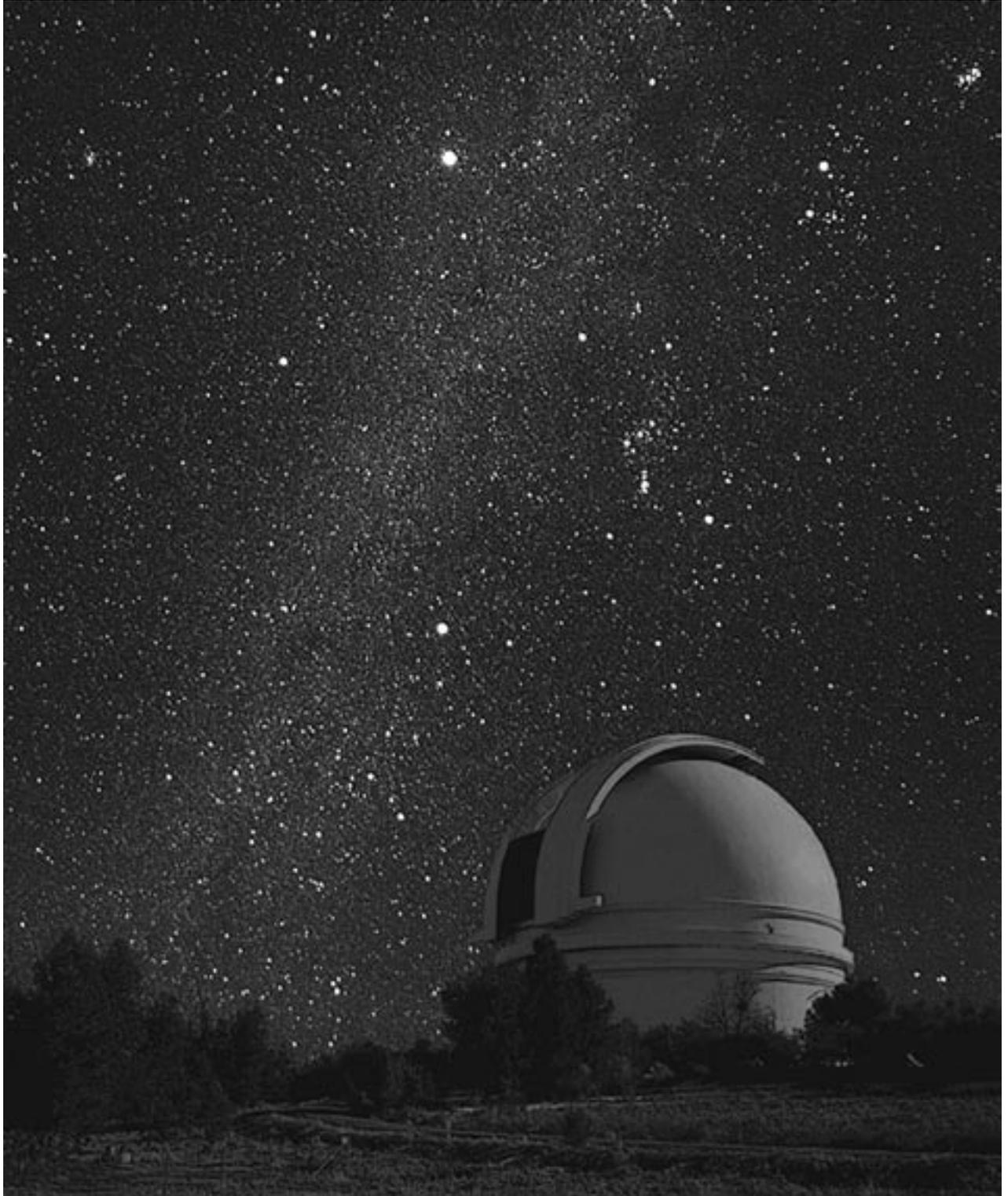


WHAT'S UP 2006:
365 DAYS OF
SKYWATCHING



TAMMY PLOTNER

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365 DAYS OF
SKYWATCHING

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“The fairest thing we can experience is the mysterious.
It... Stands at the cradle of true art and true science.”
– Einstein



“SOUTHERN AURORA IN OHIO”
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FOREWORD

Greetings, fellow SkyWatchers! Are you ready for a whole year of what's up in the night sky? Then look no further as we present the best of what can be seen on any night. In these pages you will find lunar features, planets, meteor showers, bright and double stars, open and globular clusters, as well as distant galaxies. There's astronomy history to explore here, just as there is some science. You'll find things here for those who enjoy stargazing with just their eyes, binoculars, or even the largest of telescopes!

While these observing tips are designed with all readers in mind, not everyone lives in the same time zone, same hemisphere, nor has clear skies every night. No matter where you live, or who you are, it is my hope that somewhere here you find something of interest to keep you looking up!

I am...~Tammy Plotner

Learning the Night Sky...

If you are new to astronomy, perhaps one of the most difficult and daunting parts about beginning is learning all those stars. Relax! It's a lot easier than you think. Just like moving to a new city, everything will seem unfamiliar at first, but with a little help from some maps, you'll soon be finding your way around like a pro. Once you become familiar with the constellations and how they appear to move across the night sky, the rest is easy.

Thanks to the good folks at Sky and Telescope magazine, we've provided you with some "sky view" charts to help guide the way. They outline the constellations that can be seen at any particular time of the year and will help you greatly on your way. There is also an optional download of sky charts created by Jeff Barbour that list objects in even greater detail, as well as a key of Greek letters to help you read them, and help to understand star hop instructions. Keep in mind the constellation charts are oriented just as if you held the map over your head, while star charts are printed in the order in which the sky moves - north is up and east is left.

These pages also contain a simple way of helping you understand relative positions and sizes in the sky. In some instances, you will find directions to certain objects to read a "handspan" or a "fingerwidth", but what exactly does that mean?

While not everyone's hands are the same size, these types of instructions

will help to put you in the general area of an object you are looking for. A “hand-span” is a measurement from the tip of your little finger to the tip of your thumb when held outstretched at arm’s length. For the most part, this simple measurement covers around 20 degrees of sky. A “fistwidth” is your hand closed at arm’s length and covers around 10 degrees, while a “fingerwidth” is around 2 degrees. Although these type of instructions are not foolproof, if you remember that north-east is always northeast - no matter if a constellation is rising or setting, you’ll find these simple directions will help you to find the right area to begin.

Observing Equipment...

While I would love to be able to tell you which binoculars or telescope would be perfect for you - I can’t. The choice in equipment is just as individual as one’s taste in automobiles. Every person uses equipment differently and under different circumstances.

Let’s start with binoculars...

Anyone every vaguely interested in the night sky should own a pair of binoculars - even inexpensive ones. While they will never reveal the heavens in quite as much detail as even a small telescope, their availability, ease of use, and portability make them the perfect night sky companion. It takes no effort at all to aim them towards the stars and begin! But which ones?

The very best size for astronomy are 7x50 and 10x50 models of the porro prism design, yet even the modest 5x30 models will show a wealth of sky objects. While it might be tempting to get the “monster” models, remember the weight and how difficult it would be to steady them! Very large binoculars truly require a mount of some type. There is no recommended brand, but I suggest when purchasing to keep in mind they might get dropped or lost.

Don’t be afraid to ask to try models out before purchasing. They should be comfortable to hold, and when you look through the eyepieces, the field should be evenly illuminated. When you look in the main lens, white reflections mean poorly coated optics, while deep purple and green reflections indicate higher quality. Better models will have a right diopter adjustment, and check to see that both sets of lenses are well collimated. No matter which you chose, I guar-

antee you'll enjoy these hand-held "twin" telescopes!

Now let's move on to telescopes...

There are three designs. The refractor uses a lens to gather light, the reflector uses a mirror, and the catadioptric uses both. No matter which style you prefer, the object is light gathering ability - not magnification. The larger the aperture, the more light it gathers and the more power it has to resolve. Steer clear of small telescopes you see in department stores and most camera shops, they are almost invariably low quality and for about the same amount of money you can end up with a fine telescope capable of years of use.

The refracting telescope is favored by those who enjoy high power views of terrestrial subjects, as well as the Moon and planets - and provides suitable light gathering ability for plenty of deep sky. Because the eyepiece is located at the end of the scope, it is often necessary to use a right angle attachment to put the eyepiece in a comfortable location. While many claim a refractor is superior for seeing details, keep in mind that this style may put you in some very uncomfortable positions! The reflecting telescope is the instrument of choice for deep sky observing. Large aperture is far more affordable and the performance on lunar and planetary objects is more dependent on the quality of the optics and seeing conditions - rather than the design. With the eyepiece located on the top side of the body of the telescope, this type of telescope is primarily used by observers who prefer to stand. Even the smallest (114mm) reflector will provide enough deep sky studies to keep the average SkyWatcher entertained for a lifetime! Do they have a flaw? Yes. With large aperture also comes large size, and portability may become an issue. Do not let the word "collimation" frighten you. It is just the act of occasionally adjusting the primary mirror and is no different from tuning a guitar.

The catadioptric design should thereby fulfill the best of both worlds - shouldn't it? The answer is yes - but it doesn't come without drawbacks. This style telescope is very expensive and prone to "dew" up without corrective measures.

Now let's talk mounts...

Here again we have three basic designs - the altazimuth, the equatorial and

the dobsonian. The altazimuth swings left/right and up/down - and requires manual adjustment to track. These inexpensive and easy to use mounts are best suited to small refractors. The equatorial design moves in right ascension and declination. When aligned to the pole, they only require a slight turn of a slow motion control to track and are capable of being fitted with mechanical tracking devices. They come in a variety of weights and sizes suitable for any type telescope and almost all come equipped with setting circles.

The last type of scope is the dobsonian. Much like the altazimuth, it moves up, down, and side-to-side...but requires no tripod. It is nothing more than a simple, well-balanced rocker box. With small aperture dobs, this inexpensive design spells total freedom to travel with your scope, but plan on having a back-ache while using it. Conversely, larger models have a more comfortable viewing position but lack portability.

So, how to chose?!

More than anything, you must ask yourself what type of observing you enjoy the most and what scope meets your needs - and your budget. There's no point in buying a large dobsonian if you need to travel to a dark sky location to use it. You'll never be happy with a small refractor if you have dark skies outside your backdoor and an itch to galaxy hunt. I own models of every type and there's a reason for each one:

The small refractor (102mm) and its easy, lightweight mount is the perfect companion for travel. It's simple to carry, simple to set up, and provides great views - but not everything I want to see.

The small reflector (114mm) is the workhorse of my fleet. It provides great lunar, solar and double star views - along with the capability of capturing all the Messier objects and a goodly portion of the NGC targets. It's lightweight, portable enough, and I usually have at least two of the three I own always fully assembled and ready to be set outside at a moment's notice. They are all fine performers, but...I could still wish for just a little bit more.

The mid-size catadioptric (150mm) scope is a more tedious set up, but gives outstanding lunar and planetary views. It resolves tough double stars and provides crisp resolution on most star clusters. If astrophotography were a goal of mine - this would be the scope I would choose. But,

given the telescope's expense, it's usually carefully packed away and seldom used on a whim.

The larger equatorially mounted reflector (8") is a superb tool for low surface brightness objects. With its big light grasp and resolution, this is a very fine scope to spend an evening (or many!) with. It's fairly easy to transport, a little difficult to set up, but the views are quite worth the time and effort. If I need portable aperture - this is the one I chose. But it still can't quite reach those faint galaxies...

The dobsonian model (12.5") is my study scope. Far too large to be even remotely considered portable, it spends its life on self-styled transportation. While newer models are much lighter in weight, this scope needed a way of moving it from place to place without killing its owner. Once I had designed a way of transporting it with ease, the whole vista of the heavens opened up. Now I was able to totally resolve clusters, study very faint galaxies, home in on lunar and planetary features, and split intense double stars. The dobsonian design left me with total freedom of movement and after more than a decade of use, I have still not seen everything this scope is capable of.

Of course, I have ridiculously large aperture at my disposal as well, but the 31" is housed in a professional observatory and what it "sees" is almost unfair compared to backyard equipment! And now for the next major issue...

To "GoTo" or not to "GoTo" ...

Again, this is a matter of personal preference. It is my honest opinion that you do yourself a disservice by not learning to manually aim a telescope at an object. There is great joy to be had in studying the sky and finding a distant galaxy using nothing more than a map and your own two hands. So many folks have these wonderful systems gathering dust because they found out that it requires perfection in positioning as well as basic sky knowledge to use. Regardless of the claims of how many objects a database contains - only experience will tell you how many of these objects can be seen with your scope and sky conditions!

But do not be angry. There is also a beauty in these systems. For those with limited time, it only takes a little learning to use. Many such systems are also able to identify objects by their coordinates, so they do

have their good points.

And so we come to eyepieces...

The bottom line is - you get what you pay for. A highly expensive eyepiece will not turn a bad telescope into a good one, but it will turn a good telescope into an awesome one. My best advice is to start with the mid-range priced optics and a very simple variety of sizes. 32mm is great for wide field views, 25mm and 17mm are fantastic for most work. 12mm, 10mm and 5mm are the powerhouses, and without a drive unit on a telescope often provide so much magnification as to be uncomfortable on most scopes. Like fishing lures in a tackle box, you'll find yourself collecting a variety of eyepieces over the years - and each will favor certain uses. Only experimentation will provide the eyepieces that are right for you and for your telescope.

Now for accessories...

These are the fun things to have, but none of them are necessary to practice astronomy: a sturdy case, a barlow lens, a set of basic color filters, a Moon filter, a polarizing filter, and a nebula filter. Optics cleaning kits are great - but a word to the wise - don't stress about sparkling clean optics. Unless it is more than 20% obstructed you will probably do more harm than good in cleaning. And there are so many little things that make observing fun, and fun to have in your "kit." But what do you really need?

The very best accessories I recommend are a comprehensive Moon map, an easy to read sky chart, a watch, a pad of paper, a mechanical pencil and a red flashlight. These are the most important things you will ever use. While basic maps are provided with this book, you may find charts of your own that you prefer. While note keeping is not a necessity, you'll find more often than not that you'll need it. Basic sketches are easy and you might find that you'll refer to your own notes often. Keep track of what you do, what you use and when you see it... There are many fine observing programs offered through the Astronomical League that provide awards for your study. And who knows?

You just might discover something new...

Ready To Observe...

The Moon

Let's start with one of the most simple to find and highly rewarding objects to study - the Moon. Its rugged craters, high mountains and vast seas offer some of the finest details to be found in any astronomical target. It changes every night as the terminator - the line between sunset and shadow - progresses over the surface, revealing new details.

Unlike a star chart, Moon feature instructions are based on lunar topography and not our Earthly cardinal directions. While these pages outline what features should be visible on any given night, the position of the terminator may be slightly different for viewers in various time zones.

Let's start by discussing how and when the Moon can be seen...

The Moon and Earth both rotate at exactly the same speed, so we will always see the same "side" - yet its elliptical orbit causes a kind of "wobble" that we refer to as libration. This means there may be times when you can see just a bit more along the Moon's limb - the visible edge. When the Moon's orbit carries it between the Earth and the Sun, this is referred to as "New Moon." It's still there...but we cannot see it.

As its orbit progresses, the Moon will slowly move to its first position, appearing in the night sky just after the Sun sets. The sunlight on the lunar surface will begin its march across the surface, progressing from lunar east to lunar west. At either pole of the Moon is the area called the cusp - the tip of the curve where the terminator ends. This progression of light is called the "waxing" phase.

When the Moon has reached the second position, it is now directly opposite the Sun in our sky and the surface is totally illuminated - "Full Moon." At this time, the Earth is between the Sun and the Moon. Most of the time, the Moon's orbit will either carry it north or south of the Earth's shadow, but about every six months it will slip inside that shadow and a lunar eclipse will occur. When it passes only partially into the cone of shadow it is known as a penumbral eclipse and when it is directly aligned it will be known as a "full" or umbral eclipse.

Now the Moon is heading towards its third position and moving back

towards the Sun. It will rise later each night and the terminator will now progress across the surface in the same direction - east to west - but this time the features will be seen at lunar sunset instead of sunrise! This is known as the “waning” phase. It will become slimmer each night as it heads toward the rising Sun.

At first, the lunar landscape will look quite confusing - but keep in mind that lunar north has fewer craters than lunar south. As you study the Moon from month to month, craters will become more familiar to you and it won't be long until you know their names and can often tell what features will be visible - without even looking!

The Planets

Just like the Sun and Moon, the planets dance along an orderly path in the sky known as the ecliptic plane. Their progression against the background stars will seem slowest when they are the furthest away. During an observing season, it's possible to watch as the Earth overtakes a planet, much like running past an object on a racetrack. As we approach it, it will seem to slow down, stand still, and then move backwards as we go by. Once we have passed, it will then appear to resume forward motion.

Since Mercury and Venus are on the inside track of our racecourse, they move much more quickly around the Sun than the outer planets do. They will always appear just ahead of the rising Sun, or just after the setting Sun - and like our Moon - will go through phases as they progress in their orbits.

Mars, Jupiter and Saturn are three of the most highly observed planets, and at times, can offer up wonderful details to the telescope. But do not be disappointed if you do not see fantastic things on your first night out! There are many things to be considered when viewing these planets. Stop first to consider their distance at any given time, and the effect of our own atmosphere on observing conditions. Do not be discouraged! Large binoculars and the smallest of telescopes will reveal Jupiter's equatorial bands and clockwork movement of the four Galilean Moons...even the rings of Saturn! As aperture - the size of the optics - increases, so does the amount of detail that can be seen... But even the largest of telescopes cannot compensate for poor viewing conditions!

The outer planets - Uranus, Neptune and Pluto - also follow the ecliptic

plane. Both Uranus' and Neptune's movements can be followed with binoculars, but even large telescopes offer little detail due to their great distance. Pluto is an observing challenge, requiring extensive map and study work, but it's a highly rewarding experience for the mid-to-large telescope.

Night Lights

Of course, there are other things within our own solar system that can also be easily studied - such as asteroids, comets and satellites. Given the nature of this book - which was created without the use of a planetarium program - these types of studies are best undertaken with the aid of either software or magazines such as *Sky and Telescope* or *Astronomy*. There are also on-line tools available to assist you and you'll find reference to all of these in the resource area.

You'll also enjoy meteor showers throughout this observing year as well. While the dates that we pass through these cometary debris streams are predictable, the fall rate - the estimated amount that can be seen in a given time - is not. As a rule of thumb, you can see any given meteor shower from either hemisphere if you can see the constellation of the radiant - the general area from which they appear to originate. Keep in mind that ambient light plays a huge role in how many meteors can be seen - and the darker the skies, the better your chance for success.

Deep Sky

This is the term given to objects that reside outside of our solar system. These include single stars, multiple star systems, open or "galactic" star clusters, globular clusters, nebulae and distant galaxies. While many of these objects are within reach of small binoculars, just as many reside at the outer limits of the capabilities of a large telescope. It wouldn't be such a delightfully challenging hobby if everything were easy!

Let's Begin...

There are a few things to keep in mind as you begin exploring deep sky and the

most important is sky conditions. Even the largest of telescopes will have difficulty catching a faint galaxy through light polluted skies or during poor atmospheric conditions (“bad seeing”). Nothing is a better teacher than experience and it won’t take long before you learn what your equipment is capable of.

For example, from a dark sky site with favorable atmosphere, it is entirely possible to see the majority of the Messier catalog of objects with a pair of 5x30 binoculars...or even some objects with just the unaided eye. But binoculars are not the Hubble telescope and you need to understand what you might expect to see! A nebula will appear as a faint glowing cloud, a globular cluster as a round contrast change, and a star cluster as a “patch” of concentration. None of these will be particularly large given the fact that binoculars offer a wide field of view and little magnification. But how wonderful it is to use such simple equipment to view things so many light-years away!

A small to large telescope will increase that light grasp and allow you to see progressively fainter and fainter objects - and in greater detail. Instead of a round “smudge” when looking at a globular cluster, individual stars will appear. A single bright star will reveal its tiny companion, nebulae will unfold and the light of distant galaxies suddenly will become much closer... But all of this is dependant on one single thing - sky conditions.

Experience is the greatest teacher. You cannot expect a small telescope to reveal an 11th magnitude galaxy, yet under the right conditions it is possible for it to reach beyond its theoretical limitations. Do not stop trying because you’ve had a few disappointments - learning comes with time. The eye must be trained to pick up on very faint things and the best advice I can offer you is my three P’s for success - Practice, Patience and Persistence.

You can learn to identify lunar features. You can learn how to read a star chart and find the positions in the sky. If you are having problems with something? Improvise. If the equatorial mount on your telescope puts you in an awkward position? Pick it up and turn it around. I assure you that the “polar alignment police” will not come to get you. If your small dobsonian telescope is hard on your back? Set it up on something! If the legs on the tripod are too high or you can’t stand for a long period of time? Lower them and find a stool. If you live in a light polluted area, it won’t stop your love of the Moon and the planets and perhaps there will be a time and place that will allow you to get away to a dark sky location.

The telescope that is loved the most is the one that gets used. If at all possible, consider keeping it fully assembled where it may be set outside at a moment's notice - such as in a garage, an outdoor shed, or near a door. You will be far more likely to spend 15 minutes with the Moon, or a half hour out of your busy schedule with deep sky if you do not have to go through complicated set up procedures. Forget the stress factor. Unless you are using a "GoTo" model, a drive system, setting circles, or planning on photography it is not necessary to have everything perfectly aligned to enjoy the night sky or your telescope! If you reach the end of a slow motion cable's extent? Turn it back and reset the scope on the object. The only hard and fast rule in practicing amateur astronomy is to enjoy what you are doing.

If it is not practical in your circumstance to keep a telescope assembled - then consider even an inexpensive pair of binoculars. If you think you can't afford them - then think again. Many very suitable pairs of binoculars can be had for about the price of an extra large pizza! These small, handheld "twin telescopes" will increase your love of astronomy and whet your appetite for more.

Ready... Set... Go!

Now we have our equipment, our maps, and our notes... What's next? This is probably the most important step for any observer - allowing your eyes time to dark adapt. Picture yourself walking into a dark room. You can see nothing when you first enter, but after several minutes your eyes begin to adjust and you can "see" the sofa you are about to stumble over! This is absolutely true for viewing the night sky. When you go out from a brightly lit room to the outdoors, at first you will only see the brighter stars, but after several minutes you will see that many more begin to appear.

Everyone's eyes adjust at different rates. For some, it may only be a matter of minutes before you are able to spot faint objects, but for others it may take a lot longer. This is why you might find a faint galaxy, only to drag a friend or family member away from the television and discover they can't see it! Avoid bright lights, televisions and computer screens as much as possible before observing. Darken the room or wear sunglasses. While this may sound silly, you'll find it will greatly increase your chances of finding that difficult galaxy or faint comet!

This is also why astronomers use red flashlights or red lighting... It helps to preserve night vision while reading a map, taking notes or preparing to observe. If you do not have one, take a look around you at what might suffice. Keychain lights often come in red and are sufficiently bright to read a map. Even a bit of red cellophane rubberbanded over a penlight will do!

So, what else do we need before we begin to observe? While the art of note taking or sketching is not for everyone, it's something I highly recommend. Even if it's nothing more than a pocket notebook and a pencil stub, you are on your way. Imagine seeing Jupiter and its moons for the very first time! By having a handy way of taking notes, it takes very little effort to draw a circle and a few dots and indicate on your notes which direction they move across the eyepiece field. Just this simple bit of information is enough to let you later identify which moons were in what position!

The same will hold true of everything you observe. By writing down dates and times - along with seeing conditions - it won't be very long until you are able to accurately assess what can be seen on any given night. You'll quickly discover that the first night you could see M44 unaided was also the first night you spotted M33 in binoculars! These notes are yours, and no one will come to "grade" them. They are all a part of learning...

