Hi, I am Nancy B, and I started my science club called Nancy B’s Science Club. I want you to join me in exploring the wonders of science! You can:

- Share your journal pages with other club members and see what other projects they’ve been working on.
- Apply for my Summer Science Scholarship.
- Read and comment on the latest science news.
- Learn more about me, and meet other kids who are making a difference in our world!
- And much more...

I hope to see you there!

Nancy B

MOONSCOPE™

& Sky Gazer’s Activity Journal
Planets and comets and stars all day.
The sun and the moon high in the sky
wonderful places to see and explore.
Let’s look closer to see some more.

Welcome, amateur astronomer. Amateur astronomers love looking at the moon, planets, stars, and other objects in the sky. They gaze at the patterns of the stars. They observe and explore the craters of the moon. And they may even search the sky for UFOs.

Nighttime is the best time for an astronomer because during the day the sun is so bright that it’s almost impossible to see anything except clouds in the sky.

WARNING: Never look directly at the sun. Looking at the sun is very dangerous and can blind you. Don’t look at the sun with your naked eye and don’t look at it with your MoonScope. Don’t look at it with sunglasses either!

USING THE MOONSCOPE

Telescopes, such as your MoonScope, are cool scientific tools. They let you travel to faraway places without leaving home.

Here are three important tips:

TIP #1
Experiment with your MoonScope in the daylight. There are things to see during the day, such as distant trees and buildings. Looking at them through your MoonScope will help you learn how to set up, focus, and operate your MoonScope. Then it will be a lot easier to use at night.

TIP #2
Find Focus! Power up! When you first look for an object, start with the finder scope. Then, look through the less powerful eyepiece (20mm), focus, and finally switch to the more powerful eyepiece (5mm). It is easier to locate objects this way because the finder scope and less powerful eyepiece show you a wider field of view—the distance seen from left to right when you are looking through your MoonScope—than the more powerful eyepiece.

Make a mini poster of the three steps used to locate an object:

1. FIND!
2. FOCUS!
3. POWER UP!

Decorate your mini poster with a drawing of yourself with your MoonScope (or paste in a photo, if you prefer).

Me, amateur astronomer
SIGHT IT IN!

WHEN TO LOOK
You can do this activity any time, day or night. (If it’s daytime, remember NOT to look at the sun.)

NANCY B. SAYS TO TRY THIS!

Set up your MoonScope with the 20mm eyepiece and pick a distant object that isn’t moving. (Street lights, trees, or distant buildings are fun for this.) Place your eye about three inches away from the finder scope, look through the tube, and gently move your MoonScope so the object is directly in the crosshairs. Draw where the object appears in the finder scope. Next, look into the eyepiece of the MoonScope and draw where the object is in the field of view, but don’t be surprised if it is flipped in the opposite direction. Just draw the object as you see it. No, you don’t have to stand on your side to see the object! Because of the way the lenses in the MoonScope work, it’s normal for things to appear left-right reversed.

Notice that it’s easier to find objects first with the finder scope because it has a wider field of view than your MoonScope. What you see through the MoonScope is only what you see in the very middle of the finder scope.

3

Finder Scope View

MoonScope View

20mm Eyepiece
20x Magnification

4mm Eyepiece
50x Magnification

DOODLE A UFO HERE

Remember: Lower number eyepiece = higher magnification

EYEPiece Practice: Selecting Eyepieces

WHEN TO LOOK
You can do this activity any day of the month. It’s easier to do during the day.

NANCY B. SAYS TO TRY THIS!

Your MoonScope comes with two different eyepieces. The low-power eyepiece, which magnifies objects 18 times, has the higher number (20mm). The high-power eyepiece, which magnifies objects 50 times, has the lower number (4mm). Eyepiece numbering seems strangely backward, but the shorter the eyepiece, the greater the power! Let’s see this in action.

