Easy Star Gazing
Winter 2011/2012

Slide 1
I'm Street Astronomer and welcome to Easy Star Gazing. This presentation will acquaint you with the basics of star gazing. I want you to leave this presentation knowing more about what there is to see in the sky and how to see it. This presentation is focused on star gazing from your backyard or darker location. None of this presentation requires a telescope or a degree in astrophysics.

You have some handouts that I'll explain as we go long.

Slide 2
Here are the topics of tonight's presentation. The subjects will help you get around the night skies. After learning about these topics, you'll be able to have more fun star gazing any time you're outdoors at night.

Slide 3
Now the fun is just beginning when the sun sets and it's something that most people over look, the earth's shadow.

Slide 4
Our eyes stand above the horizon, so we can see down the other side of the earth. Because of this, we can see a projection of the earth's shadow on the atmosphere. Not only that, but we also see the projection of the dusk's light on the atmosphere. How does this look?

Slide 5
I took this picture of the earth's shadow about seven minutes after sunset. You can see the dark band of the earth's shadow below the red glow of sunset. This picture hardly does justice as I was also able to see a bit of yellow in the red. Many of you have probably seen this and didn't realize what was causing it. Just look opposite the sunrise or sunset. For 15 or more minutes before sunrise or after sunset you'll see the uniformly darker earth shadow rise or fall. A simple camera and short exposure was all I needed to record this image on film.

PASS AROUND THE EARTH SHADOW BOOK

Slide 6
To get around the sky, you need a road map. This part of the presentation will give you that map. This map involves just a few widely spaced constellations, so it's easy to learn and covers a large portion of the sky.

Slide 7
Our first constellations are Ursa Major and Ursa Minor. In Latin they mean the Big Bear and the Little Bear. But more people know them by the names, the Big Dipper and the

Little Dipper. In late autumn the Big Dipper passes its closest to the ground. Later this winter is will begin rising again in the northeast.

Two important stars in the Big Dipper are its pointer stars, Dubhe and Merak. They're important because they point nearly straight to this star in the Little Dipper. Who knows the name of this star?

Polaris is the lucida, or brightest star of Ursa Minor. Astronomers call Polaris, Alpha Ursae Minoris. Some times you'll hear people call this star the North Star or the Lode Star. Polaris gets these names because it's the guide to true north. To some one at the North Pole, Polaris appears straight overhead. Unlike what you may have heard, Polaris is not the brightest star in the sky nor is it exactly true north. Polaris is the 40th brightest star in the sky and ¾ of a degree (1-1/2 moon diameters) away from the point of true north in the sky.

At 430 light years away, you're seeing light from Polaris that was emitted in the year 1579.

Slide 8
Pegasus is the flying horse from Greek mythology. Pegasus was created from the blood of the dying Medusa, a monster with snakes in her hair that turned anyone looking at her into stone. The hero Perseus killed her by looking at her reflection in his shield. After killing the Medusa, Perseus flew back home on winged sandals. Before he got there, he saw a beautiful woman chained to the rocks on a beach. Her name was Andromeda and she was chained there as a sacrifice to a monster that was terrifying the land of Ethiopia.

The star that connects Andromeda to Pegasus is named Alpheratz and it really belongs to Andromeda. Alpheratz is one of only a few stars that connect two constellations together. Alpheratz is 97 light years, so if you were born in 1912, Alpheratz is your birthday star this year. Being hotter than our Sun, Alpheratz produces more ultraviolet radiation.

Slide 9
Taurus the bull represents the animal form that the Greek king of the gods, Zeus took. Zeus wanted the beautiful mortal Europa for himself.

The stars in Taurus form the horns of the bull. The lucida of Taurus is the star Aldebaran. The star is orange in color and represents the eye of the bull. If you were born in 1949 then Aldebaran is your birthday star. That's because the light you see tonight left Aldebaran 60 years ago. Aldebaran is an orange giant star, 40 times larger than our sun. Because of its large size, Aldebaran is 350 times brighter than the sun, even though its surface is cooler than the sun's.

Surrounding Aldebaran is the Hyades star cluster. The cluster is 150 light years away, so Aldebaran is not really a part of the cluster. What looks like a brand on the bull is another star cluster called the Pleiades, or the Seven Sisters. The Pleiades are 440 light

years away. The Hyades and Pleiades are nice binocular objects that Paul will tell you more about later.

Slide 10
Gemini is an ancient constellation and represents the twin heroes of Sparta, Castor and Pollux.