And you can learn!

Now let's be comfortable with ourselves, who we are, what we have and what we know. There's a whole wonderful night sky filled with things to explore! Our equipment is ready and we are ready. So let's head out under the stars, because...

Here's what's up!

Foreward I

2006

January 1

February 33

March 62

April 94

May 125

June 157

July 188

August 220

September 252

October 283

November 315

December 346

Resources 378

About the Author 381

Acknowledgements 382



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JANUARY 2006

SUNDAY, JANUARY 1



GIUSEPPE PIAZZI
(PUBLIC DOMAIN IMAGE)

Welcome to the New Year! 195 years ago this night, Italian Giuseppe Piazzi discovered the first asteroid- an object we know now to be a minor planet. He observed until illness stopped him on February 11th. Piazzi sent news of his discovery to other observers on January 24th, but by the time they were received, Ceres was too close to the Sun for observation and was lost. With help from Gauss' refined method for calculating orbits, Ceres was finally recovered in Virgo on the last day of 1801 and reconfirmed on this date in 1802.

As in Piazzi's day, Ceres is far too close to the Sun now for observation, but let's start our year by exploring one of the most magnificent sights in the heavens - the "Great Orion Nebula."

Although seasoned observers already know how to find M42, perhaps you are just learning. Relax, because this is one of the easiest studies in the sky to find. Once your new telescope or binoculars are ready, avoid all light sources

while waiting on the sky to get good and dark. Go out and face southeast. See those three bright stars in a row? They form the "Belt of Orion." Now, hold your left hand out with your arm extended as far as possible. The constellation of Orion is quite large and your hand spans about 20 degrees of sky. If you cover the "Belt" with your palm, the bright red star at the tip of your little finger is Betelgeuse and the bright blue star by your thumb is Rigel. Congratulations, you've learned a lot in just a few minutes!



M42:
"THE GREAT ORION NEBULA"
CREDIT: R. JAY GABANY

Now look again at the belt of Orion and give it a "thumbs up." About a thumb's length below it is a curved line of dimmer stars. Good job! This is Orion's "Sword." If skies are dark, you will see a faint, glowing patch in the center of this area. Now, aim your telescope or binoculars there...

The Great Orion Nebula is one of the most breathtaking sights in the sky and holds a wealth of fine details. Great swirls and whorls of fluorescent nebula fan their way outwards across the field of view. Later, we'll explore its many riches, but for now... Welcome to the Night Sky and prepare to journey with us as we explore together throughout the year.

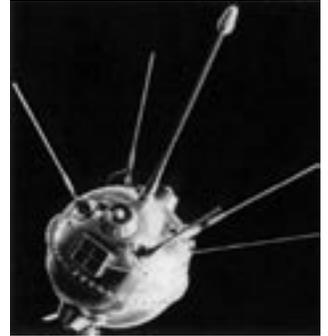
MONDAY, JANUARY 2

In 1959, the USSR launched the very first Moon probe. Named Luna 1, it was the first craft to leave Earth's orbit.

Although the slender crescent Moon is low on the eastern horizon, we can still look at the lunar surface. Just slightly lunar south of center where light and shadow meet (the terminator), look for large crater Humboldt. Stretching 125 miles in length and reaching a depth of 15,400 feet, this excellent old crater will show a dark, inner east wall that runs almost parallel to the terminator.

Since the Moon will set quickly, we'll have early evening dark skies. Let's take this opportunity to explore a distant galaxy much like our own - M74.

Located about a finger-width east-northeast of Eta Piscium, this large spiral galaxy was first discovered by Pierre Mechain in 1780. M74 is possibly one of the faintest and most elusive of the Messier objects and it's a challenge for small telescopes with its low surface brightness and a distance of 43 million light-years. With mid-sized scopes, expect nothing more than a faint, round glow from this galaxy - but larger scopes will reveal a condensed nucleus and hints of faint swirling spiral arms.



LUNA 1 - CREDIT: NASA



M74 - CREDIT: R. JAY GABANY

TUESDAY, JANUARY 3

Tonight the waxing Moon will be a bit higher above the horizon. This will give us a splendid opportunity to study it. Let's begin with binoculars and start by identifying the partially disclosed Mare Crisium just lunar north of center along the terminator. Seen along the curve of the surface, our emerging mare doesn't look large, but it's actually the size of the state of Washington. If you are using a telescope, look along the eastern edge of its walls. Roughly to the middle, you will see two small craters - Alhazen to the north and Hansen to the south.

When the Moon sets, we have an opportunity to do some deep sky observing. Let's focus our attention on M77. Located less than a finger-width southeast of Delta Ceti, this 10th magnitude spiral is bright, compact and within small scope range. M77 is a member of a galaxy group including NGC 1055, NGC 1073, NGC 1087, and NGC 1090. The bright, inner spiral pattern around the nucleus of M77 is easily resolved by large scope, but you might catch a glimpse through small scopes on a dark and steady night. For large aperture, many small knots and brightenings await you as you view this 60 million light-year distant galaxy!



WEDNESDAY, JANUARY 4

386 years ago on this night, Galileo Galilei began to make a series of observations that revolutionized the study of the sky. Using his handmade refractor telescope of less than 2" aperture, Galileo saw craters and mountains on the Moon! Tonight let's celebrate Galileo's many achievements by taking our own lunar journey of discovery.

Using binoculars, return to the Mare Crisium area and look just lunar north for spectacular Cleomides. This two million year old crater is separated from Crisium by some 60 kilometers of mountainous terrain. Telescopically, Cleomides is a true delight at high power. Look for two small interior craterlets and a surface crack called a rimae cutting diagonally through its northern interior. Can you spot small craters Debes and Trailes on Cleomides' northwestern edge?

Later tonight will be the perfect time to watch the Quadrantid meteor shower. Its source point, called a radiant, belongs to an extinct constellation - Quadrans - now associated with bright Arcturus and Bootes. The fall rate varies, but you might be able to spot around 60 per hour from a dark location. Look for trails that have a blue tint.



GALILEO
CREDIT: NASA



MARE CRISIUM
CREDIT: GREG KONKEL



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NGC 869 AND NGC 884: THE "DOUBLE CLUSTER"
CREDIT: N.A. SHARP/NOAO/AURA/NSF

Tonight let's return to the lunar surface and begin our explorations using binoculars to identify Mare Fecunditatus - just lunar south of Mare Crisium. This "fertile sea" is an area around of the size of the state of California. Look on its eastern shore to see the flat, bright oval of Langrenus. This is an opportunity to challenge yourself by identifying two small craters just slightly northwest of the mare's central point - Messier and Messier A - named for the famous French comet hunter. Keep them in mind, for in a few days you will see a pair of "rays" extending out from them.

Now turn your binoculars or telescope towards one of the finest pair of star clusters in the sky. Look midway between the lazy "W" of Cassiopeia and the long backwards "J" of Perseus for the "Double Cluster."

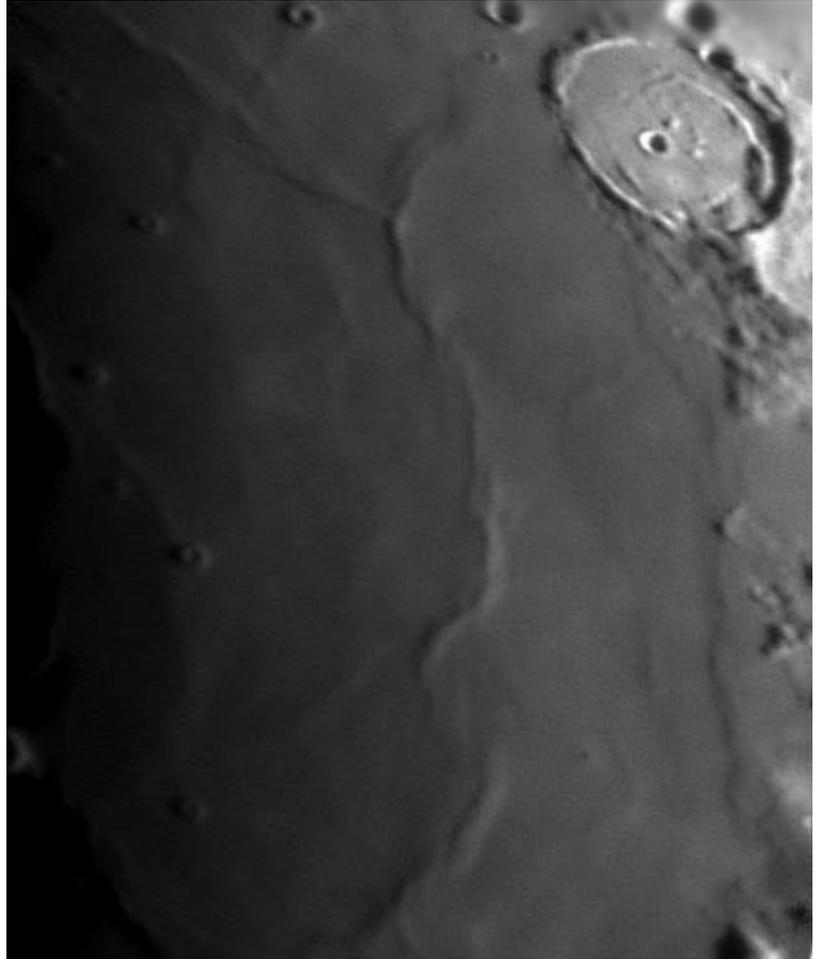
Known more properly as NGC 869 and NGC 884, each of these "gatherings of stars" is a fine example of a galactic cluster and together they are outstanding. Noted in records from as early as 150 B.C., they are roughly 8000 light-years away, and contain many supergiant stars 10 times more massive than our own Sun!

FRIDAY, JANUARY 6

The first atomic clock was built on this day in 1949. Based on theoretical work by Isidor Rabi and Norman Ramsey, it used ammonia as a “pendulum.” Eight years later, the first cesium beam device was built and its successors now keep time to one-millionth of a second per year. This type of accuracy makes possible high resolution radio interferometry. It also tests Einstein’s theory of general relativity, runs the Global Positioning Satellite systems, and accurately determines the Earth’s changing rotation rate!

On the lunar surface tonight, let’s look at Mare Serenitatus. On its northeast shore, binoculars will have no trouble spotting the shallow ring of crater Posidonius. Almost flat from eons of lava flows, this crater shows numerous variations in texture along its floor in small telescopes. Look a bit south of Posidonius and almost parallel to the terminator for a curious feature known as the Serpentine Ridge. This thin, white line wanders across the western portion of Mare Serenitatus for a distance of about 250 miles. In some places it rises as high as 1000 feet above the smooth sands. This lunar “wrinkle” is an amazing 6 miles wide.

While you’re out, why not try asteroid Vesta? It’s at opposition tonight and you can find accurate locator charts at www.heavens-above.com. If you’re not too sure of which stellar point is the asteroid, try printing out the map and looking over a period of several night for which “star” moves.



THE SERPENTINE RIDGE
CREDIT: RICARDO BORBA

SUNDAY, JANUARY 7

On this night in 1610, Galileo discovered three of Jupiter's four largest satellites, now referred to as the Galilean Moons. His discovery shocked Europe, proving that not all bodies revolve around the Earth. If you're up before dawn this morning, why not have a look at the Galilean Moons yourself? Jupiter will be the brightest "star" in the sky and can be found in the constellation of Libra.



THE CAUCASUS MOUNTAINS
CREDIT: GREG KONKEL

Even binoculars can show the Galileans!

Let's start the evening with Moon study and explore the edges of a feature that's about the same size as the state of New Mexico - Mare Serenitatus. On its southwest border stand the Haemus Mountains, which will continue on beyond the terminator. While the Montes Haemus look pretty impressive, they are foothills compared to the Apennines which have yet to emerge. Look at Serenitatus'

northwest edge to view some real mountains. These are the Montes Caucasus, rising up to 17,000 feet above the plains.

Now let's turn toward Cetus to have a look at a star known as "The Wonderful."

Omicron Ceti, best known as Mira, was the first variable discovered (in 1596) and is the prototype of all long term variable stars. When Fabricus first viewed it, he believed it to be a nova and did not wait for a return. Consequently, Mira wasn't seen again until 1603, when Bayer added it to his catalog as a 4th magnitude stars and assigned it the designation of Omicron. Imagine his embarrassment when it later disappeared! Careful observation revealed its presence a year later and the age of variable stars was ushered in. Oddly enough, Mira has a blue companion star. First viewed in 1918, it is far too faint for backyard telescopes, but we can still enjoy Mira... Or not!



<http://www.universetoday.com>

SUNDAY, JANUARY 8

On this day in 1642, Galileo Galilei died. On the anniversary of his death, but three centuries later, Stephen Hawking was born. Despite serious physical limitations, the British theoretical astrophysicist went on to become one of the world's foremost cosmologists and his book - *A Brief History of Time* - remains one of the most clearly written on the "Big Picture" of the Universe.

Tonight the huge, hexagonal walled plain of Albategnius - one of the most prominent craters on the Moon - is visible in binoculars and telescopes. Located one-third the way north from the southern pole near the terminator, Albategnius is a very old crater. Stretching 81 miles in diameter and 14,400 feet deep, look for a brilliant inner west wall and, if the timing is right, a small central peak on its dark floor. Albategnius' walls themselves are marred with many craters, but one of the finest is Klein extending from the southwest to almost touch the central peak.

Despite the Moon we can still have a look at open cluster NGC 1342 in Perseus. Located about halfway between Beta (Algol) and Zeta, this fairly large binocular patch will show a distinct X pattern in its handful of starry members.



STEPHEN HAWKING
CREDIT: NASA



ALBATEGNIUS
CREDIT: GREG KONKEL



<http://www.universetoday.com>

MONDAY, JANUARY 9

Today in 1839, South African Thomas Henderson measured the distance to the closest bright star other than the Sun. Using geometrical parallax, Alpha Centauri was found to be 4.3 light-years away - this amounted to a distance of almost 41 trillion kilometers! Such a distance is the equivalent of over 270,000

earth-sun distances (astronomical units - AU).

Speaking of parallax, let's take a look at a star with the precisely measured distance of 10.67 light-years from our Sun - Epsilon Eridani. Epsilon is the third closest of the visible stars and can be found tonight by starting at Rigel. About a hand span southwest, locate Gamma Eridani and head another fist-width northwest for a pair of easy stars. Epsilon is the westernmost.

At magnitude 3.7, Epsilon is not one of the brightest stars in the night sky because it has only 85% of the mass of our own Sun. It is also a young star, some 4 billion years younger than Sol and slightly variable. But, like our own "star," Epsilon has no companion. On a curious note, science fiction chose Epsilon Eridani to be the home of the Vulcans!

Now let's have a look at the Moon and a crater so prominent that it can be spotted unaided. To the lunar north, look for the dark ellipse of Plato. This mountain-walled plain with a dark floor is a Class V crater. Its slightly oval shape spans 64

by 67 miles in diameter, but appears far more elliptical due to its northern latitude. Plato's floor is its most curious feature. Consisting of 2,700 square miles of unique lava, and only broken by a couple of very minor and supremely challenging craters, Plato is one of the very few areas on the lunar surface that seems to have changed in recent history.

Be sure to notice how close the Moon and Pleiades are tonight and check on the internet (IOTA) for grazing and occultation events visible from your area.

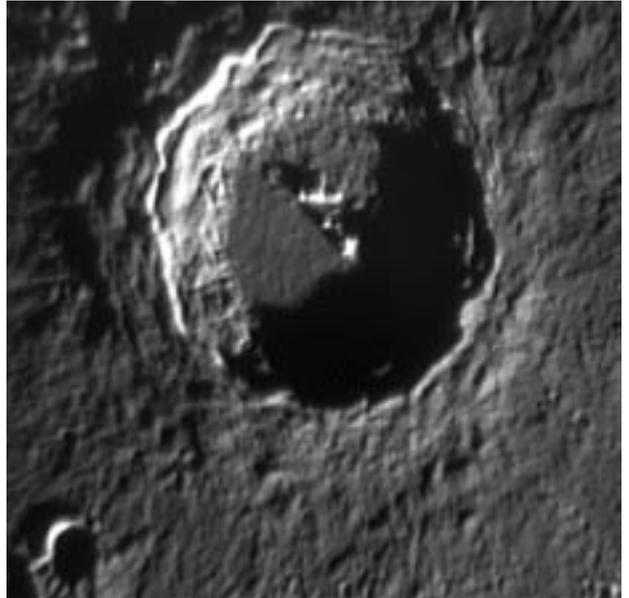


PLATO
CREDIT: WES HIGGINS

TUESDAY, JANUARY 10

Robert W. Wilson was born this day in 1936. Wilson is co-discoverer, along with Arno Penzias, of the cosmic microwave background and in 1978, won the Nobel Prize for Physics. On this day in 1946, the US Army's Signal Corps became the first to successfully bounce radar waves off the Moon. Although this might sound like a minor achievement, let's look just a bit further into what it really meant.

Known as "Project Diana," scientists were hard at work to find a way to pierce the Earth's ionosphere with radio waves - a feat believed impossible at the time. Headed by Lt. Col. John DeWitt, and working with only a handful of full-time researchers, a modified bed-spring-type radar antenna was set up at Camp Evans, Georgia. Anxiously, the power was cranked up and the antenna aimed at the rising Moon. A series of radar signals were broadcast and echoes were picked up exactly 2.5 seconds later - the time it takes light to travel to the Moon and back. The significance of Project Diana cannot be underestimated. Because the ionosphere could be pierced, communications became possible between Earth and future space missions. Although it would be more than a decade before the first satellites and manned missions were launched into space, Project Diana had paved the way.



COPERNICUS
CREDIT: RICARDO BORBA

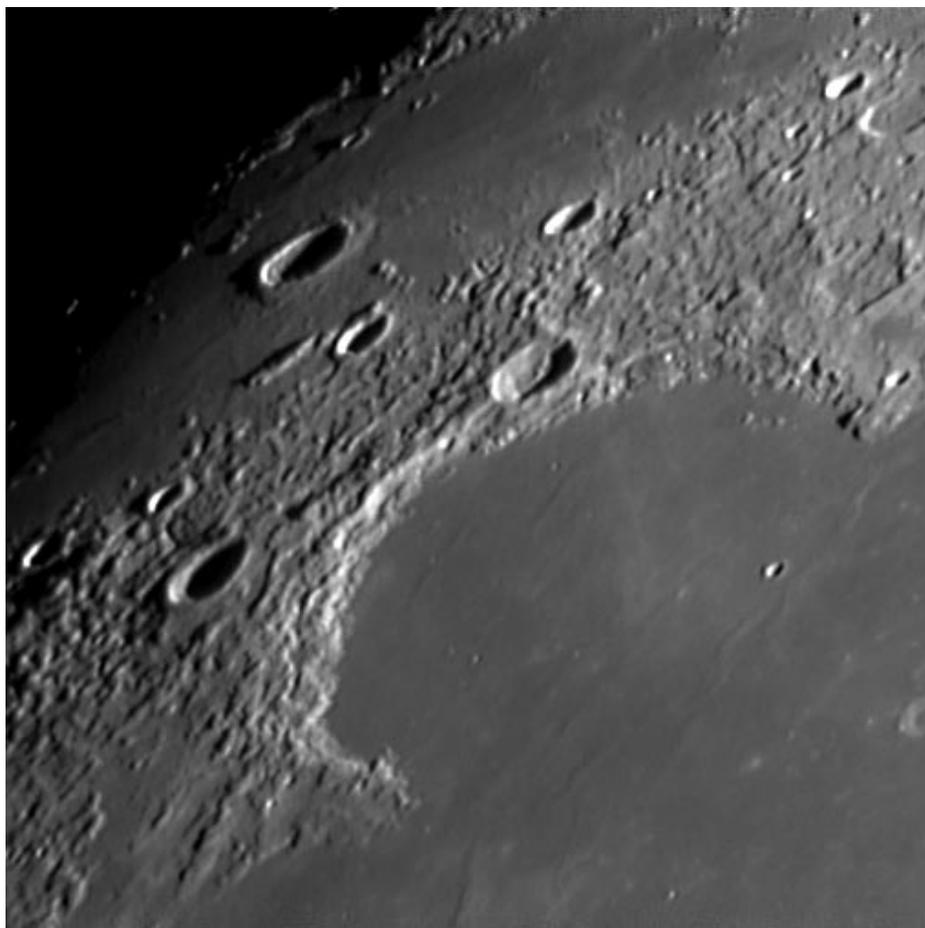
To commemorate Project Diana, let's have a look at one of the most impressive craters on the Moon - Copernicus.

While Copernicus is not the oldest, deepest, largest, or brightest crater on the Moon, it certainly is one of the most detailed. Visible in binoculars toward Plato and near the terminator, this youthful crater gives a highly etched appearance. Its location in a fairly smooth plain near the center of the Moon's disc, and prominent "splash" ray system, all combine to make Copernicus visually stunning in a small telescope.

Tonight let's try our hand at splitting a double star - Gamma Arietis. Known as Mesarthim, Gamma is the third star in the line of bright stars - about a hand span west of the Pleiades - pointing in the direction of Eta Piscium. This orange and green pair gives the appearance of two glowing eyes in the night. Seeing two equal magnitude stars so close together can't help but get you out observing - even when there's Moon!

WEDNESDAY, JANUARY 11

Tonight in 1787, Sir William Herschel discovered Uranus' largest moons - Oberon and Titania. Let's have a look. Sixth magnitude Uranus is around two finger-



widths south-southwest of Lambda Aquarii. Its small, pale blue disc will be distinguishable from neighboring stars. Under the right conditions, the planet can sometimes be seen unaided and was once given the designation "34 Tauri" by 17th century astronomer John Flamsteed. The two satellites - both 14th magnitude - can be seen with very large scopes with excellent seeing conditions.

The most outstanding feature on the northern lunar surface this evening is the "Bay of Rainbows" - Sinus Iridum. Take the time to power up and enjoy its many wonderful features including the bright Promontorium LaPlace to the northeast and Heraclides to

the southwest. Ringed by the Juras Mountains, Sinus Iridum also includes crater Bianchini at center and Sharp to the west.

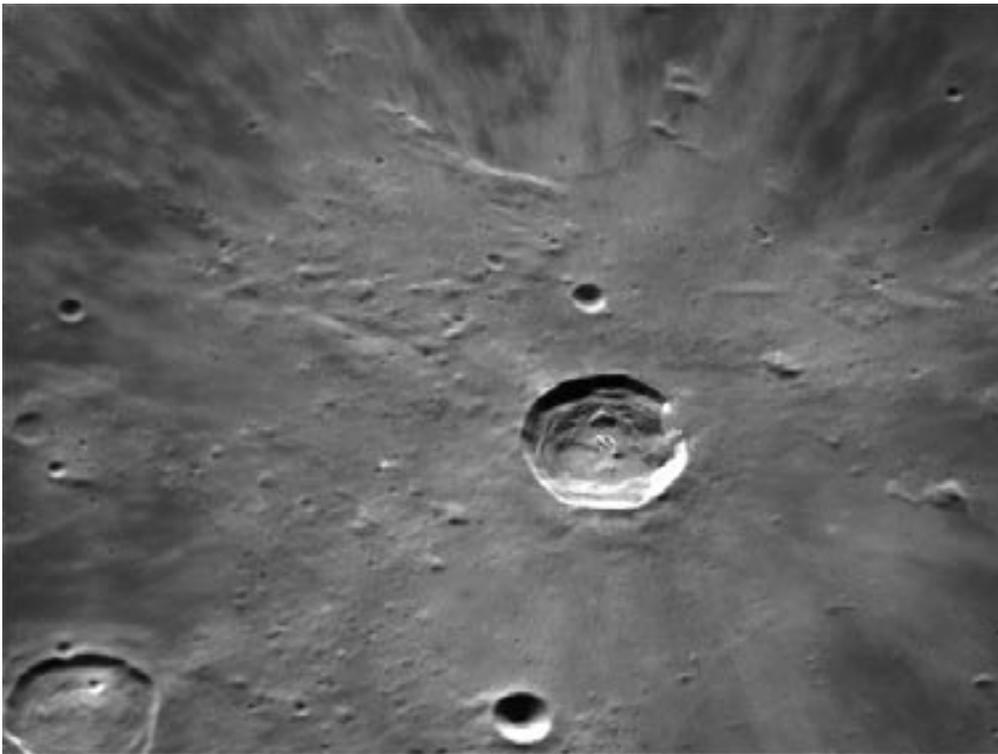
SINUS IRIDUM
CREDIT: RICARDO BORBA

THURSDAY, JANUARY 12

This date celebrates the 1830 founding of what - one year later - would become the Royal Astronomical Society. Conceived by John Herschel, Charles Babbage, James South and others, the RAS has continuously published its Monthly Notices since 1831.