Pick a tree or a street sign in the distance and look at it with the 20mm eyepiece. Remember to find, then focus! Draw what you see. Switch to the 4mm eyepiece and draw what you see.

After you have done this activity with a tree or street sign, try some of these other objects: a parked car, a bird sitting on a telephone wire, or an elephant sitting on a lorry. However, it may be easier to find a car or a bird!
LEARNING THE PHASES OF THE MOON

Some people think the moon looks like a big piece of cheese. And every night it looks like it moves around the sky and changes shape. Maybe an enormous imaginary mouse eats a bit of the big cheese each night!

Actually, the moonlight that we see is sunlight reflecting off of the moon’s surface. However, since the moon moves around Earth in a kind of gravitational dance, we only get to see different parts of the moon lightened each night. The parts that we can see follow a pattern. Each part of the pattern is called a phase. The moon goes through the same phases every 29.5 days. (However, you can’t see anything for 4-5 days during the new moon.)

Study the picture of the moon’s phases below. You may wish to read more about the moon’s phases in books or online.

Some people wax their cars or their kitchen floors, but when the moon is waning it means the moon appears to be getting bigger. For observers in the northern hemisphere, when the moon is waxing, the right-hand side of the moon is illuminated.

When the moon is waning, it appears to be getting smaller. If the left-hand side of the moon is illuminated, its waning. Think of waning as “fading” to the left. (If you live in the southern hemisphere, including in Australia, this is reversed.)

If you have some sandwich cookies, take apart a cookie and scrape away some of the frosting to re-create the moon’s phases. Label each phase. Take a photo and paste it over or below this sandwich cookie picture. (Then have a treat and eat some moon cookies!)

FUN FACT

We are always looking at the same side of the moon, no matter how much of it is lit by sunlight! The side that faces Earth is called the near side of the moon, and it’s why the moon’s features always look the same. We know what the far side of the moon looks like, though. That’s because we have photos from satellites. Astronauts have seen it from orbit too!
**OBSERVING THE PHASES OF THE MOON FOR YOURSELF**

**WHEN TO LOOK**

You can start this activity anytime you see the moon...

**NANCY B. SAYS TO TRY THIS!**

When astronauts landed on the moon, did they become aliens? What do you think Earth looked like to astronauts? (From the moon, Earth goes through phases!) People have always been fascinated with the changing phases of the moon. The changing phases are actually a single day on the moon. Now, it’s time for you to watch the changing phases for yourself. For the next 28 days, look at the moon each night. Draw what you can see off it. Use your naked eye or the MoonScope. With the MoonScope, you’ll see changing shadows on the moon during the course of a month.

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**A LUNAR TOUR**

**WHEN TO LOOK**

Complete this activity on several different nights during the month. It is actually easier to see certain details when the moon is not full. The mountains and craters are most visible near the first or third quarter. The parts material (big split marks from crater impacts) is easiest to see near a full moon. The only time you won’t be able to do this activity is on a cloudy night or during a new moon. During a new moon, there’s nothing to see because the sunlight is reflecting off the side of the moon that is turned away from Earth.

**NANCY B. SAYS TO TRY THIS!**

Set up your MoonScope and look at the moon. Remember to find, then focus. Try to match the items listed on the moon map on the next page to what you see on the moon. Check them off as you find them. Don’t forget to look at the edges of the moon (as if you were trying to peer around to the dark side), because you can see the raised edges of the craters!

- If the moon is bright, try using your moon filter when you look at the moon. The filter is a bit like moon glasses for your MoonScope—it makes it easier for you to see detail on the moon when it is brightly lit by the sun. **BUT THE MOON FILTER DOES NOT MAKE IT SAFE TO LOOK DIRECTLY AT THE SUN.** Like sunglasses, it will change the color. In this case, the moon will look green. Maybe the moon really is made of green cheese!

The red light on your tripod will be a big help with this activity. You’ve probably noticed that your eyes take time to adjust to the darkness. The red light prevents your eyes from having to adjust so much between light and dark. Use the red light to read the moon map.