The two brightest stars of Gemini are Castor and Pollux. Caster is 52 light-years away and Pollux is 34 light-years. If you were born in 1957, Castor is your birthday star this year. And if you were born in 1975, Pollux is your birthday star this year.

Slide 11
Orion is one of the most recognizable constellations in the sky. In Greek mythology, Orion was a great hunter and the son of the god of the seas, Poseidon, or Neptune in Roman mythology.

Rigel is the bright white star in the lower right corner of the constellation of Orion, the Hunter. Rigel is the brightest star in Orion. Rigel is located 777 light years from Earth. So the light you see tonight left in 1232. Rigel is a blue supergiant star, 17 times more massive than our Sun, 70 times larger, and 40,000 times brighter.

Betelgeuse is the second brightest star in the constellation Orion. It's the orange star located in the upper left corner of the constellation. Betelgeuse is 425 light years away from earth. So the light you see from Betelgeuse left the star in the year 1584. Betelgeuse is one of the largest stars in our galaxy. If it replaced our sun its surface would reach over half way to Jupiter, engulfing the planets Mercury, Venus, Earth, and Mars. That's 600 times larger than our sun!

Bellatrix is the Latin word for female warrior or some times called the Amazon Star. Bellatrix is one hot star. Its surface temperature is over 38,000 degrees and is over six times larger than the sun. If you include its ultraviolet radiation, which we can't see, Bellatrix emits over 6,400 times more light than the sun. Bellatrix is 240 light years away, so the light of Bellatrix left the star in 1769.

Slide 12
Canis Major is Latin for the Big Dog. Canis Major is Orion's hunting dog. Sirius is the lucida of the constellation of Canis Major and the brightest star in our sky. Only the planets Venus, Mars, and Jupiter can surpass it in brilliance. Sirius is bright white and throws off shards of color when low to the horizon where there's more atmosphere to refract its starlight. If you were born in 2000, then Sirius is your birthday star this year because the light you see tonight left Sirius 9 years ago. The name Sirius comes from the Greek word for scorching. Early August, during the Dog Days of summer, the sun and Sirius are close together in the sky. The Greeks believed the additional heat of Sirius added to the sun's heat and made these days especially hot.

Canis Minor is the Little Dog. The Little Dog is another of Orion's hunting dogs. The lucida of this constellation is the star, Procyon. The name Procyon comes from the Greek word meaning, Before the Dog. This name is in reference to the fact that Procyon rises shortly before Sirius, the Dog Star, for mid-latitudes.

If you were born in 1998 then Procyon is your birthday star this year because the light of Procyon you see tonight left the star 11 years ago. Both Procyon and Sirius are orbited by companion stars and both companion stars are white dwarfs. White dwarfs are old stars that have consumed their supply of nuclear fuel of hydrogen and helium. The force of gravity has taken over and compressed these white dwarfs into spheres the size of planets, or about 100 times smaller that they use to be. A cubic centimeter of their compressed matter weighs about a ton. Imagine the weight of a car in a single teaspoon.

Slide 13
Here's a comparison between the sun, Aldebaran, and Betelgeuse, Rigel, and Pollux. Antares is the heart of Scorpius and it recently set. Notice that at this scale, the sun is only one pixel in size.

Slide 14
All five classical planets and the Zodiacal Light are prominent this winter. However, Mercury only makes a brief appearance in March.

Slide 15
An hour or more after sunset in February and March, look for what looks like the glow of twilight in the west when the moon is not out. Except this glow doesn't hug the horizon, it will stand up like a leaning pillar of light. That light is sunlight reflecting off dust in orbit around the sun. The glow is called the Zodiacal Light and its dust comes from ground up asteroids and comet tails. Our solar system is in need of a good dusting.

Slide 16
Mercury, Venus, and Jupiter put on a fine display on the evening of March 5th. Mercury will only be visible for another week before it drops below the horizon.

Slide 17
Venus is the Evening Star this winter. Look for it as the brilliant star in the west after sunset. It continues to climb higher for several more months.

Slide 18
Mars reaches opposition in March. That means it's opposite the sun from earth's perspective. As a result, it is at its brightest for the year.

Slide 19
Jupiter is visible in the evening this winter. In March, Jupiter will sink closer to the horizon and pass Venus as it climbs higher.

Slide 20
Saturn rises in the east after midnight until February. Don't confuse it for the slightly brighter Spica.