Tonight our primary lunar study is crater Kepler. Look for it as a bright point, slightly lunar north of center near the terminator. Its home is the Oceanus Procellarum - a sprawling dark mare composed primarily of dark minerals of low reflectivity (albedo) such as iron and magnesium. Bright, young Kepler will display a wonderfully developed ray system. The crater rim is very bright, consisting mostly of a pale rock called anorthosite. The "lines" extending from Kepler are fragments that were splashed out and flung across the lunar surface when the impact occurred. The region is also home to features known as "domes" - seen between the crater and the Carpathian Mountains. So unique is Kepler's geological formation that it became the first crater mapped by U.S. Geological Survey in 1962.

With the nearly full Moon in Gemini, go north to Cassiopeia and check out wide double star 35 Cassiopeia about two finger-widths west of Epsilon and an equal distance north of Gamma. This is an easy split for telescopes and can be resolved in steady binoculars.



KEPLER
CREDIT: WES HIGGINS

FRIDAY, JANUARY 13

Tonight let's give the Moon a rest and turn our scopes to Mars high overhead. With the exception of Sirius, Mars remains brighter than any star in the sky. To the eye, the planet's ruddy glow makes it unmistakable. Through the telescope, observers can make out large-scale details such as the planet's polar caps, Syrtis Major, Sinus Sabaeus, and the three major Mares - Cimmerium, Sirenum and Acidalium. Although good "seeing" makes high power and fine details possible, sometimes just "viewing" is half the fun!



MARS
CREDIT: WES HIGGINS

SATURDAY, JANUARY 14

Tonight's Full Moon is known as the Wolf Moon. For the northern hemisphere in January, extreme cold and deep snows gave rise to the legend of wolf packs howling hungrily outside Indian villages. Sometimes the January Full Moon is also referred to as the Old Moon, or the Moon after Yule. No matter what it is called, it is still a lovely sight to watch rise and glide across the luminous night sky.

As a challenge this evening, try tracking down 5th magnitude double star Zeta Piscium. Located two finger-widths due east of Epsilon, this pair is easily resolved at low magnification due to its near matched brightness. Look for subtle shades of color displayed by the blue primary, and ivory-colored secondary.



FULL MOON
CREDIT: GREG KONKEL

SUNDAY, JANUARY 15

With only a short time before the Moon rises tonight, let's start our evening by viewing a distant multiple star system - Sigma Orionis.

You'll easily find 1400 light-years distant Sigma less than a finger-width below the left hand star in Orion's "Belt" (Zeta or Alnitak). What won't be easy is to distinguish the closest and brightest pair! 3.8 magnitude A and 6.6 magnitude B revolve around each other every 170 years and are separated by a close 0.3 arc seconds. Among the most massive binaries known, these two stars have extremely hot surfaces (approaching 50,000 degrees K) and both appear white in the eyepiece.

At a more comfortable separation, the white 8.8 magnitude C star resides 11.4 arc seconds southwest of the brighter pair. At a similar distance from AB to the east, look for red 6.7 magnitude D. Considerably further away at 41 arc seconds, the blue E star resides east-northeast of the AB primary. Unusual star E shares the same spectral qualities as the AB primary, yet is rich in helium light (emission lines) within its color spectrum. If five isn't enough, then look 30 arc seconds southwest of E - because it, too, has a companion. All of these stars are part of the same physical system spanning about one-third of a light-year.

If you choose to look at the lunar surface, carefully check along the eastern edge where the terminator is now receding. In the north, look for the dark shades of Mare Humboldtianum and the equally dark floor of crater Endymion to its west. This lava filled area is around 70 miles in diameter.



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MONDAY, JANUARY 16

Although the early rise of tonight's Moon will hamper the Delta Cancri meteor shower, be on the lookout for fast moving meteors appearing to radiate from an area just west of the "Beehive" - M44. It's a minor shower, with a fall rate of about 4 per hour, but it's fun to catch one!

While we're watching, take a look at M44 with binoculars or a low power telescope. You'll find it in the center of the triangle of bright stars, Pollux, Regulus, and Procyon, and it is usually visible to the unaided eye from dark sky locations.

Better known as the "Beehive," M44 shows several dozen stars through binoculars. Through the scope, the cluster reveals up to 100 stars! Of the 400 known members, most congregate in an elliptical "swarm" spanning 15 light-years. The "Beehive" is only slightly more distant than the Pleiades at 500 light-years away. Thanks to its advanced stellar evolution, it contains several red giants, leading astronomers to believe it is around 400 million years old.

After moonrise, have a look at the lunar surface as the terminator reaches the edge of Mare Crisium in the northeastern quarter. Depending on your viewing time, you may have the opportunity to spot small craters

Alhazen and Hansen on its eastern edge. Look for a long "wrinkle" creasing Crisium's smooth sands. Such lunar features are known as dorsae. Dorsa Tetyaev and Dorsa Harker come together along Mare Crisium's eastern shore. Look for south-central Dorsa Termier and Dorsum Oppel along Crisium's west bank. These frozen "waves" of lava are millions of years old.



M44
CREDIT: NOAO/AURA/NSF

TUESDAY, JANUARY 17

With time to spare before Moon rise tonight, let's hunt down that "wascally wabbit" Lepus and have a look at M79. Let Alpha and Beta be your guide as you drop the same distance between them to the south for double star ADS3954 and this cool little globular cluster.

Discovered by Pierre Méchain in 1780, M79 is not large, nor bright, but is visible in binoculars. Large telescopes will find it well resolved with a rich core area. Around 50,000 light-years away, this particular globular is very low in variables and recedes from us at a "rabbit" speed of 118 miles per second. But, don't worry - it will remain visible for a very long time!

Now, take a quick look at tonight's Moon. The terminator has advanced through Mare Crisium and looks like a gigantic "bite" taken out of the lunar edge.



M79 - NOAO/AURA/NSF

WEDNESDAY, JANUARY 18

If you are up before dawn, why not spend a moment looking at the sky? Although the Moon will still be bright, stay on watch for meteors belonging to the Coma Berenicid shower. The fall rate is very modest with only one or two per hour, but these are among the very fastest meteors known. Blazing through the atmosphere at 65 kilometers per second, the trails will point back to the Coma Berenices star cluster east of Leo.

Since we'll have early dark skies, let's have a look at a single star - R Leporis. Because it is variable, ranging in magnitude from 5.5 to 11.7, R may or may not be visible to the unaided eye tonight. Use a telescope, or binoculars, to locate it west of Mu. Look for a line of three dim stars and choose the centermost.

Most commonly known as "Hind's Crimson Star," this long term, pulsating red variable was discovered in 1845 by J.R. Hind. Its light changes by a factor of 250 times during its period of 432 days, but R Leporis can sometimes stall while brightening. As an old red star, R takes on a unique ruby-red color as it dims. To understand carbon stars, picture a kerosene lamp burning with its wick up high. This "high burn" causes the glass to smoke, dimming the light and changing the color. Although this example is simplistic, it hints at how carbon stars work. When it sloughs off the soot? It brightens again!

"Hind's Crimson Star" is believed to be about 1500 light-years distant and moving slowly away from us at about 32 km per second. No matter how "bright" you find it tonight, its unusually deep red color makes it a true pleasure.

THURSDAY, JANUARY 19



JOHANN BODE
(PUBLIC DOMAIN IMAGE)

Johann Bode was born today in 1747. Bode publicized the Titus-Bode law, a nearly geometric progression of the distances of the planets from the Sun, and made a number of discoveries of deepsky objects. Also born today in 1851, was Jacobus Kapteyn. Kapteyn studied the distribution and motion of almost half a million stars and created the first modern model of the size and structure of the Milky Way Galaxy.

Tonight in celebration of them both, let's have a first look at a pair of circum-polar galaxies known as "Bode's Nebulae." Discovered by Johann in 1774, the galaxies known as M81 and M82 were first described by him as "nebulous." In Bode's time, it was thought such patches were solar systems in formation, but by Kapteyn's time in the late 1800's, astronomers were beginning understand the mechanics of stellar motion in the Milky Way galaxy. While M81 and M82 are not in good sky position right now, you can still track them down in binoculars. Look for the bowl of the "Big Dipper" and draw an imaginary line from Phecda to Dubhe (the southeastern and northwestern stars) and extend it the same distance northwest. Fade ever so slightly toward Polaris and enjoy this bright pair of island universes sharing space in the night.



M81
CREDIT: ROGER WARNER



M82
CREDIT: ROGER WARNER

FRIDAY, JANUARY 20

Born this day in 1573 was Simon Mayr. Although Mayr's name is not widely recognized, we know the names he has given to Jupiter's satellites. During 1609 and 1610, Mayr was observing moons of Jupiter at about the same time as Galileo. Though discovery was credited to Galileo, Mayr was given the honor of naming them. If you're up before dawn, look for Jupiter in the constellation Libra and see if you can spot Io, Ganymede, Callisto and Europa for yourself!

Early dark skies mean a chance for serious study, and tonight our target will be a challenge. Head towards Zeta Ceti and neighboring Chi Ceti. When you've identified Chi, power up and look north-northwest to locate small, 11.8 magnitude galaxy NGC 681. It might be small and faint, but it's a great example of barred spiral seen near edge-on. Mid-sized scopes will see little detail, but large instruments reveal a broad equatorial dust lane. At a distance of 55 million light-years, this peculiar galaxy is a rare sight. All its stars move at the same orbital speed around the core - hinting at vast quantities of unseen, mysterious "dark matter!"

SATURDAY, JANUARY 21



JOHN COUCH ADAMS
(PUBLIC DOMAIN IMAGE)



BENGT STROMGREN
(PUBLIC DOMAIN IMAGE)

John Couch Adams was born today in 1792. Adams, along with Urbain Le Verrier, mathematically predicted the existence of Neptune. Also born today in 1908 was Bengt Stromgren - developer of the theory of ionization nebulae (H II regions). Tonight we'll take a look at an ionization nebula as we return for a more in-depth look at M42.

Known as "The Great Orion Nebula," let's learn what makes it glow. M42 is a great cloud of gas spanning more than 20,000 times the size of our own solar system and its light is mainly florescent. For most observers, it appears to have a slight greenish color - caused by oxygen being stripped of electrons by radiation from nearby stars. At the heart of this immense region is an area known as the "Trapezium" - its four brightest stars form perhaps the most celebrated multiple star system in the night sky. The Trapezium itself belongs to a faint cluster of stars now approaching main sequence and resides in an area of the nebula known as the "Huygenian Region" (named after 17th century astronomer and optician Christian Huygens who first observed it in detail).

Buried amidst the bright ribbons and curls of this cloud of predominately hydrogen gas are many star forming regions. Appearing like "knots," these Herbig-Haro objects are thought to be stars in the earliest stages of condensation. Associated with these objects are a great number of faint red stars and erratically luminous variables - young stars, possibly of the T Tauri type. There are also "flare stars," whose rapid variations in brightness mean an ever changing view.

While studying M42, you'll note the apparent turbulence of the area - and with good reason. The "Great Nebula's" many different regions move at varying speeds. The rate of expansion at the outer edges may be caused by radiation from the very youngest stars present. Although M42 may have been luminous for as long as 23,000 years, it is possible that new stars are still forming, while others were ejected by gravitation. Known as "runaway" stars, we'll look at these strange members later in detail. A tremendous X-ray source (2U0525-06) is quite near the Trapezium and hints at the possibility of a black hole present within M42!

HUBBLE NEAR INFRARED
IMAGE OF THE "TRAPEZIUM"
CREDIT: NASA



SUNDAY, JANUARY 22

With tonight's dark skies let's have a look at another "cloud in space" - M78. It is easily located around two finger-widths north-northeast of Alnitak. Despite being 8th magnitude, you'll probably need a telescope to see it. M78 is actually a bright outcropping of an extended region of nebulosity (the Orion Complex) including M42, 43, NGC 1975-77-79, the Flame Nebula, and the Horsehead. There's plenty of material for future starbirth here! Nicknamed "Casper the Friendly Ghost Nebula," M78 was discovered by Pierre Méchain in 1780. It shines almost purely by reflection and is the brightest non-emission nebula observable by amateurs. For larger scopes, look at nearby nebula NGC 2071. Unlike M78, NGC 2071 is associated with a single 10th magnitude star instead of the pair that gives "Casper" his glowing eyes.



M78
CREDIT: NOAO/AURA/NSF



<http://www.universetoday.com>

MONDAY, JANUARY 23

Thanks to dark skies, tonight will be the perfect opportunity to “go crabbing” in Taurus. Although M1 was discovered by John Bevis in 1731, it became the first object on Charles Messier’s astronomical list. He rediscovered M1 while searching for the expected return of Halley’s Comet in late August 1758 and these “comet confusions” prompted Messier to start cataloging. It wasn’t until Lord Rosse gathered enough light from M1 in the mid-1840’s that the faint filamentary structure was noted (although he may not have given the Crab Nebula its name). To have a look for yourself, locate Zeta Tauri and look about a finger-width northwest. You won’t see the “Crab legs” in small scopes - but there’s much more to learn about this famous “supernova remnant” in the future.



M1: “THE CRAB NEBULA”
CREDIT: R. JAY GABANY

TUESDAY, JANUARY 24

Today is the birthday of American solar astronomer Harold Babcock. Born in 1882, Babcock proposed that the sunspot cycle was a result of the Sun's differential rotation and magnetic field in 1961. Would you like to have a look at the Sun? Although solar observing is best done with a proper filter, it is perfectly safe to use the "solar projection method."

Before we start, NEVER look at the Sun directly with the eye or with any unfiltered optical device, such as binoculars or a telescope. We're not joking when we say this will blind you. Exposed film, mylar, and smoked glass are also UNSAFE. But don't be afraid, because we're here to tell you how you can enjoy solar viewing. A safe way to observe sunspots is to "project" an image of the Sun through a telescope or binoculars onto a screen. This can be as simple as cardboard, a paper plate, a wall or whatever you have handy. If you're using a telescope be sure the finderscope is securely capped. If you use binoculars, cover one of the two tubes. By using the shadow method to aim, you will see a bright circle of light on your makeshift screen. This is the solar disc. Adjust the focus by moving the distance of the screen from your optics until it's about the size of a small plate. If the image is blurry, use manual focus until the edges of the disc become sharp. Even though it might take a little practice, you'll soon become proficient at this method and be able to see a surprising amount of detail in and around sunspot areas. Happy and SAFE viewing to you!

Today in 1986, the United States Voyager 2 became the first spacecraft to fly by Uranus, providing us with the most outstanding photographs and information on the planet to date. After 10,382 days of successful operation, Voyager 2 still continues on towards the stars carrying "The Sounds of Earth."

Speaking of stars, turn your scope on brilliant Rigel - Orion's south-westernmost bright star. Enjoy its cool radiance and look for an 8th magnitude companion just outside the spikes of light caused by the Earth's atmosphere.

WEDNESDAY, JANUARY 25

This morning before dawn, look for the Moon very near Antares. Many observers will have the opportunity to see it occulted, so please check with the International Occultation Timing Association (IOTA) for details.

Today is the birthday of Joseph Louis Lagrange. Born in 1736, the famed French mathematician made important contributions to the field of celestial mechanics. We're not talking "wrenches in space," but how masses interact gravitationally to keep things orderly in the solar system and beyond. If you're up early this morning, have a look at the lunar crater named for him. You'll find LaGrange on the southern limb about one-quarter the distance up from the cusp. But, you won't find the SOHO satellite there. NASA's "eye on Sol" is parked at Lagrange point one (L1) between the Earth and Sun.

Tonight let's journey to Orion and have a look at a pair of neighboring open clusters. Found a little less than a hand span northwest of Betelgeuse, NGC 1807 and NGC 1817 aren't exactly twins. Both clusters are of similar magnitude and can be seen as faint patches in binoculars. Through a telescope, NGC 1817 appears far more populated with stars than its neighbor. Studies based on stellar motion reveal that NGC 1817 has far more stars than the brighter NGC 1807. Although the two are quite distant from one another in space, we get to see them both as close friends...

THURSDAY, JANUARY 26

In keeping with our dark sky studies, tonight we'll explore planetary nebula NGC 1514 in Taurus. Locate it by moving about two finger-width's south-east of Zeta Perseii. Planetary nebulae were first described as "planetary" by William Herschel in 1785. Before then, all were simply considered "nebulae." It was once thought they were made of stars, but today we know planetaries are created from material given off by a single star. Many show well-defined rings of one type or another. Others - like M1 - are irregularly shaped supernova remnants. NGC 1514's material is slowly boiled off over time, rather than caused by a violent explosion.

It would be very hard to find the neutron central star in M1, but almost any scope can make out NGC 1514's 10th magnitude fueling star as it quietly cooks away gases to feed its nebulous shroud. Because it is so bright, it can easily overwhelm the eye. This makes NGC 1514 similar to the famous "Blinking Planetary" - NGC 6826 - in Cygnus.

FRIDAY, JANUARY 27

The planet Saturn is at opposition tonight, meaning it rises as the Sun sets. Look for it late in the evening moving past M44 - “the Beehive” - cluster in Cancer. The 2006 apparition will continue to feature Saturn’s rings and the planet’s southern hemisphere.

Are you ready for more deep sky? Then let’s head off towards the galaxy NGC 1023 in Perseus. It’s a beautiful example of a slightly tilted “SBO” spiral galaxy. You won’t see any spiral arms on this one - but not because your telescope isn’t large enough. Unlike our own Milky Way, NGC 1023 really doesn’t have any. But, it does have a bright galactic hub bending like a thick lens going outward. At the center of the hub is one of the most massive black holes within a hundred million light-years. Don’t worry about being pulled in, because this galaxy is located 33 million light-years away! You’ll find it a bit closer to home about a fist-width southwest of Algol - Beta Persei.

There is a much closer supermassive black hole at the center of our own galaxy. It’s a profound gravitational anomaly causing stars to take on strange, highly elliptical orbits at very high speeds - some which have orbits taking far less time than Jupiter does to revolve around the Sun. The stars involved (“S-stars”) appear mysteriously young to astronomers. This might occur because their outer atmospheres are being stripped away by gravitational tidal forces. It’s happening in NGC 1023 as well, but that galaxy is ten times more massive than our own!

SATURDAY, JANUARY 28

It's Saturday and New Moon! Many amateurs will be out tonight "partying" beneath the darkest night sky of the month. All that's needed is a wide-open field well away from glow from artificial lights and a variety of optical instruments - eyes, binoculars, and telescopes. The joy of observing can be multiplied many times over when shared with others!

What should you bring to a "star party?" Start with your favorite scope and a short list of things to observe including both "everybody's favorites" and at least one "special study" that others may not have observed before! Tonight, the two "Greats" - M31 and M42 - will be on everyone's list, but what about those "great" unknowns?

Consider NGC 1535 - a fine planetary nebula with central star in Eridanus. At magnitude 10, this 1600 light-year distant beauty has an easy 12th magnitude star providing illumination at its core. Use high power to give "image scale" to this small, subtle study. You'll find it just about a fist's width east-northeast of Gamma Eridani. If you find it difficult, you'd be right - but that's why this aqua blue planetary is not more widely appreciated!

SUNDAY, JANUARY 29



JOHANN HEVELIUS
(PUBLIC DOMAIN IMAGE)

Today is the birthday of Johannes Hevelius. Born in 1611, Hevelius was the first to publish detailed maps of the Moon. His book, *Selenographia*, debuted in 1647. That's 359 years ago - and it's still accurate! Too bad there's no Moon to celebrate with... Or is it?

Let's have a look instead at the Pleiades - M45. We aren't finished observing the Pleiades yet, because the "Seven Sisters" may not be finished either. On a moonless night, you can see the afterbirth of stellar creation - the faint sheen of nebulosity illuminated by hot stars doing their best to "light up the night." Most easily spotted is NGC 1435 associated with Merope and NGC 1432 near Maia. To be sure you are seeing the nebulosity, look well away from both stars. From Merope (the southernmost bright star) look due south - away from the brightest stars of the cluster. Compare that to the nebulosity which surrounds all seven major stars - but especially Maia - north of Merope. Be sure not to stare directly. They will appear like a pale smear or a "fog" on your optics. Move your eyes around to activate the sensitive light-receptors in the eye - that's using your eyes to advantage!



M45: "THE PLEIADES"
CREDIT: NOAO/AURA/NSF

MONDAY, JANUARY 30

The Moon is now a thin crescent at sunset but no problem for dark sky observing. Tonight let's have a look at the "Great Nebula" in Orion and its shy neighbor - M43.

M43 has its own special beauty. First discovered by Jean-Jacques D'Ortous de Mairan in the early eighteenth century, M43 is actually a continuation of M42 blocked by a dark slash of nebulosity called the "Fishmouth." The star illuminating M43 is variable NU Orionus - which ranges about one magnitude in brilliance. Like its overpowering neighbor, M43 is a stellar nursery with the beginnings of its own cluster held close to its heart.



M43
CREDIT: N.A. SHARP
NOAO/AURA/NSF

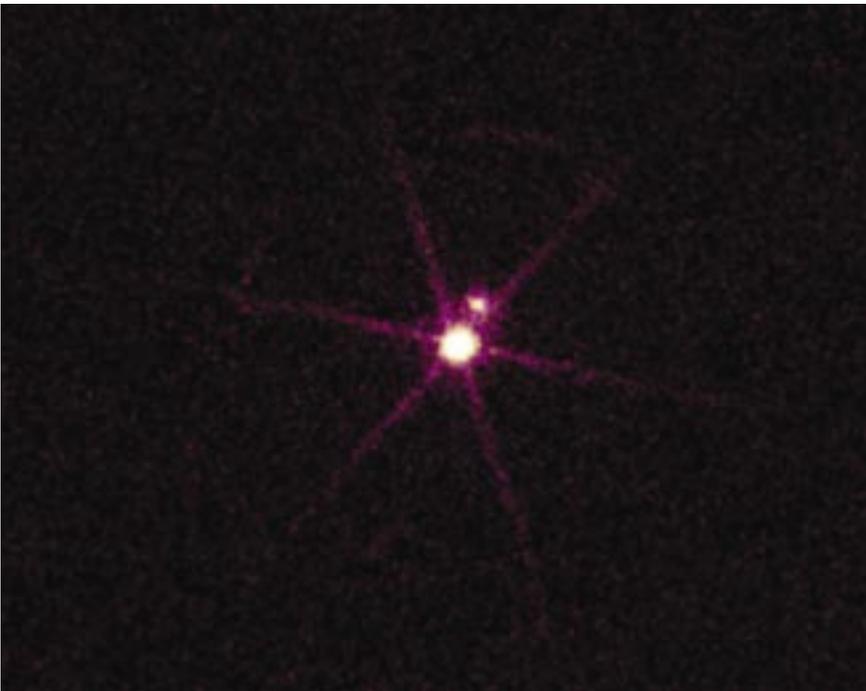
TUESDAY, JANUARY 31



NGC 204
CREDIT: TODD BORONSON
NOAO/AURA/NSF

Tonight in 1862, Alvan Graham Clark, Jr. made an unusual discovery. While watching Sirius, Clark uncovered the intense star's faint companion while testing an 18" refractor for Dearborn Observatory. The scope itself was built by Clark, his father and his brother. Imagine his excitement when it turned up the white dwarf - Sirius B! Based on the strange way Sirius A wobbles in the sky, Friedrich Bessel proposed its B's existence back in 1844, but this is the first time it was confirmed visually.