In the space below, write three things that you saw on the moon or how you felt when you looked at this faraway place.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
MOON MAP

Put a check in the box when you spot each location with your MoonScope.

- Mare Imbrium (Sea of Rain).Ent
- Mare Serenitatis (Sea of Serenity)
- Sinus Iridum (Bay of Rainbows)
- Mare Cricum (Sea of Crises)
- Monses Apenninus (Apennine Mountains)
- Aristarchus Crater
- Kepler Crater
- Grimaldi Crater
- Copernicus Crater
- Tycho Crater
- Mare Tranquillitatis (Sea of Tranquility)

Perhaps you or your children will visit some of these places one day! Playing a game in gravity that is only one-sixth as strong as Earth’s would be a lot of fun!

WHEN TO LOOK

Complete this activity when the moon is full or almost full. Look at the moon with your naked eye.

NANCY B. SAYS TO TRY THIS!

Have you ever looked up at the full moon and thought you saw a face? That is why some people talk about a Man in the Moon. For thousands of years that face has watched over people on Earth. Just think, the Man in the Moon who looks down at you is the very same man in the Moon who looked down on the dinosaurs and the ancient Egyptians! Pharaoh? Maybe the Man in the Moon is a woman? People can imagine all sorts of faces and creatures in the light and dark spots of the moon’s surface. Now it’s your turn to go on an imaginative journey. Look at the moon through your MoonScope, and try to use the features to form a face or animal. Draw your face or animal on the moon picture below.
MOON MYTHS

There are many myths about how the moon was created. The Native American Kalispel Tribe of the Northwest offers this one:

How Rabbit Became the Moon

Long ago someone took the moon from the sky. So, Yellow Fox became the moon. But Yellow Fox was too bright, which made Earth hot at night. Coyote became the moon instead. Coyote’s gray fur was neither too bright nor too dim. But Coyote could see everything on Earth and he hated on people who did wrong to others. The criminals didn’t like Coyote poking in their business so they forced him out of the sky by saying he was too noisy. Rabbit has almost the same color, so he became the moon, which worked well because he can curl into a circle. When the moon is almost full, you can see Rabbit’s nose and whiskers. And to this day, Coyote still pokes around in other people’s business and howls at the moon.

Here is a story from the Aboriginal people of Australia:

How a Burning Torch Became the Moon

A long time ago, when the world was young, there was no heat or light. Life was hard for people. One day, the first man in the world, Purukupali, and his friend, Japara, were rubbing sticks together and discovered fire. Purukupali realized fire would help people, so he gave a large torch of burning bark to his sister, Wurupuranla, and a smaller torch to his friend, Japara. He told them to always keep their torches burning. Wurupuranla went to the sky and became the sun-woman, while Japara became the moon-man. Forevermore, they take turns giving light to Earth.

Write your own creation myth about the moon. Maybe it can go along with what you drew on page 10. Think about these questions. Does the person or animal have a name? How did it end up on the moon? What does it do during the daytime when the sun is out? Draw a picture to illustrate your myth.

__________________________

__________________________

__________________________
THE DAYTIME MOON

Have you ever noticed that the moon is sometimes visible during the day? Does that mean the moon has forgotten to go to bed? No, not at all. It simply means Earth is turned so that you can see the sun and the moon at the same time. Because the moon travels around Earth about once a month, there are times when the moon appears to be close to the sun.

WHEN TO LOOK
The moon is out in the daytime during its quarter phases. During the moon’s third quarter phase, the waxing moon is visible in the morning. The cool morning air is a good time to observe.

Reminder: DON’T look directly at the sun! Never! Ever! If the moon is close to the sun, don’t look at the moon. It’s not worth the risk to your eyes.

It is safe to look at the moon because the moon only reflects light. The moon does not make its own light. However, the sun makes its own, powerful light and can damage your eyes. Don’t ever look directly at the sun!