Slide 21
The easiest night time astronomical object to find is the moon. It makes a great object for study in your binoculars.

Slide 22
First, the moon has phases. Here are the names of the phases and the moons typical age during that phase.

When the moon grows in size it is waxing. When it gets smaller, it's waning. When the moon is less than half full it's a crescent. When it's greater than half full it's gibbous.

The moon phase begins at new moon. The moon is a waxing crescent until first quarter, or half full. Then the moon becomes a waxing gibbous until it's full. From new moon to full moon takes just over 14 days and the moon rises before sunset. After full moon the moon begins waning. So it's a waxing gibbous until it's half full at third quarter. It continues to shrink and is a waning crescent. At 29 days the moon reaches new again and cannot be seen.

Slide 23
Ever look at the thin crescent moon and see what looks like the rest of the moon? It is the dark side of the moon and it's illuminated with earth light. Sunlight reflecting off the earth casts just enough light on the portion of the moon still in the night so we can see it. The light is called Earthshine and people have often called it the old moon in the arms of the young moon. If you were an astronaut standing on the moon, you would see an earth four times larger than the moon shining in very bright blue and white light.

Slide 24
Which moon phase is the best for star gazing? Well, that depends on what you're looking for.

If you want to take photographs by moonlight, then a moon from half full to full is pretty good. If you want to see moon craters through your binoculars, then a first or last quarter moon is ideal. If you want to scan the Milky Way with your binoculars, then a new moon or waxing crescent is best.

Slide 25
There's a lot you can see on the moon with the binoculars. So let's learn the names of a few features that you can see on the moon.

Slide 26
The moon is made up of two types of terrain, maria and highlands.

The highlands are a rocky scum that was created when the moon first formed. The highlands are made of a white mineral called feldspar. It has a low density compared to the rest of the moon, so it floated to the top. Highlands are the oldest parts of the moon. We can tell this because they are heavily cratered. The highlands formed while the solar system was still forming by the collision of planet building blocks, called planetesimals.

Maria are lava flood plains. They were created when fissures erupted lava on the moon and filled the large impact basins. The lunar lava is basalt, the lava rock we see in some much of Idaho. The lava erupted on the moon after most of the impacts. So maria are devoid of the large, shoulder to shoulder craters you see in the older highlands. Maria is plural for mare and mare comes from the Latin word for sea.

Here are two rocks from Idaho that are similar to what astronauts find on the highlands and maria.

PASS AROUND THE MOON ROCK ANALOGS

These are the names of a few of the maria visible on the moon. Please mark your Lunar Maria sheet just like you see on this slide. Afterwards, we'll give you a quiz.

These mare are called
Sea of Serenity
Lake of Dreams
Sea of Tranquility
Sea of Crises
Sea of Fertility
Sea of Nectar
Sea of Vapors
Central Bay
Sea of Clouds
Sea of Moisture
Seething Bay
Ocean of Storms
Sea of Rains
Bay of Rainbows
Sea of Cold

Slide 27
Now call out the name of the mare in the next three quiz questions. Don't worry if you get them wrong, we're not giving a grade. Oh, you can also use your notes. Ready?

Slide 28
This mare is named?
(Sea of Rains)

Slide 29
This mare is named?
(Sea of Serenity)

Slide 30
This mare is named?
(Ocean of Storms)

Slide 31
Now that you know a few lunar seas, let's try a few prominent craters. Young craters have ejecta blankets and rays. Tycho is a great example of this. The craters Plato and Grimaldi are old craters and flooded with lava. Please mark your Lunar Craters sheet just like you see on this slide. Afterwards, we'll give you a quiz.

Slide 32
At first quarter moon there are a ton of craters long the terminator, but these three stand out the best.

Slide 33
Now call out the name of the crater in the next three quiz questions. Don't worry if you get them wrong, we're not giving a grade. Oh, you can also use your notes. Ready?

Slide 34
This crater is named?
(Tycho)

Slide 35
This crater is named?
(Grimaldi)

Slide 36
This crater is named?
(Copernicus)

Slide 37
Probably everyone has heard of the man on the moon. But how many have seen him or the rabbit on the moon? Here's how the maria on the moon create the images of a young woman, older man, and a rabbit.

As the moon traverses the sky, it appears to rotate. That occurs because the moon keeps its poles pointing in the same direction with respect to the solar system. The moon's rotation emphasizes different aspects of the mare.

Slide 38
As the moon rises, its North Pole tilts towards the left. This can make the mare appear as a woman who is dancing or reading or reading a book.