Sirius B is nicknamed "the Pup," and tonight we'll have a serious look at Sirius, and see what it takes to uncover its little companion. Sirius is the brightest star that normally graces the night sky. At magnitude -1.6, it produces so much light that the atmosphere won't stand still for it - sometimes even flashing in vibrant colors! This means that poor "Pup" hardly stands a chance of being seen. At magnitude 8.5 it could easily be caught in binoculars if it were on its own. So how do you find it? First, you'll need a mid-to-large telescope with



SIRIUS AND SIRIUS B
CREDIT: NASA/SAO/CXC

a high power eyepiece. Second, add a stable evening - not night - sky around the time Sirius is as high up as possible. Third, you'll have to train your eye to perceive something that will cause you to say "I could hardly believe my eyes!" - because it's that faint. Seeing the Pup is a Sirius matter, but practice will help you walk "the Pup" out of the evening sky!

If you had problems finding it, don't worry... Others have problems, too. On this night in 1948, the first test photos using the Hale 5-meter (200-inch) telescope at Mt. Palomar were underway. Believe it or not, problems with the configuration and mounting of the mirror meant that it was almost 2 years later before the first observing run was made by a scheduled astronomer!

FEBRUARY 2006



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WEDNESDAY, FEBRUARY 1

The Moon has returned. Could you spot its slender crescent last night? If not, then try again tonight as we aim binoculars and telescopes toward the lunar surface.

Look almost centrally on the terminator for the very conspicuous crater Langrenus. Depending on your viewing location and time, it may be divided by the terminator, but will be quite recognizable. Spanning 85 miles in diameter, the



M1: "THE CRAB NEBULA"
CREDIT: ROGER WARNER

steep, rugged walls rise almost 16,200 feet above the crater's floor and you'll see their bright outline on the western edge. Can you spot its central peak? It's small for a crater this size and will present a challenge for binoculars.

While we're out, let's revisit Crab Nebula in Taurus - there's so much to learn and see about this very special nebula. The label "planetary" is a definite misnomer. Unlike most with this designation, M1 hardly looks like a globe and varies in other significant ways. Most planetaries have central stars that spew out atmo-

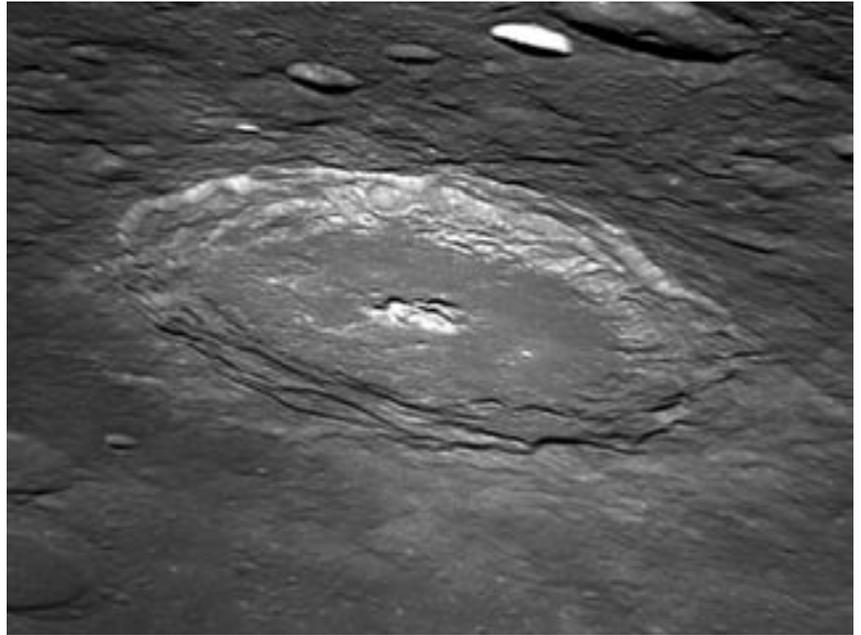
spheric gases on a regular basis - but not this one. M1 did it all at once and we know exactly when it happened.

As one of only about 20 supernovae seen before the invention of the telescope, 11th century Chinese astronomers thought it four times brighter than Venus. Seen in broad daylight, the supernova remained visible for more than three weeks and continued to be seen in the night sky for almost two years. The position recorded for that July 4th, 1054 AD discovery now corresponds with that of the Crab Nebula.

THURSDAY, FEBRUARY 2

There's no missing the Moon tonight, so let's go explore. Notice how crater Langrenus has changed in just 24 hours! Our study will be a trio of craters that look very much like a paw print on the surface. Just northeast of Langrenus' border, look for the collection of Naonobu (north), Atwood (south) and Bilharz (west). Power up and try an even more challenging crater almost on the edge of Langrenus' northern rim. This small pock-mark is known as Acosta.

When the Moon has begun to set, let's have a look at a pair of neighboring open clusters in Gemini - M35 and NGC 2158. While both can be seen in the same low-power field, only M35 is visible in binoculars as a round nebulosity as large as the Moon's disc and peppered with faint stars. This is precisely how NGC 2158 looks in a mid-sized telescope. Like many of the brighter Messier



LANGRENUS
CREDIT: DAMIAN PEACH

studies, M35 was observed by others before Charles began looking for comets and kept running into deep sky objects. Keep in mind as you view these two galactic clusters that faint NGC 2158 is 16,000 light years away. That's five times more distant than M35!

Tomorrow morning, observers in far western North America and Hawaii, will have the opportunity to see the Moon occult 4.5 magnitude Epsilon Piscium. Check the IOTA webpage to determine times and locales for Epsilon's disappearance on the Moon's shadowed side and reappearance on its bright limb. Keep the site bookmarked and use it as a reference throughout the observing year for other similar events.

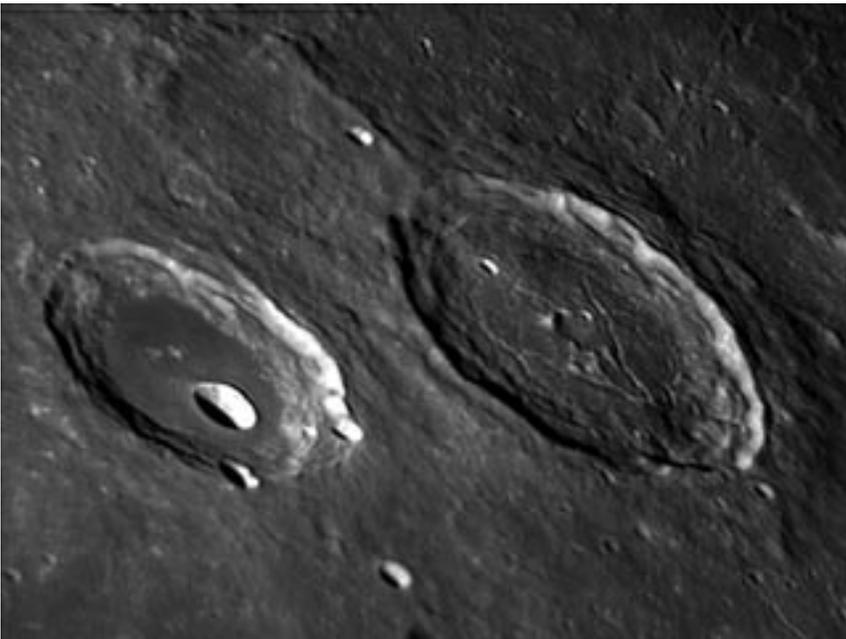
FRIDAY, FEBRUARY 3



LUNA 9 -
CREDIT: NASA

On this day in 1966, the first soft landing on the Moon occurred as Soviet probe Luna 9 touched down and sent back the very first pictures from the surface. Although Luna 9's landing area in the Oceanus Procellarum is not visible tonight, we'll discover two giants - Atlas and Hercules.

Located in the northeastern quarter of the lunar surface, this pair of craters is very prominent tonight in either binoculars or telescopes. The smaller, western crater is Hercules and the larger one is Atlas. When Hercules is near the terminator its western bright wall is in strong contrast to an interior so deep that it remains in shadow. Spanning 45 miles in diameter and plunging down 12,500 feet, Crater Hercules also contains an interior crater revealed as the Sun rises over it in the next 24 hours. Far more detail tonight is shown in much older crater Atlas. Spanning 54 miles in diameter and more shallow at



ATLAS AND HERCULES
CREDIT: DAMIAN PEACH

10,000 feet, Atlas contains a small interior peak. Power up and see if you can spot a Y-shaped crack along Atlas' floor known as the Rimae Atlas.

If you're in the mood to stay out a bit later, let the Moon set and have a look at the Eskimo Nebula (NGC 2392) in Gemini. Discovered by William Herschel in 1787, the 5000 light year distant NGC 2392 gives the appearance of a parka hooded face in large telescopes. In the center is a single 10th magnitude star - the source of both the planetary's nebulosity and its light. Smaller scopes

easily show both the central star and bright mantle of gas with a hint of "fuzzy" around the edge. Although the Eskimo is looking at us - it's moving away at 75 km per second.

To find the "Eskimo", start at Delta Geminorum and look about a finger width east/southeast for dim star 63. NGC 2392 is a little more than half a degree southeast, very near the ecliptic. Power up to get the best possible view of this 10th magnitude beauty. For those with a nebula filter, try it. This particular nebula will look much like a glowing green telrad.



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SATURDAY, FEBRUARY 4

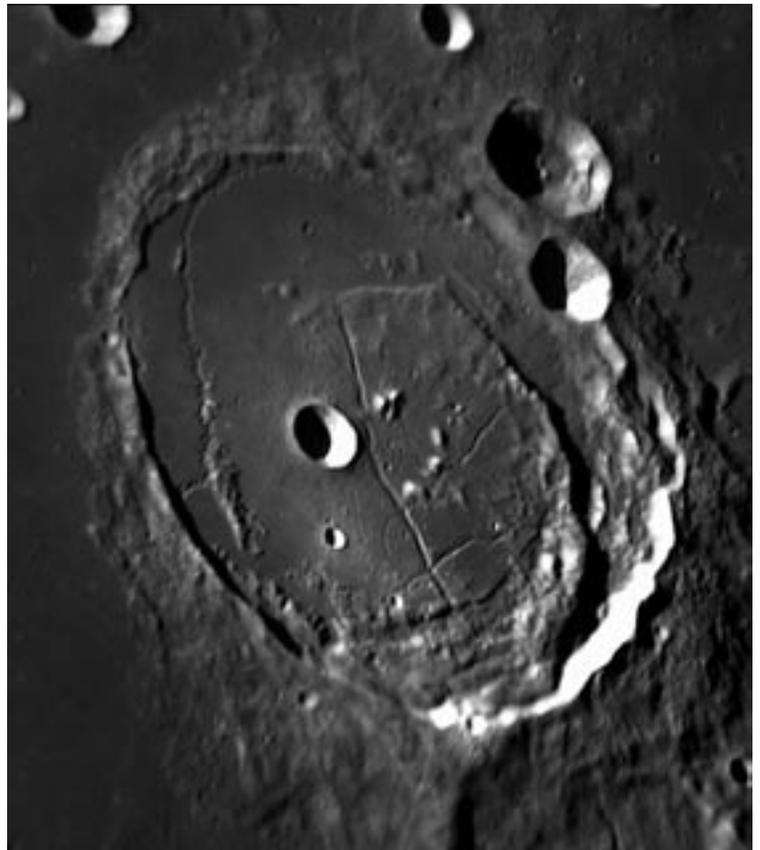
Today is the birthday of Clyde Tombaugh. Born in 1906, Tombaugh discovered Pluto 24 years and two weeks after his birth. It will be a few months before we have an opportunity to see Pluto, but it's grand to think that hard work and perseverance can accomplish some extraordinary things.

Let's have a look at the lunar surface tonight and return to crater Posidonius. Located on the northeast shore of Mare Serenitatis and near the terminator, this large, ancient walled plain is an example of a Class V crater. Posidonius appears to be very flat – and with good reason. While its dimensions are roughly 52 by 61 miles, the crater itself is only 8,500 feet deep. The bright ring of the structure remains conspicuous to binoculars throughout all lunar phases, but a telescope is needed to appreciate the many fine features found on Posidonius' floor. Power up to observed the stepped, stadium-like wall structure and numerous resolvable mountain peaks joining its small, central interior crater.

Before the Moon dominates the evening skies, let's turn our attention towards the faintest of the three Messier open clusters in Auriga - M38. You'll find it located almost precisely between Iota and Theta Aurigae. This 6.4 magnitude galactic cluster resolves into more than two dozen stars in small scopes, with its brighter members giving the appearance of an "X" in space. Like M35, M38 shares the field with a much fainter and more dense companion. Look another half degree south to find the 8th magnitude cluster NGC 1907.



CLYDE TOMBAUGH
(WIDELY USED
PUBLIC IMAGE)



POSIDONIUS
CREDIT: DAMIAN PEACH

SUNDAY, FEBRUARY 5

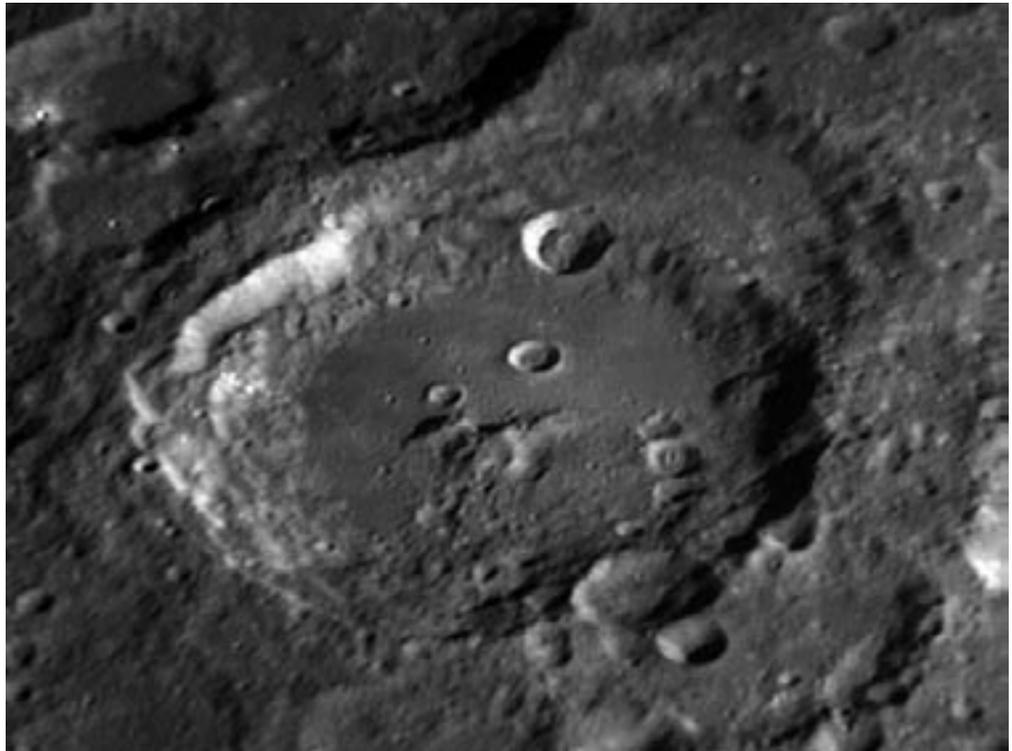


ARTIST CONCEPT OF
VENUS AND MARINER 10
CREDIT: NASA

On this day in 1963, Maarten Schmidt measured the first redshift of a distant quasar and revealed just how luminous these stellar appearing objects are. And in 1974 the first close-up photograph of Venus was made by Mariner 10.

The most outstanding feature tonight on the Moon will be a southern crater near the terminator - Maurolycus. Depending on your viewing time, the terminator may be running through it. These shadows will multiply its contrast many times over and display its vivid formations. As an Astronomy League challenge, Maurolycus will definitely catch your eye with its black interior and western crest stretched over the terminator's darkness. Too many southern craters to be sure? Don't worry. Maurolycus dominates them all tonight. Look for its double southern wall and multiple crater strikes along its edges.

Now let's journey towards Auriga and drop a fist's width south of Alpha (Capella). Congratulations on finding M38 under the moonlight! We'll look again at this superb open cluster under darker skies.



MAUROLYCUS
CREDIT: DAMIAN PEACH

MONDAY, FEBRUARY 6

On this day in 1971, astronaut Alan Shepherd became the first “lunar golfer” to tee off on the Moon’s surface. While the Apollo 14 landing site is just on the other side of the terminator tonight, we can still go “crater hopping” to catch another. Close to the terminator and about one third of the way from the southern cusp are the ancient walls of huge previously studied Albategnius. Directly to its lunar east, and about the same distance as Albategnius’ is wide, look for a trio - small western Andel, larger eastern Descartes, and larger still southern Abulfeda. Power up! Between Andel and Descartes is the small pockmark of Dolland. North of Dolland is a ruined, unnamed crater with a pronounced set of rings on its northwestern shore. On the eastern edge of the relatively smooth floor, the remains of the Apollo 16 mission still shine on!



APOLLO 16 LANDER
CREDIT: NASA

Tonight we’ll finish up our sweep for stardust through Auriga. Start at Theta and head due south five degrees (half a fist). On most nights, M37 gives an extraordinarily dense and complex view of more than 100 stars to small scopes, but lunacy will prevent that. Power up to darken the field.



POSIDONIUS
CREDIT: DAMIAN PEACH

Now let’s talk about these three interesting open clusters. All were discovered by Giovanni Batista Hodierna before the year 1654 - more than a decade before Messier cataloged them. All are located roughly 4000 light years away from Earth. The smallest of the three, M36,

spans 12 light years. That’s not much more than the distance between our Sun and Epsilon Eridani. Larger M37 and M38 span about 25 light years, or about the distance between us and Vega. We’ll come back for a look at all three later in the month.

Tonight observers in western North America and Hawaii should follow the progress of the Moon as it passes through the Pleiades!

TUESDAY, FEBRUARY 7

On this day in 1889, the first American national astronomy organization was born - the Astronomical Society of the Pacific.

Tonight, let's return to the Moon and a previously studied crater, Plato. To the south on the dark plains of Mare Imbrium, you will notice an almost star-like point of light, a singular peak named Mons Pico. Unique among lunar mountains, its highly reflective rocky composition makes it appear almost like a

pyramid in the long shadows of sunrise. "Pyramid" Pico stands 8,000 feet above the lunar plane on a base some 18 miles wide!

After looking at a solitary mountain this evening, let's have a look at a solitary star as well - Alpha Orionis. Although its designation lists it as Orion's brightest star in Johann Bayer's Uranometria of 1603, Betelgeuse is actually slightly fainter than Beta (Rigel). What makes it special is its color. To the eye, Betelgeuse appears a distinctive red-orange. This color relates directly to its

spectral class of M2. Like many M-spectra stars, Betelgeuse truly is a "red giant" - a star approaching the end of its life. With an immensely swollen, low temperature, near-vacuum photosphere of hydrogen and helium gas, this star measures some! 300 million miles in diameter. Placed at the Sun's position, it would extend out beyond the orbit of Mars! At 430 light years away, Betelgeuse is not the farthest or bright stars of winter, but it is most certainly the largest.



PLATO AND PICO
CREDIT: ROGER WARNER

WEDNESDAY, FEBRUARY 8

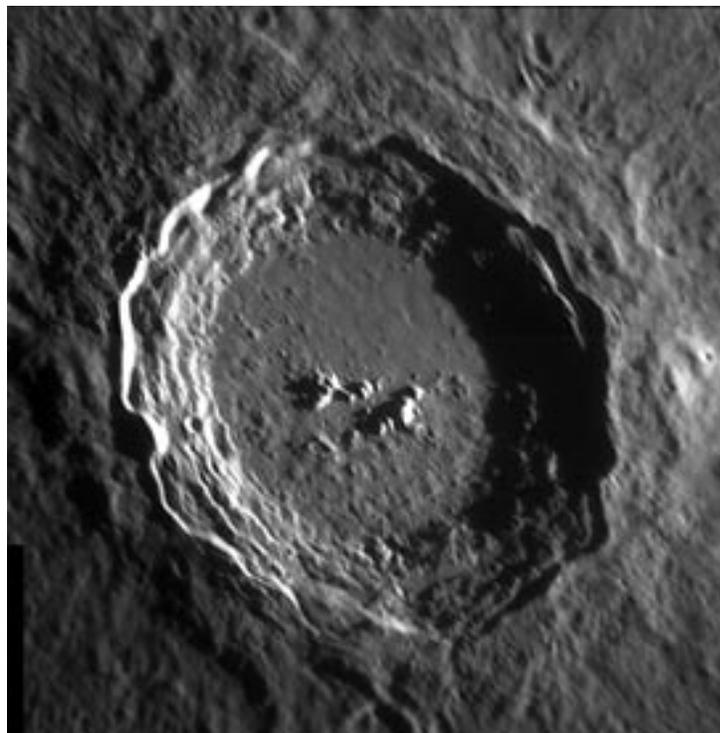
Today celebrates the birth of J.L.E. Dreyer. Born in 1852, the Danish Dreyer came to fame as the astronomer who compiled the New General Catalogue (NGC) published in 1878. As a professional, Dreyer began his observations of the night sky in the employ of Lord Rosse at Birr Castle Ireland. Later Dreyer moved to Armagh Observatory where he confirmed many of the deep sky studies compiled by William Herschel and other observers using the 10" refractor he secured funds for and selected as his instrument of choice. Even with a wealth of astronomical catalogs to choose from, the NGC objects, and Dreyer's abbreviated list of descriptions, still remain the most widely used today.

Let's engage in some further lunar exploration as crater Copernicus again becomes visible tonight to even the most modest of optical aid. Small binoculars show Copernicus as a bright "ring" midway along the lunar dividing line of light and dark called the "terminator". Telescopes will reveal its 97 km (60 mile) expanse and 120 meter (1200 ft.) central peak to perfection. Copernicus holds special appeal as it's the aftermath of a huge meteoric impact. At 3800 meters (12,600 feet) deep, its walls are around 22 km (14 miles) thick and over the next few days, the impact ray system extending from this tremendous crater will become wonderfully apparent.

Now, let's explore something special from J.L.E.'s lifework. Let's turn eyes, binoculars, and scopes on Orion's Belt and the brightly scattered open cluster NGC 1981. On a dark, moonless night, NGC 1981 can be seen unaided as a small, fuzzy haze in Orion's "sword". Let's start by using binoculars - or finderscope - to get a sense of how 1981 "fits in" with the area. Do you see those three 6th magnitude stars at the top? They're part of the 1981 cluster. Now look south to 4.6 magnitude 42 Orionis - a tight, disparate double. You probably won't see M43 further south, but M42 will be visible. Try observing multiple system Iota Orionis. After the low power tour, head back to the top of the list with a telescope and enjoy the dozen or so brightly scattered, hot young stars that make up number 1981 on J.L.E Dreyers celestial list!



J.L.E. DREYER
(PUBLIC DOMAIN IMAGE)



COPERNICUS
CREDIT: DAMIAN PEACH



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THURSDAY, FEBRUARY 9

It's a "Moon Gazer's" evening as our nearest astronomical neighbor continues to light up the night sky. Don't put away your telescopes and binoculars thinking there's nothing to view though, because one of the most "romantic" features on the lunar surface will be highlighted tonight.

