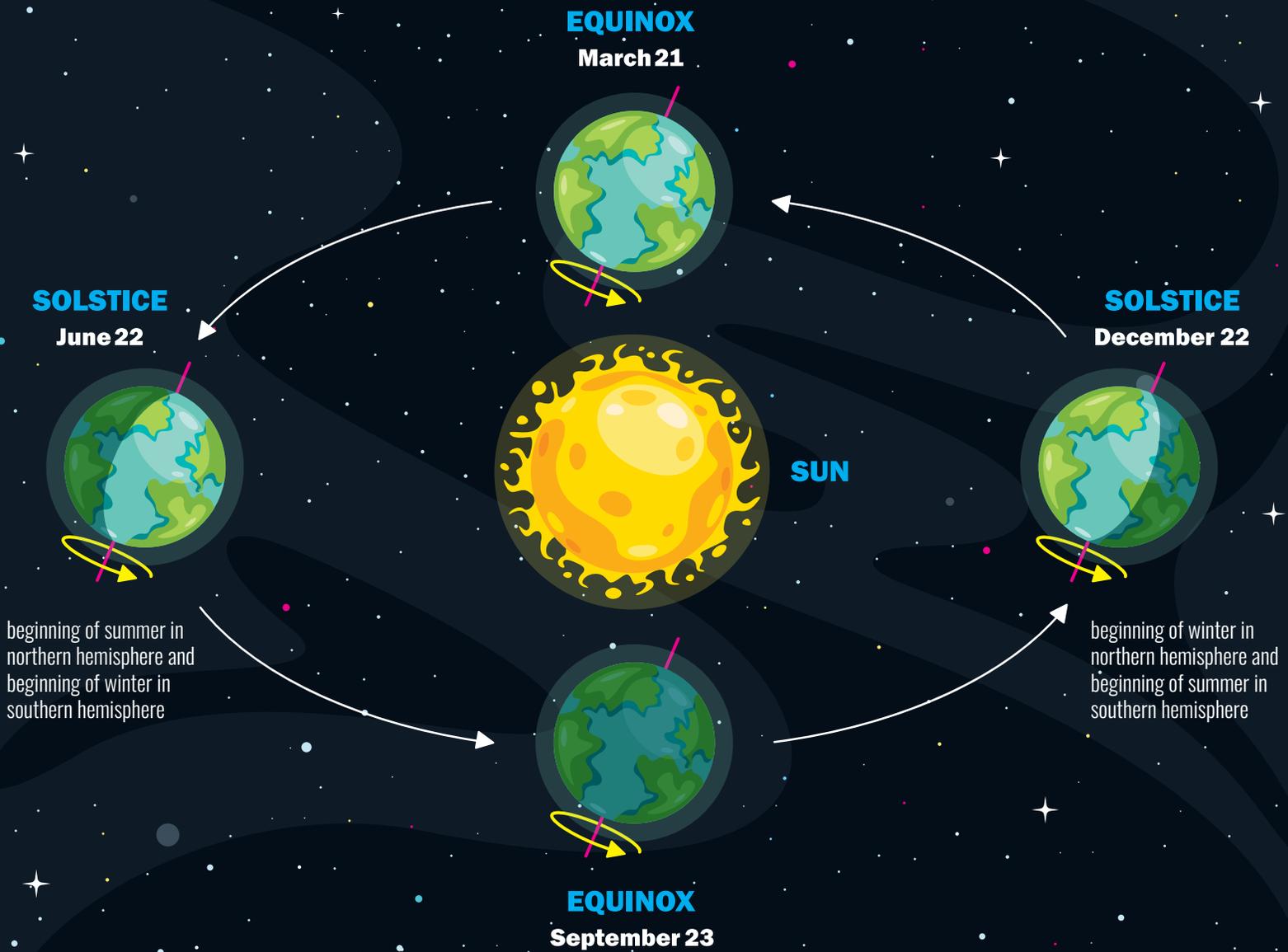
Why do we have seasons?

You probably already know that the Sun is the center of our solar system and that the Earth orbits the Sun once per year. You've also probably noticed that temperatures and daylight hours change throughout the year in seasonal patterns.

But... do you know WHY this happens?

It's because the Earth is tilted on its axis by 23.4° , and as it orbits the Sun, one hemisphere of the Earth is tilted towards the Sun and the other hemisphere is tilted away from the Sun. When a hemisphere is tilted towards the Sun, it experiences warm summer temperatures, and when a hemisphere is tilted away from the Sun, it experiences cooler winter temperatures. The hours of daylight also change with the seasons. Twice a year, on the first day of Autumn and Spring, we have days that have approximately the same number of hours of daylight and nighttime hours, known as an **equinox**. A **solstice** represents the opposite, and we experience the longest day of the year on the first day of summer and the shortest day of the year on the first day of winter.





DETOUR

Do some research to bust these myths and misconceptions. Explain why each statement is incorrect.

- The Earth is the center of the universe.
- The Sun is the only star that has planets.
- Mercury is the hottest planet because it is the closest to the Sun.
- There's a dark side of the moon.

Project Achievement



Explore Your Interests

Pursue one of your passions or select a topic that excites you! Then we will help you choose the right Project Achievement category for you to compete in based on your topic of interest.

Unleash Your Creativity

Research, write, and design your demonstration. Project Achievement is like researched and planned show-and-tell. You can choose a new topic each year or stick to one.



Share Your Story

This is your time to shine! Participants present their demonstrations in small groups to trained judges in a friendly, supportive environment.

Celebrate Your Achievements

Awards are given for top presentations in each category. You will learn about yourself and improve skills while studying the topic you chose.



Project Achievement specifically seeks to help students grow by:

- Increasing self-confidence
- Improving communication and public speaking skills
- Developing responsibility and time management skills

For more information, contact your local county Extension office!



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