Slide 39
A little later, the moon's North Pole points more towards the top. The rotation gives the mare the appearance of the Man on the Moon.

Slide 40
Closer to moon set, the lunar North Pole appears to point towards the upper right. The moon's apparent rotation is great enough that we make out a rabbit shape on the moon. In Japan, this rabbit is the Shogun of the Moon.

Slide 41
The moon makes a great guide to the night skies. You all should have a winter lunar guide. If you can take a quick look at it, you'll see that it lists the days of the moon phases and when the moon is near a planet or star that we have discussed.

Slide 42
The full moon crosses through the earth's shadow on the morning of December 10th. Here in Kansas we will only get to see the early part of the eclipse. If you go outside after 5:00 AM you will see the moon getting dark before it sets.

Slide 43
Along with planets and stars, you'll see meteors while you star watch. So let's take a minute to discuss them.

Slide 44
Most meteors you see are bits of comet dust. When a comet enters the inner solar system, it forms a tail of dust and gas. The dust follows the comet in its orbit around the sun. When the earth passes through the orbit of a comet, dust ejected from its tail years or centuries ago will slam into the atmosphere. The dust and sand grains can have speeds approaching 70 miles per second. We call this tiny particle a meteoroid.

Slide 45
When meteoroids enter the atmosphere that fast, they create a shockwave that compresses the air ahead of it. The shocked air gets very hot; so hot that its heat will warm and melt the grain. The meteoroid creates a channel of hot glowing air and appears as a luminous streak in the night sky. That streak is called a meteor, or falling star. Most meteors you see are 60 to 80 miles above the ground and will melt and vaporize long before they can reach the ground. Sometimes the air is left glowing like the gas inside a fluorescent light. When this happens, a faint trail is left hanging in the sky. The trail can persist for several seconds to more than several minutes. A meteor flashes across the sky in just a few seconds.

BEGIN METEOR WATCHING

So normally, when some one says, "Oh, there's a good one"!

TURN TO LOOK

…it's usually over before anyone can see it.

Occasionally though, you'll see a slow one that takes 5 seconds or longer to travel. Larger and faster meteoroids create the brightest meteors. Some times they can be as bright as the moon. Really bright ones are called bolides and they can end in a terminal burst of light. The burst of light can be followed by fainter colored sparks.

PASS AROUND METEORITE

If a meteoroid is large, several inches or larger across, they can survive their passage through the atmosphere and land on earth. A meteoroid that makes it to the ground is called a meteorite. Here's one example of a meteorite. Please don't drop it on your toes.

Slide 46
Because comets follow the same orbit around the sun, earth will run into their dusty orbits the same time each year. When this happens, we see an increase in the number of meteors per hour. This is a meteor shower. Meteors from the same shower enter the atmosphere in the same location. This makes them appear to radiate from one point in the sky. Perspective makes them appear to fan out like this slide shows. If you trace the meteors back, you'll find they appear to originate from one point in the sky.

Typically, on any given night there are seven meteors per hour. During a meteor shower the number can go up to over 60 meters per hour, or one per minute.

The three showers this winter are the Geminids, Ursids, and Quadrantids. The Geminids are the most promising this winter and all the showers are listed in your meteor shower handout.

Slide 47
Along with meteors, you also see satellites drifting across the sky. Satellites look different than meteors or airplanes. Meteors are swift and can change in brightness very fast. Airplanes blink and show color. Satellites on the other hand drift slowly across the sky and tend to not change brightness, or at least not very fast.

Slide 48
Satellites are visible when the sky is dark but the sun is not far below the horizon. When the sun is not far below the horizon, its light will still illuminate the satellite. We see that reflected sunlight in a dark sky. In dark skies you can expect to see at least half a dozen satellites. They will appear as stars slowly drifting across the sky. A satellite can take as long as fifteen minutes to travel from one horizon to another. Often the satellite will fade out long before reaching the horizon. That's because the satellite has traveled out of the sun's light and into the earth's shadow. Some satellites slowly pulsate in brightness. These satellites are usually rocket boosters left in earth orbit. As the long cylindrical

booster tumbles end for end, its size and therefore brightness appears to fluctuate. Satellites will not blink, nor will they have lights right next to them. Those are airplanes.

The most enjoyable satellites to look for are the ISS and Iridium satellites.