The Sinus Iridium is one of the most fascinating and idyllic regions of the



SINUS IRIDIUM
CREDIT: RICARDO BORBA

Moon. At 241 km (150 miles) in diameter and ringed by the Juras Mountains, it's known by the quiet name of "The Bay of Rainbows". Despite this serene name, the region was actually formed by cataclysm. Astronomers speculate that a minor planet of around 200 km in diameter once impacted our newly formed Moon with a glancing strike. This caused "waves" of superheated material to wash up along a "shoreline" forming this delightful C-shaped lunar feature. The effect of looking at a bay is stunning as the smooth inner sands show soft waves called "rilles", broken only by a few small, impact craters. This picture is completed as Promontories Heraclides and LaPlace rise above the surface (at 1800 meters

and 3000 meters respectively) appearing as distant "lighthouses" standing at the entrance.

It's also a great time for seeing double. Before it moves too high overhead, have a look at 41 Aurigae. The pair – one of 5th and other of the 7th magnitude - is separated by 8 arc seconds. Notice how the companion orients almost due north of its brighter primary. The result appears as two stars moving side-by-side across the field of view! 41 Aurigae and its secondary are members of the Hyades. To locate 41, start at Beta Aurigae. Use your finderscope to center on Pi - a little more than a degree north. 41 is a slightly fainter star around five degrees northeast of Pi. It's a challenge to locate - but it means is that you can congratulate yourself when you find it! And enjoy observing it all the more...

FRIDAY, FEBRUARY 10

Let's return to the Moon tonight and explore an area to the south around another easy and delightful lunar feature - the crater Gassendi. At 110 km in diameter and 2010 meters deep, this ancient crater contains a triple mountain peak in its center. Once one of the most "perfect circles" on the Moon, the south wall of Gassendi has been eroded by lava flows over a 48 km expanse and offers numerous detailed features to telescopic observers on its ridge and rille covered floor. Observing with binoculars? Gassendi's bright ring stands on the north shore of Mare Humorum...an area about the size of the state of Arkansas!

Are you ready for a tough double star? Alnitak (Zeta Orionis) is the easternmost star of Orion's belt. It's a double just wide enough to resolve through any telescope. However, you'll need steady skies to show the two bright stars as distinct and tiny orbs of light separated by a mere 2.3 arc seconds. While observing this tight couple, keep in mind that both stars are some 800 light-years distant and that Zeta-A has one of the hottest photospheres among all known stars. At

31,000 degrees K, its temperature is so high that it shines primarily in the ultra-violet. Look for a third, 10th magnitude star almost 1 arc minute away from the bright pair. When you can see this one plainly, you're ready to start looking for fainter members of the famed Trapezium found in the heart of M42.

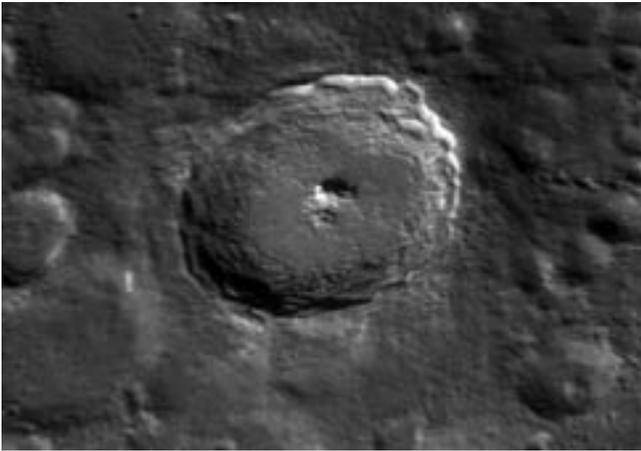


GASSENDI
CREDIT: DAMIAN PEACH

SATURDAY, FEBRUARY 11

On this day in 1970, Lambda 4S-5, the first Japanese satellite was launched.

The waxing Moon will dominate early evening skies, but tonight is an excellent opportunity for binoculars and telescopes to explore crater Tycho.



TYCHO
CREDIT: DAMIAN PEACH

Named for Danish astronomer, Tycho Brahe, this fantastic impact crater is very impressive in even the most modest of optical aids. Spanning 85 km, this lunar feature will be very prominent and unmistakable in the southern hemisphere of the Moon. Tycho's highly conspicuous ray system support its origin as an impact crater. The rays span hundreds of kilometers across the lunar surface. Tycho is also one of the youngest of the

major features at an astounding age of only 50,000,000 years old!

On January 9, 1968 Surveyor 7 - the last lunar robot of its kind - landed quietly at lunar sunrise on Tycho's slopes. Because previous Surveyor missions provided the Apollo program with all data necessary for manned missions, Surveyor 7's presence was scientific only. Two weeks later, when the Sun set on the landing site, Surveyor 7 had provided over 21,000 photographs, determined physical and chemical properties associated with the Southern Highland area, and detected laser beams aimed at it from two separate Earth observatories.

With the Moon lighting the skies, tonight will give you and opportunity to see just how much effect it has on



SURVEYOR 7 IMAGE
OF TYCHO
CREDIT: NASA

studies. In the spirit of investigation, have a look at the Great Nebula in Orion. Not quite the glorious sight you remember, huh? But while in M42, power up a little and have a look at those four stars in its midst. We will be back...

SUNDAY, FEBRUARY 12

Tonight the Moon will command the skies and give naked-eye observers an opportunity to use their imaginations!

Since the dawn of mankind, we have been gazing at the Moon and seeing fanciful shapes in large lunar features. Tonight, as the Moon rises, is your chance to catch an Astronomy League lunar challenge - "The Rabbit in the Moon." The "Rabbit" is a compilation of all the dark maria. The Oceanus Procellarum forms the "ear" while Mare Humorum makes the "nose." The "body" is Mare Imbrium and the "front legs" appear to be Mare Nubium. Mare Serenitatis is the "backside" and the picture is complete where Mare Tranquillitatis and Mare Fecunditatis shape the "hind legs" with Crisium as the "tail."

See the Moon with an imaginative mind and new eyes – and find the "Rabbit". It's already out of the hat and in the heavens...

For telescopes and binoculars, the lunar surface will provide a bright but superior view of crater Grimaldi. Named for Italian physicist and astronomer, Francesco Grimaldi, this deep grey oval is one of the darkest features on the Moon - only reflecting about 6% of the light. Approximately 430 km (140-145 miles) long, it's easy to spot along the terminator and just slightly south of the center of the lunar limb. Tonight is the best time to view its mountained walls, for later they will disappear and Grimaldi will take on the appearance of a small mare in the light of the full Moon.

Before then, let's look at another fine double star - Eta Orionus. Eta is the 3.4 magnitude star a little over 6 degrees north-northeast of Rigel. Like Alnitak, Eta has a bright, closely spaced companion. Look for a much fainter 9.4 magnitude star that may not be part of the system. Like Alnitak, almost any size telescope can split the pair, but it will take a still sky to fully distinguish each star clearly.



"RABBIT IN THE MOON"
CREDIT: TAMMY PLOTNER

MONDAY, FEBRUARY 13

Tonight is Full Moon. During the month of February the upper northern hemisphere is often heavy with snow. Native Indian tribes of the north and east called February's Full Moon the Full Snow Moon. Some tribes also referred to this Moon as the Full Hunger Moon as arctic weather conditions often made hunting and food gathering very unproductive.

Tonight let's have a look at a pair of single stars that make up Gemini, the Twins - Castor and Pollux.

In Greek mythology, Castor and Pollux were fathered by the Greek god Zeus (Jupiter) who took the form of a swan and came upon a beautiful mortal woman.



FULL MOON
CREDIT: ROGER WARNER

Pollux later grew up to become a skilled boxer and Castor, a master horseman. The two brothers were inseparable. It is said that they rescued the beautiful Helen from Troy, traveled with Jason and the Argonauts, and ultimately found themselves in a mortal battle with another pair of twin brothers over a beautiful woman. Pollux was so grief stricken at Castor's death that he cried out to Zeus and offered up his own immortality in exchange for Castor's life. Zeus took pity on the twins and placed them in the sky. You can see them tonight with your

own eyes joined seemingly eternally together in Gemini.

As you observe this pair note that although Castor is almost half a magnitude fainter than Pollux, Bayer gave that star the title "Alpha Geminorum". Which one do you think appears brighter? There's more about both stars to come.

TUESDAY, FEBRUARY 14

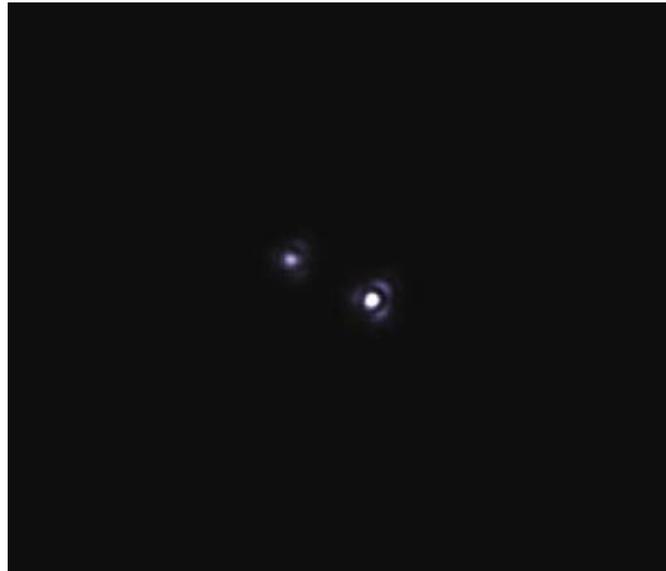
Happy Valentine's Day! Today is the birth date of Fritz Zwicky. Born in 1898, Zwicky was the first astronomer to identify supernovae as a separate class of objects. His insights also proposed the possibility of neutron stars. Among his many achievements, Zwicky catalogued galaxy clusters and designed jet engines. He also suggested the redshift displayed in the spectra of distant galaxies could be caused by something other than universal expansion.

Tonight's lunar feature for telescopes and binoculars is crater Langrenus. Named for the Belgian engineer and mathematician Michel Florent van Langren, crater Langrenus is easily found along the terminator slightly south of central. At this time its 132 km expanse will appear shallow and display a luminous central peak.

Since you have your scope out, why not turn it towards one of the brightest double stars in the night sky - Alpha Geminorum. It's true. One of the twins is a twin! Separated by a little more than 3 arc seconds, this true binary pair of 2nd magnitude stars make Castor a splendid study - even in the smallest scopes.

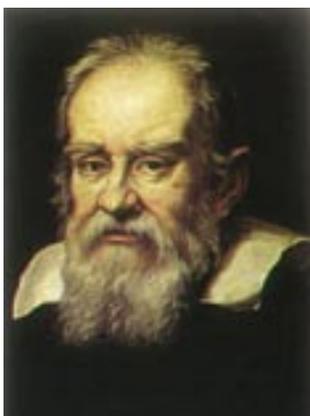


FRITZ ZWICKY
CREDIT: NEW MEXICO
MUSEUM OF SPACE HISTORY



CASTOR
CREDIT: DAMIAN PEACH

WEDNESDAY, FEBRUARY 15



ORIGINAL PORTRAIT OF GALILEO PAINTED BY JUSTUS SUSTERMANS IN 1636 (IMAGE LISTED AS PUBLIC DOMAIN)

Born on this day in 1564 was the man who fathered modern astronomy - Galileo Galilei. Almost 4 centuries ago, Galileo became the first scientist to use a telescope for astronomical purposes and his first study was the Moon. His words, "Most beautiful and admirable is it to see the Moon's luminous form... At nearly thirty diameters - some 900 times greater in region - anyone can perceive that the Moon is not covered with a smooth and uniform surface but in fact reveals great mountainous shelves, deep cavities, and gorges just like those of the Earth," still echo true today.

Tonight the tiny crater named for Galileo will be visible on the surface, but seeing it - even in a telescope - will be a challenge. Look to the fully illuminated western edge. Almost central and caught on the edge of Oceanus Procellarum, you will see a small, bright ring. This is crater Reiner. You will find Galileo just a short hop to the northwest as a tiny, washed out feature. What a shame the cartographers did not pick a more vivid feature to honor the great Galileo!

Galileo is noted for making many wondrous discoveries, but did you know that he may have been the first astronomer to see the Trapezium in M42? Galileo included three of the four stars in a sketch based on what is probably a low power (27x) view of the Great Nebula. Tonight celebrate that unheralded discovery by using the lowest possible magnification and the smallest telescope you can find to get the "Galileo-eye view" of the Trapezium.

THURSDAY, FEBRUARY 16

Today celebrates the birth of Francois Arago. Born in 1786, Arago was an early and enthusiastic supporter of the wave theory of light. His scientific achievements were many - including the 1811 invention of the polariscope. Arago was also a practiced astronomer and wrote 4 volumes entitled *Astronomie Populaire* in the mid-1800's. Arago's polariscope revealed that light could be organized in such a way as to cause photons to have a similar electromagnetic orientation. Polarized light viewed through his polariscope could come close to disappearing when the instrument was rotated. Many amateur astronomers use polarizing filters to reduce the amount of glare from the Moon, but did you know that even starlight can be polarized?

In celebration of Arago's birth, why not go out and have a look at one such star - Merope in the Pleiades. As you observe Merope keep in mind that its light doesn't begin polarized. In passing through the Merope Nebula, it becomes filtered. Try using a polarized filter and compare the view without.

On this day in 1948, Gerard Kuiper was celebrating the discovery of Miranda - one of Uranus' moons. At magnitude 16, few of us will ever see Kuiper's discovery for ourselves. With Uranus now close to the Sun (near Lambda Aquarii), even it will be hard to see!



FRANCOIS ARAGO
(SITE SAYS IMAGE
BELIEVED TO BE
PUBLIC DOMAIN)



M44: "THE BEEHIVE"
CREDIT: NOAO/AURA/NSF

FRIDAY, FEBRUARY 17

For SkyWatchers this morning, many of you will have the opportunity to watch the Moon occult bright Spica - Alpha Virginis. Be sure to check with IOTA for times and locales.

Early evening means dark skies, so let's take the opportunity to revisit two of the three Messier open clusters in Auriga and compare them with the similar, but fainter, NGC 1893.

NGC 1893 is similar to M36 in size, but four times fainter. On a good night, a small telescope can resolve more than a dozen faint stars in this 13,000 light-year distant open cluster. To find it, look around 3 degrees southwest of M38 and west of M36. The three clusters form an even triangle in the sky. In large binoculars or a rich-field telescope, the trio can be seen together as nebulous mists sprinkled with faint stars. Remember this cluster is also four times more distant than the Messier objects it shares Auriga with. It is estimated to be 10 million years old and it's still in the process of giving birth to new stars. Reflection nebula IC 410 is also part of the NGC 1893. See if you can spot it!



IC 410
CREDIT: ROGER WARNER

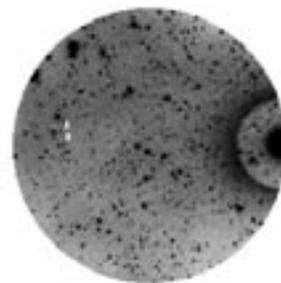
SATURDAY, FEBRUARY 18

On this day in 1930, a young man named Clyde Tombaugh was very busy with some photographic plates taken with the Lowell Observatory's 13" telescope. His reward? The discovery of Pluto!

Clyde discovered Pluto on a set of plates centered on the star Delta Geminorum - Wasat - a star lying very near the path the Sun takes across the sky. While we can't see Pluto tonight, we can study this fine 3.5 magnitude star and its disparate companion.

Once you've studied Wasat, you may notice Saturn gracing the early evening sky. As you observe Saturn's magnificent ring system and four or five brightest moons, give some thought to distance and size. If our solar system was measured in units based on the Saturn-Sun distance - rather than Earth-Sun, Pluto would be 3.4 AUs from Sol. At 2274 kilometers in diameter, Pluto is less than half the size of Saturn's largest satellite - Titan!

For deep sky, have a look at the rich open cluster NGC 2129. Located about a finger width west of M35, at low power it may appear in the same field of view as Propus - 1 Geminorum. A rich-field scope or binoculars will frame M35 and NGC 2129 together.



TOMBAUGH'S
PHOTOGRAPHIC PLATE
CREDIT: ACADEMY OF
ACHIEVEMENTS



M35 AND NGC 2129
CREDIT: NOAO/AURA/NSF

SUNDAY, FEBRUARY 19



COPERNICUS
(WIDELY USED
PUBLIC IMAGE)

Today is the birthday of Nicolas Copernicus. Born in 1473, Copernicus envisioned the modern solar system model which explained the retrograde motion of the outer planets. Considering this was well over 530 years ago, and in a rather unenlightened time, his revolutionary thinking is astounding. If you are up later, you can see the mighty crater named for Copernicus on the lunar surface almost central and west of the terminator.

But, before the Moon rises tonight, let's turn our telescopes towards Saturn - one solar system body whose motion through the heavens exemplifies much of what Copernicus hoped his concept could explain! Among the "seven classical planets", Saturn moves the slowest, taking almost two and a half years to move the thirty degrees related to each of the twelve "stations" planets pass through as they circle the ecliptic. Because of its slow pace, Saturn is often associated with "Chronos," or Father Time, who wields his scythe and harvests a 30 year-long generation of humankind. Right now, Saturn is stationed in Cancer the Crab - one of the twelve "zodiacal", or "animal signs" of the ecliptic. The



SATURN
CREDIT: DAMIAN PEACH

Crab is joined with twelve eleven other animals - preceded by neighboring Gemini, "the twin men", and followed by Leo, "the solitary Lion". By putting the Sun in the center of all this - rather than the Earth - Copernicus freed human thinking from the more ancient Ptolemaic system and allowed the solar Lion to stand at the center of things instead.

So, have another look at Saturn. Enjoy its low-contrast southern equatorial belt, subtly mottled blue polar region, and fine system of four easily seen satellites each moving much more rapidly around Saturn than the planet itself does around the Sun. Then think "Wow, that Copernicus guy would really have enjoyed seeing this!"

MONDAY, FEBRUARY 20

Today in 1962, John Glenn was onboard Friendship 7 and became the first American to orbit the Earth. As Colonel Glenn looked out the window, he reported seeing “fireflies” glittering outside his Mercury space capsule. Let’s see if we can find some...

The open cluster M41 in Canis Major is just a quick drift south of the brightest star in the northern sky - Sirius. Even the smallest scopes and binoculars will reveal this rich group of mixed magnitude stars and fill the imagination with strange notions of reality. Through larger scopes, many faint groupings emerge as the star count rises to well over 100 members. Several stars of color - orange in particular - are also seen along with a number of doubles.

First noted telescopically by Giovanni Batista Hodierna in the mid-1500’s, ancient texts indicate that Aristotle saw this naked-eye cluster some 1800 years earlier. Like other Hodierna discoveries, M41 was included on Messier’s list - along with even brighter clusters of antiquity such as Praesepe in Cancer and the Pleiades in Taurus.

Open cluster M41 is located 2300 light years away and recedes from us at 34km/sec - about the speed Venus moves around the Sun. M41 is a mature cluster, around 200 million years old and 25 light years in diameter. Remember M41...Fireflies in night skies.



JOHN GLENN ENTERING
FRIENDSHIP 7
CREDIT: KENNEDY SPACE
CENTER/NASA



M41
CREDIT: NOAO/AURA/NSF

TUESDAY, FEBRUARY 21

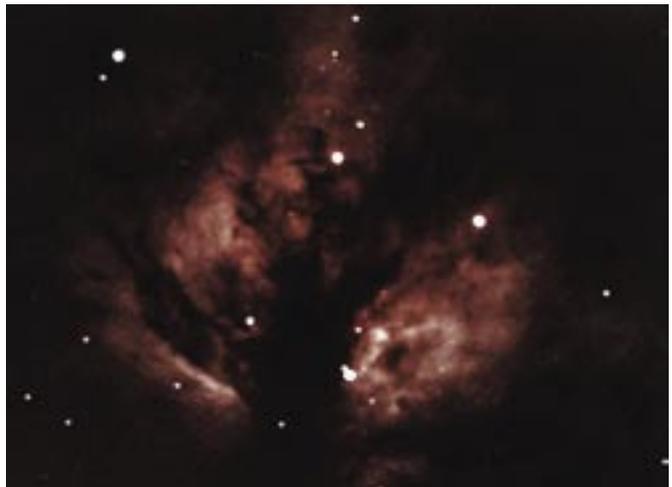
Be sure to have a look at the Moon this morning before dawn, because Jupiter will be joining it!

Tonight Luna will rise well after midnight, so let's return to look at two of the few globular clusters of the season. Starting with M79 in Lepus, head due south around 15 degrees into Columba - the Dove. There you'll find a second winter cluster almost a full magnitude brighter than M79 - NGC 1851. Give it a try!

Want another challenge? Head for bright Alnitak - the easternmost star in Orion's belt. Using medium to low power, carefully shift bright Alnitak out from the center of the field about a full moon's width to the west. With dark skies, you will see a large, faint, tulip-shaped nebulosity broken by one or more dark lanes. This is the "Flame Nebula" - NGC 2024. Congratulations. This one isn't easy, but on the darkest of nights it may surprise you!



ALNITAK AND
"THE FLAME NEBULA"
CREDIT: ROGER WARNER

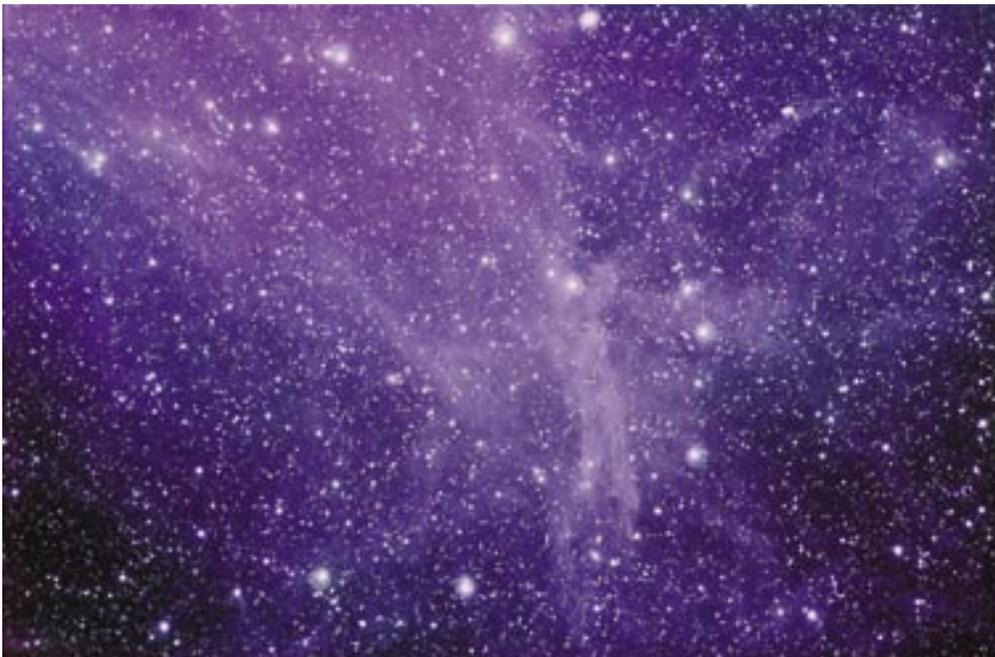


CLOSE UP OF
"THE FLAME NEBULA"
CREDIT: ROGER WARNER

WEDNESDAY, FEBRUARY 22

If skies are clear this evening, all you need do is step outside as the last glow of the long-set Sun pales to the southwest. Prepare your eyes - and heart - to follow the great expanse of the many brilliant stars of the winter Milky Way. Arching from Puppis to Cassiopeia, you might also see a fading Deneb - crown star of the Northern Cross - descending west. If you live towards the southern hemisphere, you should see brilliant Canopus - second brightest star in the night sky high to the south. In honor of the many splendid lights of the winter Milky Way, take out your binoculars and explore the marvels that await you!