NANCY B. SAYS TO TRY THIS!

In the circle, draw a line to show how much of the moon you can see with your naked eye.

Now, look at the moon through your MoonScope and fill in any additional details you see.

Were you able to see any craters on the daytime moon? YES NO

Name two ways a daytime moon looks the same or different from a nighttime moon.

___________________________
___________________________
___________________________

FUN FACT
In American folklore, corn planted under a shining moon grows slower but yields (grows) larger ears of corn. Create your own folklore about the “Daytime Moon.” The next time you are with a friend and see the moon during daylight, you can share the lore you made up. See if your friend believes it.

ON A CLOUDY DAY

WHEN TO LOOK
A cloudy sky will prevent you from seeing the moon, planets, and stars. But it doesn’t have to stop you from using your MoonScope. Do this activity during the day when there are big fluffy clouds in the sky.

NANCY B. SAYS TO TRY THIS!

Setup your MoonScope and arm it at some big fluffy clouds—they may look like fluffy elephants or hippos or just giant cotton balls! Remember, DON’T arm your MoonScope at the sun. Choose a cloud far away from the sun. Quickly draw the shape of the cloud. Then watch the cloud change. Draw the shape 10 minutes later, and then draw the cloud another 10 minutes after that. Notice how the clouds move and change over time.

First Look

10 Minutes Later

20 Minutes Later

Circle the answer to each of these questions:

Based on your observation of the clouds, do you think the night sky will be cloudy or clear? Cloudy Clear

Are more clouds arriving or are more clouds leaving? Arriving Leaving

Take a look at your local weather forecast. See if it agrees with your prediction. Tonight, peak at the sky to find out if you were right!
FIND COOL MOON DETAILS

WHEN TO LOOK

Do this activity whenever you can see enough of the moon to locate these sites: Apennine Mountains, Copernicus Crater, and Tycho Crater (which can only be seen during gibbous or full moon). The Apennine Mountains and Copernicus Crater are easiest to see during a crescent or quarter moon phase. Use the moon map on page 16 to help you find each of these three sites, one at a time. By the way, if you see purple aliens or green dinosaurs on the surface of the moon, you should tell your parents!

NANCY B. SAYS TO TRY THIS!

Use your MoonScope to look carefully at the Apennine Mountains—and the shadows cast by them. From the shadows, you can actually tell if the peaks are straight or jagged. Draw what you see.

See if you can find the central peaks inside Copernicus Crater. Sketch the crater and its peaks.

Tycho Crater is easy to find because of the long white rays spreading out from the crater. The rays are stuff that blasted out when an asteroid crashed into the moon and formed Tycho! Sketch Tycho Crater, as seen through your MoonScope.

FUN FACT

This is a picture of the lunar rover taken to the moon by the Apollo 15 astronauts who landed near the Apennine Mountains. They used it to drive around the surface of the moon to explore areas about three miles from the lunar module. (Hey, do you think it had a cup holder or GPS?) By the way, the rover’s tires were made of a special metal mesh, not rubber like on your car!

Pretty curious on the surface of the moon. Design your own lunar rover. What would you take with you in your rover? Draw those items!
THE EAGLE HAS LANDED

WHEN TO LOOK
Do this activity during one of these moon phases: first quarter, gibbous, or full moon.

NANCY S. SAYS TO TRY THIS!

Centuries ago, people used to think the dark patches on the moon were seas filled with water and probably a lot of fish and sea monsters! Now we know that the moon has no water, but we still call them seas. The seas are really hardened lava with moon dust covering them.

The very first piloted space mission to the moon, Apollo 11, traveled to the Sea of Tranquility. There the lunar module, named Eagle, landed. And there, the first person to set foot on the moon, Neil Armstrong, spoke his famous words, "That’s one small step for [a] man, one giant leap for mankind." Use your MoonScope to find Mare Tranquillitatis, which means Sea of Tranquility. Look on the map on page 9 to help find it. Draw Mare Tranquillitatis in the space below. (By the way, you may need to include some boot prints that were left by those first astronauts on the moon!)