Slide 49
To find when ISS will be visible or an Iridium satellite will flare, go the Heavens Above website, www.heavens-above.com. Then under configuration, select the option to pick a location from their database.

Slide 50
In the Name field, type your city. As long as it's not a tiny little town, Heavens Above will have one or more entries for the town's name. Select your town and state. Then save the website under your favorites so you can select it anytime you want to know what satellites are visible. Alternately, go to my website, NearSys.com and look under Easy Star Gazing – you'll find the direct link there.

Slide 51
Now that you're looking at the right page, select either, ISS passes for the next ten days or Iridium flares for the next seven days for the town closest to where you live. Be sure to save this webpage in your list of favorites.

Slide 52
The report will look like this. In your packet, you have the same reports for Topeka/Lawrence.

BRIEFLY DESCRIBE WHAT'S ON THE LISTING, POINT OUT IF SOMETHING BRIGHT IS HAPPENING TONIGHT

Slide 53
How many people own binoculars? Did you know binoculars are a great astronomical tool? They're easy to point and you can use both eyes. Briefly let's describe binoculars and what you can see with them.

Slide 54
First, you'll notice there's two popular numbers associated with binoculars. For example, 7 by 50. The first number is the magnification of the binoculars. The larger this number, the larger objects appear magnified in your binoculars. You really don't need high magnification in your binoculars. A magnification of 7 or 10 is plenty. Too much magnification usually means the binoculars are larger and heavier. That means they're harder to hold steady. You won't see nearly as much detail in binoculars if they shake in your hands.

The second number is the diameter of the objective lens in millimeters. 50 millimeter lens are two inches in diameter. The larger the diameter, the more light they gather and

the brighter objects appear. But also the larger the objective, the heavier the binoculars and the more difficult it is to hold them steady.

A pair of 7 by 50 or 10 by 50 binoculars is perfect for camping.

HOLD UP A PAIR OF BINOCULARS

Here are two important things to check on binoculars before buying them.

Alignment: First check that they are properly aligned. If the binoculars aren't aligned, the images in your eyes aren't aligned either. That means you'll see double images rather than a single object.

Focusing: Check that the binoculars focus properly when you aren't wearing glasses. Most binoculars focus with a ring in their center. Take off your glasses and try focusing a binocular at something on the horizon. If you can't twist the focuser enough to remove the blurriness of the horizon, then look for a different pair of binoculars.

HOLD UP MASSIVE BINOCULARS AND SHAKE

Binoculars views are best when the binoculars are held steady. So try propping them on stationary objects like a tree. Alternatively, you can now purchase a pair of image stabilized binoculars. These binoculars use a prism that bends the path of light. The prisms moves around to compensate for the movement of your hands.

Slide 55
Here's a list of easy to find objects to look at in binoculars this winter.

Slide 56
There's a galaxy of over 100 billion stars that's easily seen in your binoculars. Andromeda is the thin curving V coming from Pegasus. The bottom row of stars is most easily seen. The second star in the row is the brightest, so aim your binoculars there. Look up to the next star; you can't miss it in your binoculars. With those two stars in sight, go the same distance up once more. There's a star you'll see with a large fuzzy cloud next to it. That's Andromeda Galaxy. The galaxy is bright in the center and noticeably longer than it is wide. In dark skies it will stretch nearly across your binocular's field of view

Slide 57
Both the Hyades and Pleiades are easy to find with just your eye. Look straight at them and then lift your binoculars to your eyes. The Pleiades cover a smaller area than the Hyades and looks like a miniature dipper. To the naked eye, you may see six members of this star cluster. When you look at them in your binoculars, you'll be repeating a feat that Galileo did in 1609. Galileo was delighted to see so many stars in the Pleiades. When you look at them, try counting the number of stars you can find or even draw a map of the

stars in the cluster. Astronomers have determined there are over 1,000 stars in the Pleiades and the cluster is 440 light years away.

The Hyades is larger and more spread out. It will fill the binoculars with a couple dozen stars. The cluster is 150 light years away and there are at least 200 stars in it.

Slide 58
The largest nearby stellar nursery is visible to the unaided eye as a fuzzy star in Orion's Sword. This giant cloud of dust and gas is 1,600 light years away. Inside hundreds of stars are forming from swirling clouds of dust and gas. The young hot stars forming inside are blasting the cloud with ultraviolet radiation and making it glow like the inside of a fluorescent light bulb. Through your binoculars, you'll see a white fuzzy cloud.