Did you find something in the binoculars that caught your eye? Why not get the scope out and see if you can track it down. Navigating with a scope can be a challenge. Things look differently by eye, binoculars, finderscope, and telescope, but that's what learning the night sky is all about.

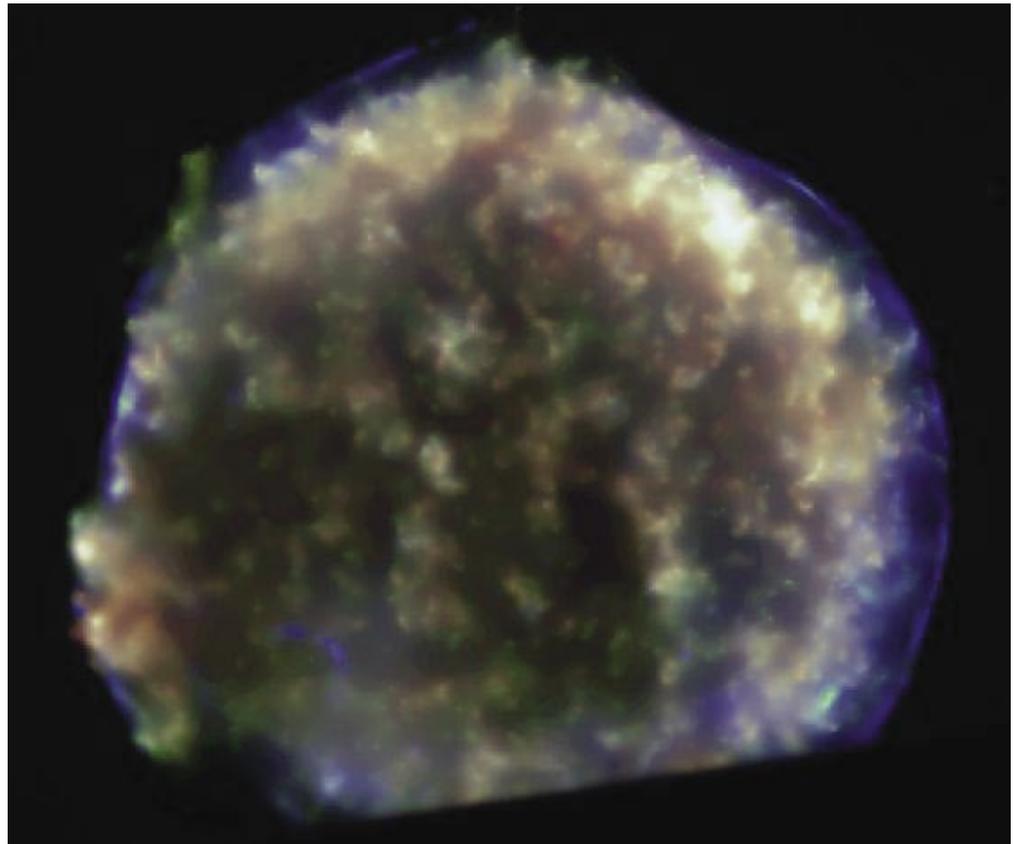


"MANDELL'S ANGEL
NEBULA": THE REGION
NEAR M81 AND M82
CREDIT: STEVE MANDEL

THURSDAY, FEBRUARY 23

On this date in 1987, Ian Shelton made an astonishing discovery - a supernova. At 160,000 light years away, distant SN1987a was the brightest novae display seen in almost 400 years. More importantly, before it occurred, a blue star of roughly 20 solar masses was already known to exist in that same location within the Large Magellanic Cloud. Catalogued as Sanduleak -69°202, that star is now gone. With available data on the star, astronomers were able to get a “before and after” look at one of the most extraordinary events in the universe! Tonight, let’s have a look at a similar event known as “Tycho’s Supernova”.

Located northwest of Kappa Cassiopeia, SN1572 appeared so bright in that year that it could be seen with the unaided eye for six months. Since its appearance was contrary to Ptolmaic theory, this change in the night sky now supported Copernicus’ views and heliocentric theory gained credence. We now recognize it as a strong radio source, but can it still be seen? There is a remnant left of this supernova, and it is challenging even with a large telescope. Look for thin, faint filaments that form an incomplete ring around 8 arc minutes across.



FRIDAY, FEBRUARY 24

In 1968, during a radio-telescope search for quasars, Susan Jocelyn Bell discovered the first pulsar. At first the regularity of the pulses was so precise that Bell and her college advisor, D. A. Hewish, thought they might be receiving a signal from a distant civilization. It soon became clear as the number of these objects multiplied that all were natural - rather than artificial - phenomena. Two co-directors of the project, Hewish and Ryle, later matched Bell's observations to the notion of a rotating neutron star. This won them the 1974 Physics Nobel Prize and proved a theory brought forward thirty years earlier by J. Robert Oppenheimer.

Tonight let's take a journey just a breath above Zeta Tauri and spend some quality time with a pulsar embedded in the most famous supernova remnant of all. Factually, we know the Crab Nebula to be the remains of an exploded star recorded by the Chinese in 1054. We know it to be a rapid expanding cloud of gas moving outward at a rate of 1,000 km per second, just as we understand there is a pulsar in the center. We also know it as first recorded by John Bevis in 1758, and then later cataloged as the beginning Messier object - penned by Charles himself some 27 years later to avoid confusion while searching for comets. We see it revealed beautifully in timed exposure photographs, its glory captured forever through the eye of the camera - but have you ever really taken the time to truly study M1?

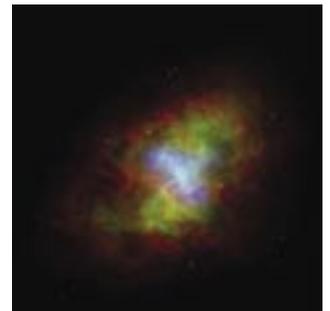
Then you just may surprise yourself...

In a small telescope, the Crab Nebula might seem to be a disappointment - but do not just glance at it and move on. There is a very strange quality to the light which reaches your eye, even though at first it may just appear as a vague, misty patch. To small aperture and well-adjusted eyes, M1 will appear to have "living" qualities - a sense of movement in something that should be motionless. The concept of differing light waves crossing over one another and canceling each other out - with each trough and crest revealing differing details to the eye - is never more apparent than during study. To truly watch M1 is to at one moment see a "cloud" of nebulosity, the next a broad ribbon or filament, and at another a dark patch. When skies are perfectly stable you may see an embedded star, and it is possible to see six such stars.

Many observers have the ability to see spectral qualities, but they need to be developed. From ionization to polarization - our eye and brain are capable of seeing to the edge of infra-red and ultra-violet. Even a novice can see the effects of magnetism in the solar Wilson Effect. But what of the spinning neutron star at M1's heart? We've known since 1969 that M1 produces a visual pulsar effect. About once every five minutes, changes occurring in the neutron star's pulsation affect the amount of polarization, causing the light waves to sweep around like a giant "cosmic lighthouse" and flash across our eyes. M1 is much



JOCELYN BELL
(WIDELY USED
PUBLIC DOMAIN IMAGE)



PULSAR
CREDIT: J. HESTER (ASU),
CXC, HST, NRAO, NSF, NASA



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TAMMY PLOTNER

SATURDAY, FEBRUARY 25

Since we've studied the "death" of a star, why not take the time tonight to discover the "birth" of one? Our journey will start by identifying Aldeberan (Alpha Tauri) and move northwest to bright Epsilon. Hop 1.8 degrees west and slightly to the north for an incredibly unusual variable star - T Tauri.

Discovered by J.R. Hind in October 1852, T Tauri and its accompanying nebula, NGC 1555, set the stage for discovery with a pre-main sequence variable star. Hind reported the nebula, but also noted that no catalog listed such an object in that position. His observations also included a 10th magnitude uncharted star and he surmised that the star in question was a variable. On each count Hind was right, and both were followed by astronomers for several years until they began to fade in 1861. By 1868, neither could be seen and

it wasn't until 1890 that the pair was re-discovered by E.E. Barnard and S.W. Burnham. Five years later? They vanished again.

T Tauri is the prototype of this particular class of variable stars and is itself totally unpredictable. In a period as short as a few weeks, it might move from magnitude 9 to 13 and other times remain constant for months on end. It is about equal to our own Sun in temperature and mass - and its spectral signature is very similar to Sol's chromosphere - but the resemblance ends there. T Tauri is a star in the initial stages of birth!

T Tauri are all pre-main sequence and are considered "proto-stars". In other words, they continuously contract and expand, shedding some of their mantle of gas and dust. This gas and dust is caught by the star's rotation and spun into an accretion disc - which might be more properly referred to as a proto-planetary disc. By the time the jets have finished spewing and the material is

pulled back to the star by gravity, the proto-star will have cooled enough to have reached main sequence and the pressure may have allowed planetoids to form from the accreted material.



2 MASS IMAGE: T TAURI
CREDIT: NASA



<http://www.universetoday.com>

SUNDAY, FEBRUARY 26

Today is the birth date of Camille Flammarion. Born in 1842, he became a widely read author of astronomy and originated the idea that we were not alone - the notion of extraterrestrial intelligence. Yet, Flammarion was more than the great grandfather of SETI. In 1877, Flammarion found Charles Messier's personal notes and catalog in an antiquarian book store. Based on those notes, he was able to identify M102 as Dreyer's NGC 5866 and associate NGC 4594 with M104. Because of Flammarion's hard work of scholarship and astronomical observation, two previously obscure references to faint studies in the Messier Catalogue were properly identified.

To locate these two studies, you'll be waiting until around local midnight. Start at Iota Draconis and head about half a fist width in the direction of bright Arcturus to a solitary 5.2 magnitude star. Small, 10th magnitude M102 is about one degree due north toward Polaris. M104 - the "Sombrero Galaxy" - is just a bit more than a fist width west of Spica. At magnitude 8.3, it can be easily seen as a small faint glow in binoculars or finderscope. But it requires a telescope and a dark sky to hint at its namesake.

While you're waiting for them to rise, relax and enjoy the Delta Leonid meteor shower. Entering our atmosphere at speeds of up to 24 kilometers per second, these slow travelers will seem to radiate from a point around the middle of Leo's "back". The fall rate is rather slow at 5 per hour, but any meteor trail is a delight to catch!



CAMILLE FLAMMARION
(WIDELY USED
PUBLIC IMAGE)



M102
CREDIT: NOAO/AURA/NSF



M104: "THE SOMBRERO"
CREDIT: R. JAY GABANY

MONDAY, FEBRUARY 27



BERNARD LYOT
(WIDELY USED
PUBLIC IMAGE)

Today is the birthday of Bernard Lyot. Born in 1897, Lyot went on to become the inventor of the coronagraph in 1930. Although we cannot hand you a corona, we can show you a star that wears its own gaseous envelope.

Let's go to our maps west of M36 and M38 to identify AE Aurigae. As an unusual variable, AE is normally around 6th magnitude and resides approximately 1600 light years distant. The beauty in this region is not particularly the star itself but the faint nebula in which it resides known as IC 405, an area of mostly dust and very little gas. What makes this view so entertaining is that we are looking at a "runaway" star. It is believed that AE once originated from the M42 region in Orion. Cruising along at a very respectable speed of 80 miles per second, AE flew the "stellar nest" some 2.7 million years ago! Although IC 405 is not directly related to AE, there is evidence within the nebula that areas have been cleared of their dust by the rapid northward motion of the star. AE's hot, blue illumination and high energy photons fuel what little gas is contained within the region. Its light also reflects off the surrounding dust. Although we cannot "see" with our eyes like a photograph, together the pair forms an outstanding view for the small backyard telescope and it is known as "The Flaming Star."



AE AURIGAE:
"THE FLAMING STAR"
CREDIT: ROGER WARNER

TUESDAY, FEBRUARY 28

Are you ready for a New Moon challenge? Then take advantage of dark sky time to head toward Orion. Tonight our aim is toward a single star - but there is much more hiding there than just a point of light!

Our first stop is the eastern-most star in the “belt,” Zeta Orionis, or better known as Alnitak. At a distance of some 1600 light years, this 1.7 magnitude beauty contains many surprises – it’s a double star system. High power and steady skies are needed to make Alnitak’s duplicity clear, but if you want more, look a breath east and revisit the Flame Nebula - a fantastic field of nebulosity illuminated by Alnitak. The NGC 2024 is an outstanding region of nebulosity spread over an area the apparent size of a full moon.

Still not enough? Break out the big scope and put Zeta out of the field of view to the north at high power and

allow your eyes to re-adjust. When you look again, you will see a long, faded ribbon of nebulosity called IC 434 south of Zeta. It stretches over a degree toward the south. The eastern edge of the “ribbon” is very bright and mists away to the west. Now hold your breath and look almost directly in the center. See that dark notch with two faint stars south of it? You have located one of the most famous of the Barnard dark nebulae - B33.

You may exhale now. B33 is also known as the “Horsehead Nebula”. This “Horsehead” is very tough visually - the classic chess piece appearance of a “knight” is only fully appreciated in photographs - but those of you who have large aperture can see a dark “notch,” improved with the use of a specific nebula filter. B33 is a small area cosmically, only about one light year in expanse. It’s nothing more than obscuring dark dust and non-luminous gas - but what an incredible shape! If you do not succeed at first attempt, try again. The “Horsehead” is one of the most challenging objects in the sky and has been observed with apertures as small as 150mm. This just might be your lucky “Knight”...



IC 434 AND B33:
“THE HORSEHEAD”
CREDIT: R. JAY GABANY

MARCH 2006



<http://www.universetoday.com>

WEDNESDAY, MARCH 1

George Abell was born this day in 1927. Abell cataloged 2712 clusters of galaxies based on the Palomar sky survey completed in 1958. Using plates taken by the 48-inch Oschin Schmidt telescope, Abell put forth the idea that the grouping of galaxy clusters related to the overall arrangement of matter in the universe. He developed the “luminosity function” - correlating brightness and number of members in clusters with distance. Abell also discovered a number of planetary nebulae and developed, along with Peter Goldreich, the theory of planetary evolution from red giants.

With the moon out of the picture early, why not get caught up in a galaxy cluster study - Abell 426. Located just 2 degrees east of Algol in Perseus, this group of 233 galaxies spread over a region of several degrees of sky is easy enough to find - but difficult to observe. Spotting Abell galaxies in Perseus can be tough in smaller instruments, but those with large aperture scopes will find it worthy of time and attention.

At magnitude 11.6, NGC 1275 is the brightest of the group and lies physically near the core of the cluster. Glimpsed in scopes as small as 150mm aperture, NGC 1275 is a strong radio source and an active site of rapid star formation. Images of the galaxy show a strange blend of a perfect spiral being shattered

by mottled turbulence. For this reason NGC 1275 is thought to be two galaxies in collision.

Depending on seeing conditions and aperture, galaxy cluster Abell 426 may reveal anywhere from 10 to 24 small galaxies as faint as magnitude 15. The core of the cluster is more than 200 million light-years away, so it’s an achievement to spot even a few!



GEORGE ABELL
(NO CREDITS FOUND -
PUBLIC DOMAIN?)



ABELL 426:
“THE PERSEUS
GALAXY CLUSTER”
CREDIT: NOAO/AURA/NSF

THURSDAY, MARCH 2

Tonight the Moon appears as a very slender crescent setting to the west in Pisces. This lunar apparition looks very much like a pair of bright horns bearing a dark disk. Such a moon may have given rise to the ancient symbol associated with fertility goddesses originating in Egypt and Mesopotamia. Today we see it “as the old moon in the new moon’s arms.” To see this lunar phase is an Astronomical League challenge.

Skies darken early again tonight, so we’ll have a look at an open cluster easily seen in binoculars and well resolved in small scopes. Start at bright Castor and Pollux in Gemini and turn your eyes, binoculars, or finder scope almost due



M93
CREDIT: NOAO/AURA/NSF

south to even brighter Procyon. Drop almost the same distance to Xi Puppis. Once you locate Xi, shift the scope or binoculars roughly one finger-width (two degrees) northwest. There you will see a hazy rectangular patch with a handful of barely resolvable stars in its midst - the open cluster M93.

First cataloged by Charles Messier in March of 1781, this wonderfully bright grouping contains a broad range of stellar types among its 80 or so members. Even at a distance of 3500 light-

years, binoculars reveal the cluster’s bright haze and sharply angular swatch of core stars and a scope will resolve it. Towards the center, a wedge-shaped collection of bright members congregate. At the heart of the wedge is an easy double star - with another echoing the pair to the west. The very brightest of these stars are young, hot, and blue with an overall stellar population similar to the Pleiades. How old you ask? A very young one million years.

FRIDAY, MARCH 3

With the Moon near the horizon, we have only a short time to view its features. Tonight let's start with a central feature - Langrenus - and continue further south for crater Vendelinus. Spanning 92 by 100 miles and dropping 14,700 feet below the lunar surface, Vendelinus displays a partially dark floor with a west wall crest catching the brilliant light of an early sunrise. Notice also that its northeast wall is broken by a younger crater - Lame. Head's up! It's an Astronomical League challenge.

Once the Moon has set, revisit M46 in Puppis - along with its mysterious planetary nebula NGC 2438. Follow up with a visit to neighboring open cluster M47 - two degrees west-northwest. M47 may actually seem quite familiar to you already. Did you possibly encounter it when originally looking for M46? If so, then it's also possible that you met up with 6.7 magnitude open cluster NGC 2423, about a degree northeast of M47 and even dimmer 7.9 magnitude NGC 2414 as well. That's four open clusters and a planetary nebula all within four square arc-minutes of sky. That makes this a cluster of clusters!

Let's return to study M47. Observers with binoculars or using a finderscope will notice how much brighter, and fewer, the stars of M47 are when compared to M46. This 12 light-year diameter compact cluster is only 1600 light-years away. Even as close as it is, not more than 50 member stars have been identified. M47 has about one tenth the stellar population of larger, denser, and three times more distant, M46.

Of historical interest, M47 was "discovered" three times. First by Giovanni Batista Hodierna in the mid-17th century, then by Charles Messier some 17 years later and finally by William Herschel 14 years after that. How is it possible that such a bright and well-placed cluster needed "re-discovery?" Hodierna's book of observations didn't surface until 1984, and Messier gave the cluster's declination the wrong sign, making its identification an enigma to later observers - because no such cluster could be found where Messier said it was!



M46
CREDIT: NOAO/AURA/NSF



M47
CREDIT: NOAO/AURA/NSF

SATURDAY, MARCH 4



GIOVANNI SCHIAPARELLI
(WIDELY USED
PUBLIC IMAGE)

Born on this date in 1835, Giovanni Schiaparelli opened his eyes (and later ours) to a new world of possibilities - life on Mars. As director of Milan Observatory in 1877, Schiaparelli first described fine, faint features on the surface of Mars as “canali.” Perhaps one of Schiaparelli’s most important contributions was making the connection between meteor streams and the comets that produced them.

Tonight let’s return to our studies of the Moon and a more challenging crater. Further south than Vendelinus, look for another large, mountain-walled plain named Furnerius not too far from the terminator. Although it has no central peak, its walls have been broken numerous times by many smaller impacts. Look at a rather large one just north of central on the crater floor. If skies are stable, power up and search for a rima extending from the northern edge. Keep in mind as you observe that our own Earth has been pummeled just as badly as its satellite.



FURNERIUS
CREDIT: ROGER WARNER



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SUNDAY, MARCH 5

Today is the 494th anniversary of Gerardus Mercator's birth in 1512. The famed mapmaker went on to live a life of great moral courage. Mercator's time was a rough one for astronomy and astronomers. Despite a prison sentence and threats of torture and death for his "beliefs," Mercator went on to design a globe of the earth in 1541 and one for the heavens ten years later. One sphere within a larger one - and all without the many complexities envisioned by Ptolemy a millennium before him.

Tonight the Moon provides an opportunity to view to a very changeable and eventually bright feature on the lunar surface - Proclus. At 28 km in diameter and 2400 meters deep, crater Proclus will appear on the terminator to the west of Mare Crisium's mountainous border. Depending on your viewing time, it will seem to be about two-thirds shadowed, but the remainder of the crater will shine brilliantly. Proclus has an unusually high albedo, or surface reflectivity, of about 16%. This is uncommon for most lunar features. Watch this area over the next few nights as two rays from the crater widen and lengthen, extending approximately 320 kilometers north and south.

Now, just look at the Moon. Can you spot the Pleiades nearby?

Now let's have a go at the dense open cluster NGC 2301. Located about two finger-widths northwest of visual double Delta Monoceros, this 6th magnitude cluster can be seen in binoculars as a small, faint haze divided by a line of barely resolved stars. Telescopes will reveal a half dozen bright stellar members,

plus a number of small clumps of dimmer stars.



GERARDUS MERCATOR
(WIDELY USED
PUBLIC IMAGE)



PROCLUS ON THE EDGE
OF MARE CRISIUM
CREDIT: GREG KONKEL

MONDAY, MARCH 6



JOSEPH FRAUNHOFER
(WIDELY USED
PUBLIC IMAGE)

If you see sunshine today, celebrate the birthday of Joseph Fraunhofer born this date in 1787. The German scientist Fraunhofer was a true “trailblazer” of modern astronomy and his field was spectroscopy. After having served an apprenticeship as a lens and mirror maker, Fraunhofer went on to develop specialized optical instruments. While designing the modern achromatic objective lens for the telescope, he watched the sun’s light passing through a thin slit and saw many dark lines - part of the “rainbow bar code.” Fraunhofer knew some of these lines could be used as a wavelength “standard.” For this reason he began measuring their locations relative to one another. The most prominent of the lines he labeled with letters still in use today. His skill in optics, mathematics, and physics led Fraunhofer to design and build the very first diffraction grating capable of measuring the wavelengths of specific colors and dark lines in the solar spectrum. And his telescope - did it succeed? Of course. The achromatic objective lens is still a design of choice, and the binoculars you have?

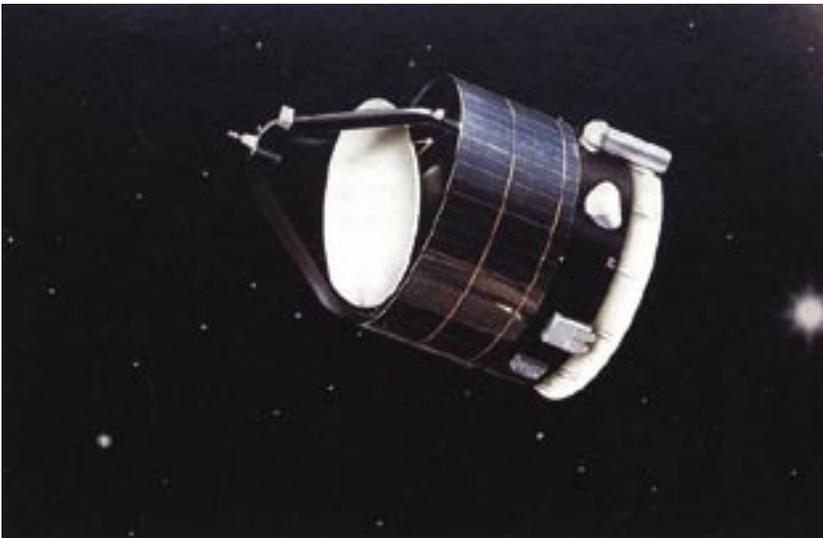
They’re achromats!