Look carefully to see if you can find long, narrow channels called rilles. These are collapsed lava tubes.

Mare Tranquillitatis (Sea of Tranquility)

Imagine you are an astronaut returning to the moon. What would you want to explore? Design your own spacesuit and draw yourself in it, standing on the surface of the moon.

Where on the moon did you land? ____________
The boot prints are still there. (Because there is no atmosphere on the moon, and no wind or precipitation, the footprints of the first astronaut will be there forever!) Draw the design on the bottom of your boot, your very own boot print design! next to the photo of the Apollo boot prints.

I'm just kidding about seeing the boot prints—there's no telescope on Earth powerful enough to see them.
SEARCHING FOR GIANTS

Actually, you will be searching for two giant planets of the solar system—Saturn and Jupiter! That’s right; you can see planets with your MoonScope!

When to look

Planets can be seen at different times of the year. If you see something that looks like a really bright star in the night sky, it’s probably a planet—Venus, Mars, Jupiter, or Saturn.

Look online to find out exactly when and where in the sky you’ll next be able to see Saturn or Jupiter. (You may need a night sky map to help find the planets among the stars.) Another fun way to find planets is to download a night sky app onto your mobile device.

NANCY B. SAYS TO TRY THIS!

Set up your MoonScope and view Saturn and Jupiter. Remember to use the finder scope first. It will be much easier to locate the planets. Then look through the MoonScope and draw what you see in the order provided.

You’ll know Saturn for sure when you see it because of those famous rings around it! If you see a dot of light nearby, that’s Titan, Saturn’s largest moon.

Through your MoonScope, you can see Jupiter’s four biggest moons nearby. You may also be able to see stripes of color on Jupiter (these are cloud bands in Jupiter’s atmosphere).

RUN FACTS

Saturn was named after the Roman god Saturn, who was the god of time.

Jupiter is the largest of the planets. It is 11 times wider than Earth. Jupiter was named after the Roman god Jupiter, who was the ruler of the gods.

Write five words about each planet that describe your thoughts and feelings about seeing the planets up close through your MoonScope.

Saturn

Jupiter

Imagine you discovered a new planet. What is it like? Since you discovered it, you get to name it! Draw what your planet looks like through the MoonScope. Label interesting features. Write its name.
SEEING STARS

It’s time to time travel. Every time you look at a star in the sky, you are actually looking back in time! It takes time for the light from stars to reach Earth. Even light from the closest star, our sun, takes about eight minutes to reach Earth. Light from the next nearest star, Proxima Centauri, takes about four years to reach Earth. This light from some of the stars you see at in the night sky is actually millions of years old. So every time you look at a star, you’re looking back in time!

It’s hard to see the details of stars with your MoonScope because they’re so far away. However, pick a star you like and take a look anyway. Does it look different through your MoonScope? Look at a few of the brightest stars through your MoonScope. You may notice that they’re not all the same color. That’s because stars have different temperatures.

For ages, kids and adults have gazed at the stars and imagined they saw pictures—kind of like a star connect-the-dots. These pictures are called constellations. One famous constellation is the Big Dipper, shown below.

Big Dipper Constellation

You can get a star map or a night sky app to identify the constellations in the night sky.

Twinkle, twinkle, little star,
How I wonder what you are.
Up above the world so high,
Like a diamond in the sky.

—Written in 1806, by Jane Taylor

There are many poems and songs about the wondrous things in the night sky. Try writing your own poem or song.

What is your constellation’s name? ____________

Congratulations on a job well done! When you peer into your MoonScope, you are like other scientists who have gazed into the night sky to explore the wonders of space. Keep on exploring and hope you make amazing discoveries—and maybe even travel into space one day! Have fun.

—NearyS