Slide 59
Look for the moon on December 14th. That's because it will lead you to Mars and a famous star cluster called the Beehive. The Beehive can be seen with the naked eye as a fuzzy star in dark skies. In your binoculars, you'll see at least a dozen stars in a compact group that will remind you of swarming bees.

Slide 60
The brightest star in Perseus is part of an association, or small group of stars. There are too few stars in it for astronomers to call it a cluster, so instead they call it an association. The Alpha Persi Association formed from the same cloud of dust and gas. In time, the stars will drift a part, since their mutual gravity isn't strong enough to hold them together.

Find Perseus and then its brightest star, Mirfak. Keep your eye on it as you raise your binoculars to your eyes. You'll see a sprinkle of stars surrounding Mirfak.

Slide 61
Let's next talk about using your digital camera to take astronomical photographs. It's easier than you think. And if you plan to go camping next year, keep in mind that cameras are small enough to fit in a back pack. You can find equally small tripods also.

POINT OUT CAMERA ON TRIPOD

To take astronomical photographs you'll need a camera with bulb setting. This lets the camera shutter remain open for as long as you wish.

Then you need a tripod to hold the camera steady. Exposures at night are from several seconds to several minutes or even hours long. Without a tripod you'll have to rely on propping your camera up against a stationary object like a rock. Here are two examples of tripods. Both are light weight, but one is a lot smaller than the other.

HOLD UP MINI TRIPOD

Then you need a cable release. The cable release does two things. First it lets you open the camera shutter without jiggling the camera. It also lets you lock the camera shutter open.

Here are some examples of what you need to photograph at night.

Be sure your camera lens is focused for infinity. If it's not, the stars become fuzzy circles in your pictures.

Here are some examples of what you can record.

PASS AROUND FRAMED PICTURES

Star Trails: If you leave the camera pointed at the sky and the lens opened for several minutes to several hours, you'll record the paths of stars as they travel across the sky. Typically you want to place an interesting landscape in the foreground. If you want the trails long, you need to leave the shutter open a long time. During long exposures the film becomes less sensitive to light and it can overexpose and fog. One way to get around this is to increase your lens' f-ratio. Instead of leaving the lens wide open, you can slow it down to f-8.

At the end of your star trail photograph you may want to flash the foreground. Since the flash is so brief, the sky above the terrain remains dark. Flashing brings out foreground features while retaining the already recorded star trails.

Aurora: Auroras are pretty bright, so an exposure of 15 seconds can plenty long enough. For an aurora photograph, leave the lens wide open.

Satellites: If you know when a bright satellite, like ISS or an Iridium flare will occur, you can position the camera in advance and let the satellite drift through. Since this normally takes less than 10 minutes, you can leave the camera lens wide open.

Meteor Showers: Recording meteors usually takes a lot of film unless you're lucky or there is a significant meteor storm. To record the faintest meteors, leave the lens wide open and keep the exposures less than an hour. The darker the sky, the longer the exposure can be.

Landscapes: Just because the moon is out doesn't mean you can't photograph at night. Moonlight adds an ethereal feel to a landscape. So set your camera up and leave the shutter open for several minutes.

Slide 62
The four largest satellites of Jupiter can be photographed with an optical zoom of six power. In this example, the slide compares the image form the camera to the prediction by a planetarium program.

Slide 63
A several second exposure recorded this image of the Pleiades star cluster.

Slide 64
This is what my camera recorded when I pointed it at the Hyades star cluster.

Slide 65
I took exposures of the small and large dipper for over two hours. The images were enhanced with a free program called GIMP and then I used Microsoft Movie Maker to animate the images. The movie I created shows the earth's rotation over a two hour period.

Slide 66
There's more detail on your resources hand out.

Slide 67
First, check out the local astronomy club's website. The Northeast Kansas Amateur Astronomer's League has an observatory they open to the public once a month.

Washburn University has a planetarium that you may schedule for shows by calling the physic department.

The University of Kansas has an astronomy associates that sets up telescopes at the Prairie Park Nature Center and a city park in summer.

South of Kansas City is an observatory open to the public. Powell observatory is open weekly and by reservation.

Monthly star maps are available at Starmaps.com. Over the course of a year you can learn your way around the night sky with their map downloads.

You can get Street Astronomer tweets and copies of this presentation by visiting my website, nearsys.com. Click the Easy Star Gazing link.

Slide 68
A planisphere is an adjustable version of the star map and they're available from book, camping, camera, and science museum gift stores. Here's how you use one.