Tonight will be the perfect opportunity to find the lunar crater named for Fraunhofer. Return again to the now shallow appearing crater Furnerius. Can you spot the ring at its southern edge? This is crater Fraunhofer - a challenge under these lighting conditions.

Now, revisit the “Twin Stars” - Castor and Pollux. Separated by not much more than 3 arc seconds, 2.0 magnitude Castor A has a bright sibling - 2.8 magnitude

Castor B. The pair is actually a true binary with an orbital period of roughly 500 years. The Castor system contains four lesser members - each main star is a spectroscopic binary. Without Fraunhofer’s discovery, we would have never known.

Although spectroscopes and telescopes are powerful instruments able to reveal much, sometimes you just have to get close for more details. Today in 1986, the first of over a week of flybys began as the Russian built VEGA 1 and European Space Agency’s Giotto became the first space probes to reach Halley’s Comet.



GIOTTO
CREDIT: NASA

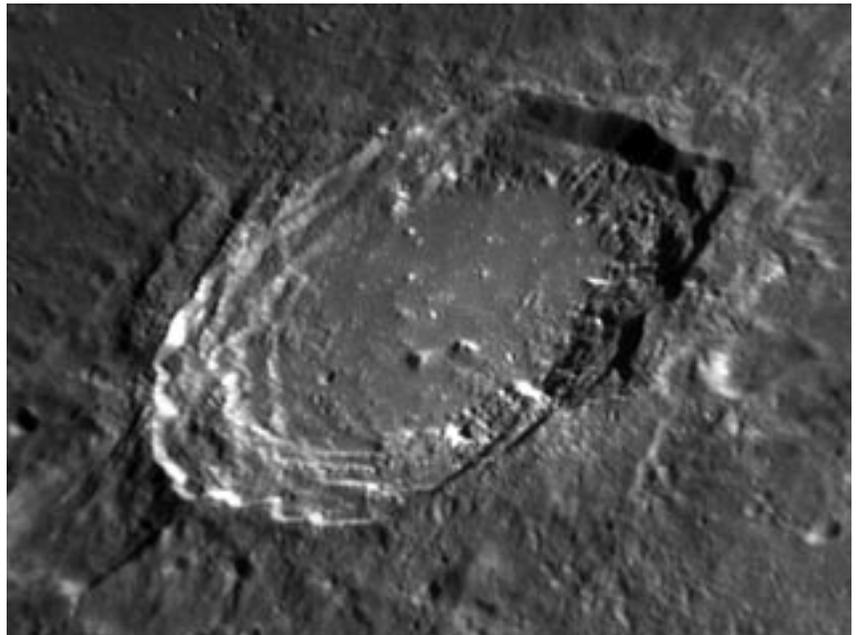
TUESDAY, MARCH 7

On this date in 1792, the only child of William Herschel was born - John. Herschel became the first astronomer to thoroughly survey the southern hemisphere sky and he discovered photographic fixer - an important chemical ingredient needed to preserve images on photographic plates. Also born on this date in 1837 was Henry Draper, the man who made the first photograph of Vega's stellar spectrum in 1872. Eight years later, he took the first picture of the Great Nebula in Orion. Draper's contribution led to new techniques in astrophotography, making it possible for celluloid to reveal faint detail beyond reach of the eye in the 1880's. This led to development of the Great Observatories - and telescopes - necessary to ultimately show an expanding cosmos populated by numberless "island universes" beyond our own Milky Way.



JOHN HERSCHEL
(WIDELY USED
PUBLIC IMAGE)

Tonight's outstanding lunar features are two craters that you simply can't miss - Aristotle and Eudoxus. Located to the north, this pair will be highly prominent in binoculars as well as telescopes. The northernmost - Aristotle - was named for the great philosopher and has an expanse of 87 kilometers. Its deep, rugged walls show a wealth of detail at high power, including two small interior peaks. Companion crater Eudoxus, to the south, spans 67 kilometers and offers equally rugged detail.



If you haven't been following Saturn with regularity, tonight's bright Moon might make this an occasion to spend some quality time on the ring system and satellites. At magnifications above 100x, the main division separating Ring A from B (Cassini's Division) should be readily apparent in most scopes. Try making a series of simple sketches

showing any nearby "stars." Keep the sketch as the Moon waxes to full and see if you can distinguish between background stars and the planet's own retinue of six most easily observed satellites - Titan, Rhea, Tethys, Dione, Enceladus, and Iapetus.

ARISTOTELES
CREDIT: DAMIAN PEACH

WEDNESDAY, MARCH 8

On this day in 1977, NASA's airborne occultation observatory made an unexpected discovery - Uranus had rings. Human eyes didn't actually see Uranus'

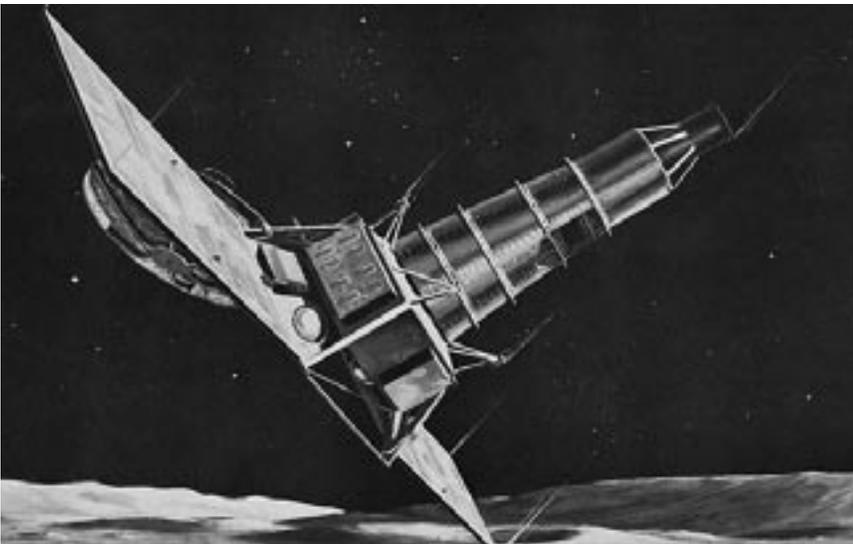


RANGER 9 IMAGES
ALBATEGNIUS
CREDIT: NASA

faint ring system at the time - only the strange wink of a star hidden behind them. It had to wait until Voyager 2 whisked by nine years later to image the rings.

Tonight the Moon provides a piece of scenic history as we take a more in-depth look at a previous study crater - Albategnius. This huge, hexagonal, mountain-walled plain appears near the terminator about one-third the way north of the south limb. This 135 kilometer wide crater is approximately 14,400 feet deep and its west wall casts a black shadow on the dark floor. Partially filled with lava after creation, Albategnius is a very ancient formation that later became home to several wall-breach craters, such as Klein, which can be seen telescopically on the southwest wall.

Albategnius holds more than just the distinction of being a prominent crater tonight - it also holds a place in history. On May 9, 1962 Louis Smullin and Giorgio Fiocco of the Massachusetts Institute of Technology (MIT) aimed a ruby



RANGER 9
CREDIT: NASA

laser beam toward the Moon's surface and Albategnius became the first lunar feature to reflect laser light from Earth.

On March 24, 1965 Ranger 9 took a "snapshot" of Albategnius from an altitude of approximately 2500 km. Ranger 9 was designed by NASA for one purpose - to achieve lunar impact trajectory and send back high-resolution photographs and video images of the lunar surface. Ranger 9 carried no other science packages. Its destiny

was to simply take pictures right up to the moment of impact. They called it... a "hard landing."

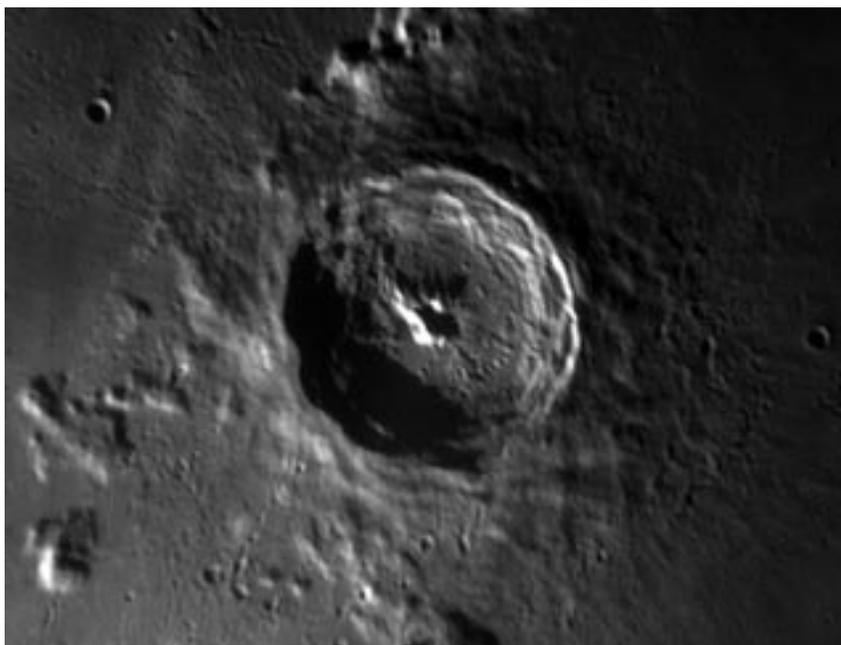
THURSDAY, MARCH 9

Today is the 442nd anniversary of David Fabricius' birth. Born in 1564, Fabricius discovered the first variable star - Mira. At the heart of Cetus the Whale, it is now dipping steeply to the south-southwest at skydark. Even when well placed above the horizon, you can't always count on Mira being seen. At its brightest, Mira achieves magnitude 2.0 - bright enough to be seen 10 degrees above the horizon. However Mira "the Wonderful" can also get as faint as magnitude 9 during its 331 day long "heartbeat" cycle of expansion and contraction. Mira is regarded as a premiere study for amateur astronomers interested in beginning variable star observations. For more information about this fascinating and scientifically useful branch of amateur astronomy contact the AAVSO (American Association of Variable Star Observers).



DAVID FABRICIUS
(ONLY IMAGE
- USED IN AN
EDUCATIONAL
BIOGRAPHICAL
PIECE WITH
NO CREDIT
CONNECTED TO
THE IMAGE.)

Tonight's featured lunar crater is located on the south shore of Mare Imbrium right where the Apennine mountain range meets the terminator. At 58 kilometers in diameter and 12,300 feet deep, Eratosthenes is an unmistakable crater. Named after the ancient Greek mathematician, geographer and astronomer Eratosthenes, this splendid crater will display a bright west wall and a black interior hiding its massive crater capped central mountain 3570 meters high! Extending like a tail, an 80 kilometer mountain ridge angles away to its southwest. As beautiful as Eratosthenes appears tonight, it will fade away to almost total obscurity as the Moon approaches full. See if you can spot it again in five days.



ERATOSTHENES
CREDIT: DAMIAN PEACH

FRIDAY, MARCH 10

Tonight would be a terrific opportunity to study under-rated crater Bullialdus. Located close to the center of Mare Nubium, even binoculars can make out Bullialdus when near the terminator. If you're scoping - power up - this one is fun! Very similar to Copernicus, Bullialdus' has thick, terraced walls and a central peak. If you examine the area around it carefully, you can note it is a much newer crater than shallow Lubiniezsky to the north and almost non-existent Kies to the south. On Bullialdus' southern flank, it's easy to make out its A and B craterlets, as well as the interesting little Koenig to the southwest.

Despite the bright waxing moon, we still have a chance to get a view of a sprinkling of faint stars high to the south at skydark. Located less than a finger-width northeast of Wezen (Delta Canis Majoris) -6.5 magnitude NGC 2354 is achievable in small scopes. Although richly populated, this open cluster lacks a bright core. This may challenge the eye to see it. Despite the moonlight, about a dozen stars should be visible in smaller scopes, but return on a moonless night to look for faint clumps and chaining among its 50 or so brightest members.



BULLIALDUS
CREDIT: DAMIAN PEACH

SATURDAY, MARCH 11

Today celebrates the birth of Urbain Leverrier. Born in 1811, Leverrier predicted the existence of Neptune. Along with a similar prediction by John Couch Adams, this led to its discovery. As both a mathematician and astronomer, Leverrier was also the first scientist to promote the idea of daily weather forecasts.

Tonight we'll have the opportunity to look for a lunar feature named for Leverrier. To find it, start with the C-shape of Sinus Iridum. Imagine that Iridum is a mirror focusing light - this will lead your eye to crater Helicon. The slightly smaller crater southeast of Helicon is Leverrier. Be sure to power up to capture the splendid north-south oriented ridge which flows lunar east.

Tonight let's try a lovely triple star system - Beta Monoceros. Located about a fist width northwest of Sirius, Beta is a distinctive white star with blue companions. Separated by about 7 arc seconds, almost any magnification will distinguish Beta's 4.7 magnitude primary from its 5.2 magnitude secondary to the southeast. Now, add a little power and you'll see the fainter secondary has its own 6.2 magnitude companion less than 3 arc seconds away to the east.



URBAIN LEVERRIER
(WIDELY USED
PUBLIC IMAGE)



CRATER HELLICON (RIGHT)
AND LEVERRIER (LEFT)
RESIDE JUST BELOW AND TO
THE RIGHT OF SINUS IRIDIUM
CREDIT: GREG KONKEL



<http://www.universetoday.com>

SUNDAY, MARCH 12

Tonight let's turn binoculars or telescopes toward the southern lunar surface as we set out to view one of the most unusually formed craters - Schiller. Located near the lunar limb, Schiller appears as a strange gash bordered on the southwest in white and black on the northeast. This oblong depression might be the fusion of two or three craters, yet shows no evidence of crater walls on its smooth floor. Schiller's formation still remains a mystery. Be sure to look for a slight ridge running along the spine of the crater to the north through the telescope. Larger scopes should resolve this feature into a series of tiny dots.

Want a challenging double this evening? Then let's have a look at Theta Aurigae. 2.7 magnitude Theta is a four star system ranging in magnitudes from 2.7 to 10.7. The brightest companion - Theta B - is magnitude 7.2 and is separated from the primary by slightly more than 3 arc seconds. Remember that this is what is known as a "disparate double" and look for the two fainter members well away from the primary.



SCHILLER
CREDIT: DAMIAN PEACH

MONDAY, MARCH 13

On this day in 1781, Uranus was discovered by William Herschel. 74 years later, in 1855, Percival Lowell was born.

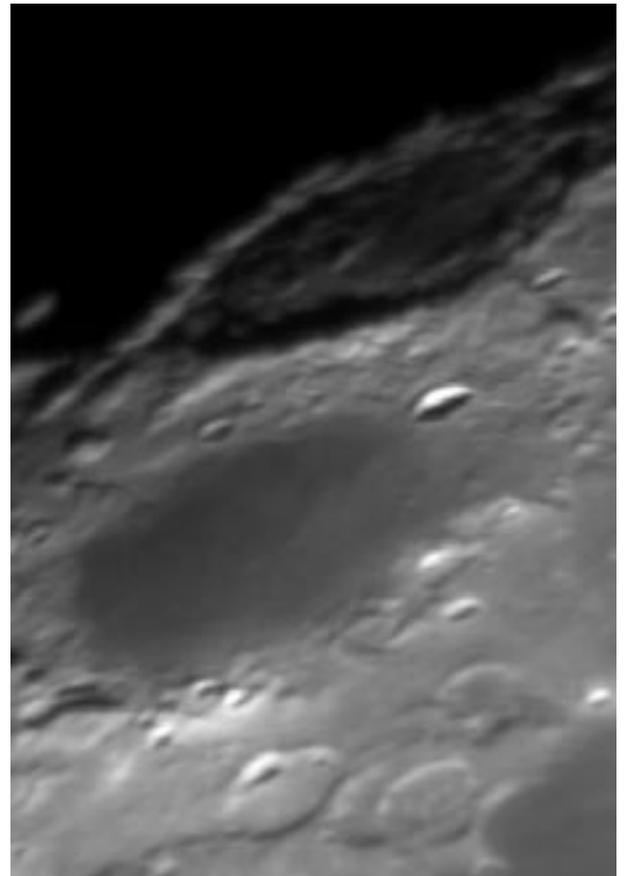
Originally named “the Georgium Sidus,” Uranus was previously catalogued as a faint 6th magnitude star by John Flamsteed in 1690 and designated as 34 Tauri. Herschel came upon this same “star” - then located in the constellation Gemini - while doing a double star search using a homemade 6” speculum-mirrored reflector. Imagine his surprise when the “star” revealed itself as a small greenish globe!

Percival Lowell was born to a distinguished Boston family with ties to Harvard University. Lowell graduated with honors in mathematics from that same institution in 1876. After traveling throughout the Far East, Lowell’s imagination was set on fire by Giovanni Schiaparelli’s observation of “canali” on Mars. In 1894, Lowell moved to Flagstaff, Arizona and established the Lowell Observatory. Over the next 15 years, he observed Mars with a passion few astronomers could ever hope to match for any single study. During this period, Lowell wrote several books developing the idea of an extinct race of Martians responsible for various artificial features he thought he had observed on the planet’s surface.

Tonight the great Grimaldi, found in the central region of the moon near the terminator is the best lunar feature for binoculars. If you would like to see how well you have mastered your telescopic skills, then let’s start there. About one Grimaldi length south, you’ll see a narrow black ellipse with a bright rim. This is Rocca. Go the same distance again (and a bit east) to spot a small, shallow crater with a dark floor. This is Cruger, and its lava-filled interior is very similar to another study - Billy. Now look between them. Can you see a couple of tiny dark markings? Believe it or not, this is called Mare Aestatis. It’s not even large enough to be considered a medium-sized crater, but is a mare!

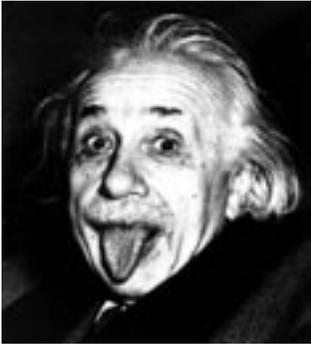


PERCIVAL LOWELL
(WIDELY USED
PUBLIC IMAGE)



GRIMALDI AND ROCCA
CREDIT: SIMONE BOLOZONI

TUESDAY, MARCH 14



ALBERT EINSTEIN
(VERY WIDELY
USED PUBLIC IMAGE.
THIS ONE IS EVEN ON AN
ADVERTISING POSTER.)



FULL MOON
SIMONE BOLOZONI

Today is the birthday of Albert Einstein. Born in 1879, Einstein was later hailed as one of the finest scientific minds of our times. In 1921, Einstein won the Physics Nobel Prize based on work completed 15 years earlier associated with the photoelectric effect - a natural phenomenon now regularly used to accumulate light to image the most distant things in the Universe. Even more significantly, Einstein developed a theory of gravity based on the curvature of space and time caused by the distribution of matter and another theory (of mass-energy conversion) which accounted for the prodigious and sustainable energy output of the stars.

Tonight is the Full Moon. In many cultures, it is known as the “Worm Moon.” As ground temperatures begin to warm and produce a thaw in the northern hemisphere, earthworms return and encourage the return of robins. For the Indians of the far north, this was also considered the “Crow Moon.” The return of the black bird signaled the end of winter. Sometimes it has been called the “Crust Moon” because warmer temperatures melt existing snow during the day, leaving it to freeze at night. Perhaps you may have also heard it referred to as the “Sap Moon.” This marks the time of tapping maple trees to make syrup. To early American settlers, it was called the “Lenten Moon” and was considered to be the last full Moon of winter. For those of us in northern climes, let’s hope so!

But for viewers almost the world over, tonight’s Moon will hold a far greater significance as it passes through a portion of the Earth’s shadow known as the penumbra. Eclipse time? You bet. For viewers in Asia, India and the western portion of Australia, you’ll get to see the Moon pass through this shadow just as it sets for your local time. For Europe and Africa? You’re in luck as the entire event can be seen from your area. For the majority of both North and South America, the eclipse will be underway as the Moon rises, but you can watch it slide out of the shadow long before it sets. Unfortunately, the western-most portion of the Americas will not see anything.

While a penumbral eclipse is not known to be particularly exciting - this one is deep. The edge of the Moon will just graze the inner umbral shadow. As a rule of thumb, remember that the Moon moves about its own diameter each hour, so the very beginning of a penumbral eclipse will be difficult to notice. Slowly and steadily, the coloration will begin to change and even inexperienced Sky-Watchers will notice that something is different. It’s a very relaxing experience and we wish you clear skies!



<http://www.universetoday.com>

WEDNESDAY, MARCH 15

Today celebrates the birth of Nicolas Lacaille. Born in 1713, Lacaille's measurements confirmed the Earth's equatorial bulge. He also named the fifteen southern constellations, and a lunar feature honors his life's work. Although the Moon will be bright, we can still have a look at the crater named for Lacaille. Start by heading towards the lunar south central region. Dominating the scene will be brilliant crater Tycho. From there, it's north to the eastern shores of Mare Nubium, where you will see the bright ring of Thebit. Shallow Lacaille resides to the east and will be a challenge to make out under the low contrast conditions.

While skies remain bright all night, we can still have a look at an open cluster easily located in northeastern Orion. This 5.9 magnitude scattered group of stars may have been first observed by Giovanni Batista Hodierna in the mid-17th century. While bright enough to have been a Messier object, William Herschel added it to his log of discoveries on October 15, 1784, as H VIII.24. Of the 30 known stars associated with this 3,600 light-year distant group, the brightest is 50 million years old. Despite lunar interference, a half-dozen of the cluster's very brightest members can be seen in small scopes at mid-range powers. Look for NGC 2169 slightly less than a fist width north-northeast of Betelgeuse and slightly south of Xi and Nu Orionis.



CRATER LACAILLE
(CENTER RIGHT)
CREDIT: ROGER WARNER

THURSDAY, MARCH 16



ROBERT GODDARD
CREDIT: NASA

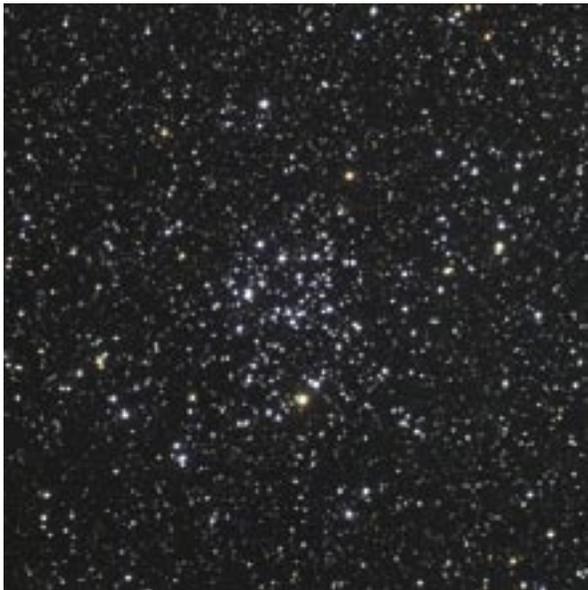
On this day in 1926, Robert Goddard launched the first liquid-fuel rocket. He first showed his potential in 1907 when a cloud of smoke rose from a powder rocket fired off in the basement of the physics building in Worcester Polytechnic Institute. Needless to say, the school took an immediate interest in the work of this student! Thankfully Robert was not expelled and a lifetime career in rocketry followed. Goddard was also the first person to realize the full spectrum of possibilities associated with missiles and space flight, and his life was completely dedicated to bringing his visions to realization. While most of Goddard's achievements went unrecognized for many years, tonight we celebrate his name and passion for the space sciences. His first flight may have only gone 12 meters, but forty years later on this same date the Gemini 8 performed the first orbital docking - a maneuver that could have never happened

without Goddard's work!

Tonight, let's have a look at an ancient walled plain - Gauss. Located north of Mare Crisium, this oblong crater should be divided by the terminator for most viewers tonight. Its east wall will be quite bright and the west wall outlined by a black arc. It is a very old crater, and if you up the magnification, you will see its ruined, cracked floor riddled with numerous small craterlets.

While out, be on watch for the Corona-Australids meteor shower. While the fall rate is low, about 5 to 7 per hour, our friends in the southern hemisphere stand the best chance with this one.

While we're out, let's have a look at another fine study on Messier's list - M50. Described as "heart-shaped" by some observers, those with larger telescopes will see enough members of this 5.9 magnitude open cluster to note two main "petals" of stars arcing outward to the north and southeast. Several tenth magnitude stars congregate toward the center of this 3,200 light-year distant cluster while numerous 11th and 12th magnitude members dance around them in chains and arcs. Look for at least one luminous red giant and a half dozen yellow giants among this 80 million year-old, 20 light-year diameter study.



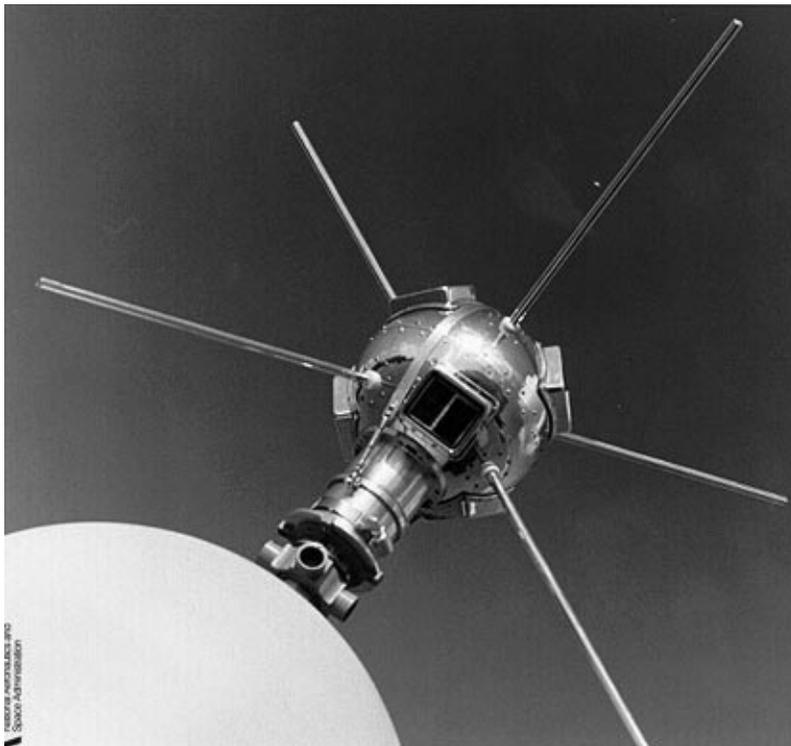
M50
CREDIT: NOAO/AURA/NSF

FRIDAY, MARCH 17

On this day in 1958, the first solar-powered spacecraft was launched. Christened Vanguard 1, it was an engineering test satellite. From its orbital position, the data taken from its transmissions helped to refine the true shape of the Earth.

While out observing, turn a scope towards Saturn and see if you can begin to make out faint structure in the ring system. On a fine night of “seeing,” you should easily be able to make out the shadow the planet casts against its posterior ring plane. Look for the shadow of the ring itself softening the view of the planet’s northern equatorial region.

As the Moon rises tonight, look for bright Spica to accompany it. For some lucky viewers, this will be an occultation! Please check with IOTA for details in your area.



VANGUARD 1
CREDIT: NASA

SATURDAY, MARCH 18



ALEXI LEONOV
(NO CREDITS ASSOCIATED
WITH THE IMAGE.
PUBLIC DOMAIN?)

Today in 1965, the first spacewalk was performed by Alexei Leonov onboard the Soviet Voskhod spacecraft. The “walk” lasted around 20 minutes and Alexei had problems re-entering the spacecraft because his space suit had inflated. Imagine his fear as he let air leak out of his suit in order to squeeze back inside. Later when the crew of two landed off target in the heavily forested Ural Mountains, the pair had to spend the night in the woods surrounded by wolves. It took over twenty-four hours before they were located, then workers had to chop their way through the forest to recover them on skis. Brave men on the frontiers of human exploration of space!

Tonight let’s honor their courage by going after something really tough - but certainly not dangerous. Start with Castor and head 3 degrees north-northeast to center on 4.9 magnitude Omicron Geminorum. Now move north another 4 degrees to locate a widely spaced east-west oriented pair of 8th magnitude stars in the constellation Lynx. Look nearby for the faint whisper of luminosity associated with one of the most fascinating studies in the heavens - 10.4 magnitude globular cluster NGC 2419 - the famed “Intergalactic Wanderer.”

First discovered by William Herschel on New Year’s Eve 1788, the Intergalactic Wanderer may or may not just be “passing through” the Milky Way region. - Even as a member of our galaxy’s entourage of clusters and satellite dwarf galaxies, it is one of the most distant. Outside of our own galaxy at around 300,000 light-years!

Small scopists take heart. NGC 2419 can be seen on dark sky occasions in instruments as small as a spotting scope - although you will need to avert your vision to see it. How is that possible? NGC 2419 is intrinsically one of the brightest globular clusters we know of. Be sure to catch this one before moonrise!

SUNDAY, MARCH 19

With time to spare before Luna lights up the night, let's go south and locate a fine reflecting nebula - NGC 2467 - in northern Puppis. Sometimes referred to as the "skull and crossbones nebula," this billowing cloud of gas and dust is easily found less than a finger-width south-southeast of 3.5 magnitude Xi Puppis. Even a small telescope will find this expansive, star-studded emission nebula a real beauty! Those with larger apertures should look for neighboring splotches of nebulosity illuminated by small groupings of stars - some of which are part of a newly forming open cluster.

Keep in mind while observing NGC 2467 that we are seeing it from a great distance. At 17,000 light-years, this expansive region of star formation is some 10 times farther away than the Great Nebula in Orion. If it were the same distance away, NGC 2467 would dwarf M42!



NGC 2467
CREDIT: NOAO/AURA/NSF

MONDAY, MARCH 20

Tonight the obscure constellation of Cancer is now well placed for observation - so why not compare views of the two Messier clusters found there? They're both binocular and telescope easy!

M44 is one of the most easily recognized studies in the night sky. Like the Pleiades and Hyades in Taurus, Praesepe, "The Manger," comes to us as a discovery from antiquity. Its myths include one about two neighboring bright stars - Asellus Australis and Asellus Borealis. These two stars are said to be donkeys taking meals from the manger. Known to amateur astronomers as "the Beehive Cluster,"

Galileo was the first to discern its stellar nature. Even with his modest scope, he resolved around forty of its brightest members. Modern telescopes have determined that at least 200 of the 350 or more stars visually associated with M44 move together and are a part of the 700 million year old open cluster.

Open cluster M67 is little less than a fist width southeast of M44, or about a finger-width west of visual star - Acubens (Alpha Cancri). Five



M67
CREDIT: NIGEL SHARP AND
MARK HANNAH/NOAO/
AURA/NSF

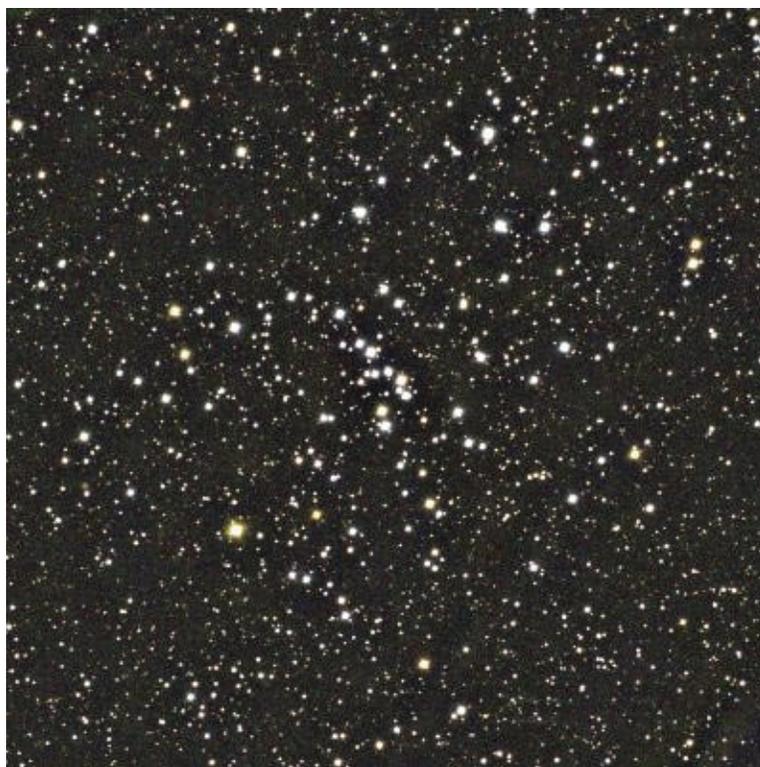
times further away than M44, and at 3.5 billion years of age, M67 is one of the oldest open clusters in our galaxy. Its brightest stars have already gone "white dwarf" after long ago exhausting their nuclear fuel. You'll notice it's quite dense and surprisingly faint for a Messier study. Its discoverer, Johann Gottfried Koehler, was unable to resolve any stars! Today's telescopes resolve dozens - even hundreds - of cluster members while most binoculars will find it to appear quite "galactic!"

Be on the lookout for Antares as it and the Moon rise together. There will be an occultation tonight, so be sure to check IOTA for times and details in your area.

TUESDAY, MARCH 21

How about one last open cluster before going galaxy hunting? Our study - M48 - is roughly 3 degrees southeast of Zeta Monocerotis. Like M44 in Cancer, M48 lies within the limits of unaided sight. Its brightest member is a spectral type A star, intrinsically some 70 times brighter than our own Sun, but it only appears close to 9th magnitude thanks to 1500 light-years separating us. M48 is quite large, and will show several dozen stars within reach of small scopes and binoculars.

Spring has arrived and with it comes the time of galaxies. To celebrate this new astronomical season, have a look at NGC 2903. Located about a finger-width south-southeast of Lambda Leonis, this 8.9 magnitude tilted spiral looks very much like a slightly fainter version of M81 in Ursa Major. Larger scopes easily catch hints of the galaxy's spiral extensions and all will show considerable brightening toward the very expansive core region!



J.W. DRAPER'S
MOON IMAGE
CREDIT: NEW YORK
UNIVERSITY

WEDNESDAY, MARCH 22



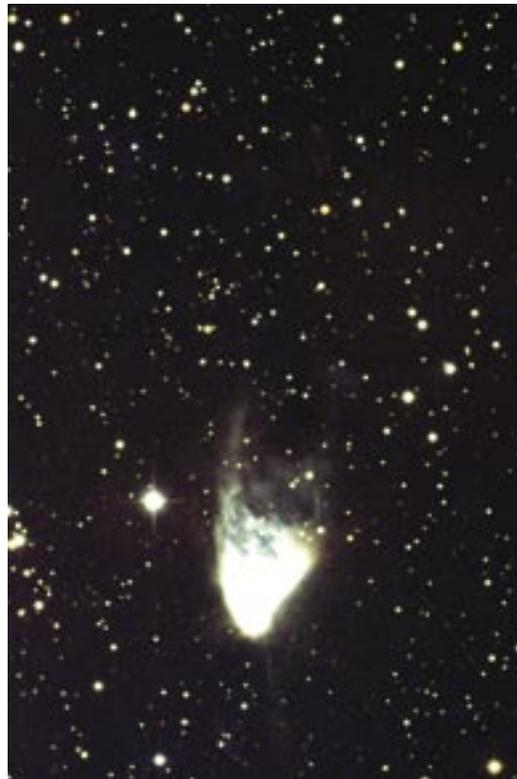
FRIEDRICH WILHELM
AUGUST ARGELANDER
(WIDELY USED
PUBLIC IMAGE)

Born on this day in 1799 was Friedrich Argelander, a compiler of star catalogues. Argelander also studied variable stars and created the first international astronomical organization entitled simply the “Astronomical Society.”

With a later moonrise tonight, let’s have a look at two meteor showers. We’ll start first with the Camelopardalids. These have no definite peak, and a screaming fall rate of only one per hour. They do have one claim to fame however - these are the slowest meteors known - arriving at a speed of only 7 kilometers per second!

Far more interesting will be to watch for the peak of the March Geminids. These were first discovered and recorded in 1973, then confirmed in 1975. With a much improved fall rate of about 40 per hour, these faster meteors will be fun to follow. When you do see a bright streak, trace it back to its point of origin. Did you see a Camelopardalid? Or a March Geminid?

While out, let’s use the late rise of the Moon to our advantage and head



NGC 2261: “HUBBLE’S
VARIABLE NEBULA”
CREDIT: N.A. SHARP AND JAY
MCGAHA/NOAO/AURA/NSF

about 2 degrees northeast of star 13 in Monoceros. Our study will be NGC 2261 - more commonly known as “Hubble’s Variable Nebula.” Named for Edwin Hubble, this 10th magnitude object is very blue in appearance through larger apertures, and a true enigma. The fueling star, the variable R Monoceros, does not display a normal stellar spectrum and may be a proto-planetary system. R is usually lost in the high surface brightness of the “comet-like” structure of the nebula, yet the nebula itself varies with no predictable timetable - perhaps due to dark masses shadowing the star. We do

not even know how far away it is, because there is no detectable parallax!

THURSDAY, MARCH 23

Today in 1840, the first photograph of the Moon was taken. The daguerreotype plate was exposed by American astronomer and medical doctor, J.W. Draper. Draper's fascination with chemical responses to light also led him to another first – a photo of the Orion Nebula.

Tonight let's have a look at a study in light and dark as we view our large binocular and telescope study for this evening. You'll find it located roughly halfway between Sirius and Alpha Monoceros - NGC 2359. Known as "Thor's Helmut," this bubble-like emission nebula was blown into existence by the superheated blue giant star in its center. NGC 2359 spans about 30 light-years some 15,000 light-years away. The supercharging Wolf-Rayet star produces high speed stellar winds which may have interacted with a nearby molecular cloud giving this strange nebula its curved shape. At magnitude 11, "Thor's Helmut" is an unusual observation to add to your collection of "head gear."



M48
CREDIT: NOAO/AURA/NSF



UNIVERSE TODAY

<http://www.universetoday.com>

FRIDAY, MARCH 24



WALTER BAADE
(WIDELY USED
PUBLIC IMAGE)

Today is the birthday of Walter Baade. Born in 1893, Baade was the first to resolve the Andromeda galaxy's companions into individual stars and developed the concept of the two types of stellar populations in galaxies. Among his many achievements, Baade is also well known for discovering an area towards our galactic center (M24) which is relatively free of dust, now known as "Baade's Window."

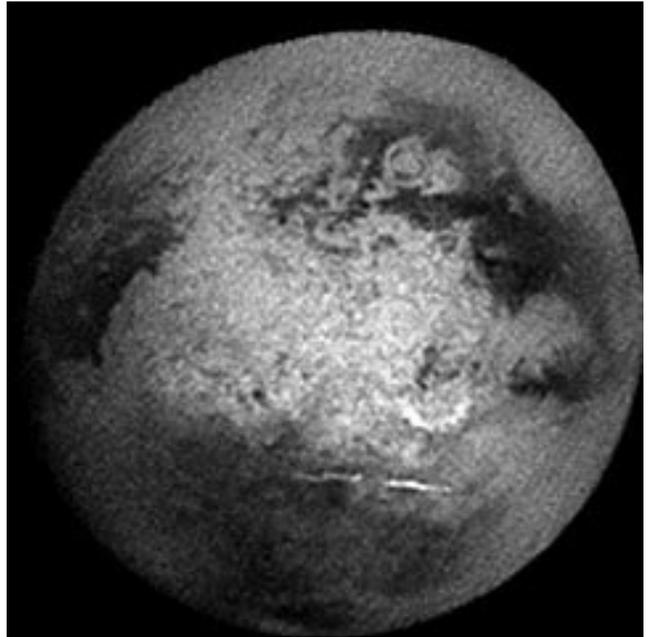
Although "Baade's Window" is a summer sky study, we can take the time this evening to study an area on the opposite side of the sky. Astronomers use a celestial coordinate system based on "hours:minutes:seconds" for east-west location (right ascension - RA) and "degrees" for north-south (declination - DEC) position. It just so happens that should you turn eye, binoculars, or telescope to a RA-DEC location completely complimentary to the center of Baade's Window (RA=6hrs:16mins, DEC=18.29 degrees) you will find yourself about mid-way between 3.2 magnitude Mu Geminorum and 4.4 magnitude Nu Orionis. And it is precisely there that you will see something that is almost completely the opposite of what can be seen in Baade's Window - which is to say, "not much."

SATURDAY, MARCH 25

Today in 1655, Titan - Saturn's largest satellite - was discovered by Christian Huygens. 350 years later, a probe named for Huygens captured the attention of the world as it descended by parachute onto Titan's surface and sent back information on that distant moon. Huygens also went on to discover Saturn's ring system in 1655. So while Saturn still rides high in the sky, make your own return visit and tour Saturn's rings and satellites. The siren song of Titan awaits you!

Also on this date in 1951, 21 cm wavelength radiation from atomic hydrogen in the Milky Way was first detected. 1420 MHz H I, neutral - but non-molecular, hydrogen studies continue to form the basis of large parts of modern radio astronomy. Milky Way H I regions are generally free of stars since they heat the stable hydrogen gases and cause them to emit light. Using 21 cm radio-telescope, astronomers can map the distribution of non-stellar matter in the interstellar medium - the vast regions of space between the stars. Because radio waves can penetrate dust also found in the interstellar medium, we know much more about the distribution of hydrogen gas in our galaxy than would otherwise be possible.

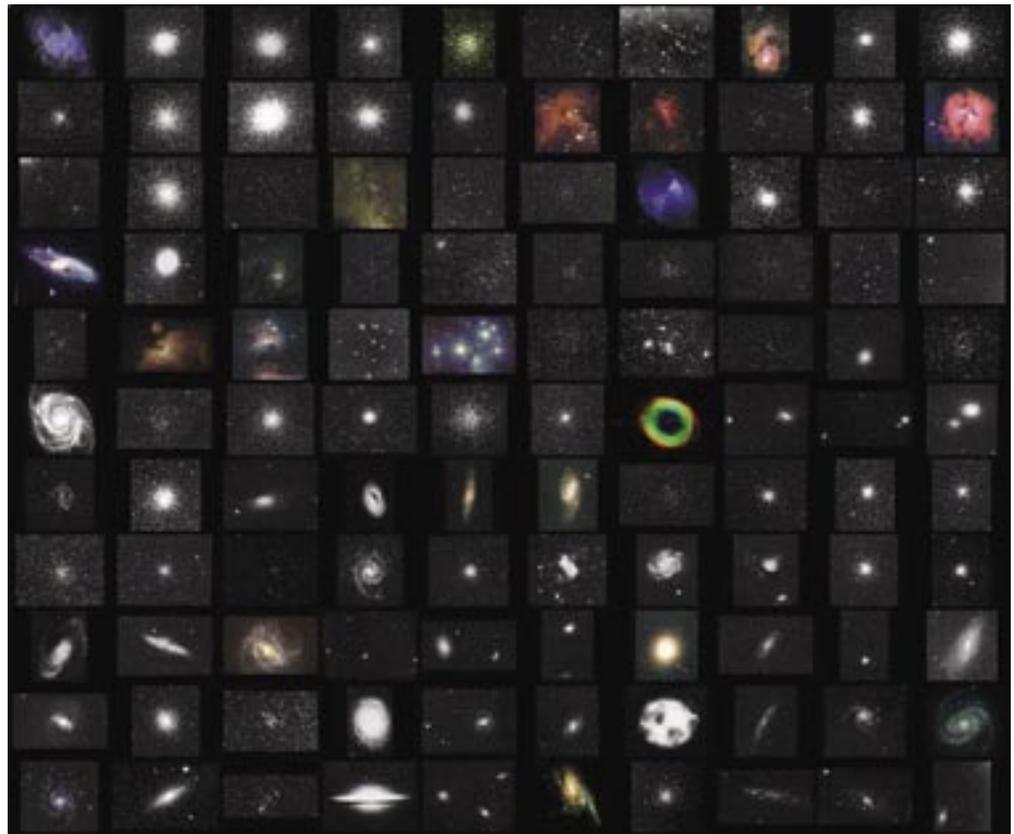
Although stable hydrogen gas is invisible optically, its presence is especially concentrated along the disk of our galaxy in its vast spiral arms. One such region is associated with the Orion Complex. So take some time to scan the sky due south of 3.4 magnitude Eta Orionis and note how few stars are visible between it and 4.2 magnitude 29 Orionis - some 5 and a half degrees away. Such regions are known to have high concentrations of 21 cm radiation caused by hydrogen gas that has yet to begin coalescing into new Suns such as our own.



CASSINI
APPROACHING TITAN
CREDIT: NASA

SUNDAY, MARCH 26

Tonight, let's have a look at the "Eight-burst Planetary." But, we have to warn you, it isn't easy for the northern hemisphere. Start by locating Alpha Hydrae. Now drop more than a hand span due south to Psi in Vela. With Psi centered at low power, you can simply wait a little less than half an hour for NGC 3132 to "drift" into the field, or move due east 7 degrees. Either way should reveal this superb 8th magnitude "Southern Ring Nebula!" Look for a "tilt" in brightness across this 2000 light-year distant ring plus its central star. Use high power - this one is less than half the size of the famed "Northern Ring Nebula" - M57.



THE MESSIER OBJECTS
CREDIT: SEDS

MONDAY, MARCH 27

This is one busy week as we start with an occultation of Uranus. Check IOTA for visibility details.

We open with the “Messier Marathon”. Begin when the sky darkens enough for guidestar Delta Cetus and M77. Now hop to M74 east of Eta Pisces. Both galaxies are telescopic only and will be challenging. Next is M33 west of Alpha Triangulum. It can be seen in binoculars, but skybright will make this huge, low surface brightness spiral difficult for even telescopes. M31 - the Andromeda Galaxy - will be a delightful capture for all optics just west of Nu Andromedae. Two more on the list are telescopic companions to M31 - M32 southeast and M110 northwest.

Head northwest for two open clusters visible to binoculars. Find M52 easiest by identifying Alpha and Beta Cassiopeia - draw a line between them and extend it the same distance northwest of Beta. Next, hop north of Delta for the M103 open cluster. Head south to Perseus and back to the telescope to locate M76 - the little “Dumbbell” planetary - just north of Phi. Binoculars will see the M34 open cluster located roughly halfway between Beta and Gamma Andromeda.

Skies are now fully dark and the fast setting objects are finished. Let’s take a moment to breathe and view M45 - the Pleiades - easily visible unaided high in the west. The next hop is with Lepus. Head south and identify Beta and Epsilon. Triangulating with the pair to the south is faint star ADS3954. Locate globular M79 to its northeast. It is possible to see in binoculars, but M42 - the “Great Orion Nebula” - is much easier! Next is M43 - a small “patch” to the north-northeast and part of M42. The next two objects, M78 northeast of Zeta Orionis and the M1 “Crab Nebula” northwest of Zeta Tauri, are both achievable in binoculars, but better with the scope.

Now relax. Take a few minutes to refresh and warm up. The remaining objects on our observing list for tonight are easy, well positioned and observable in binoculars. Ready? Then let’s go...

M35 is as simple as finding the “toe” of Gemini - bright Eta - a hop northwest will capture this fine open cluster. Next stop - Auriga. Slightly east between Theta and southern Beta is open cluster M37. Halfway between Theta and western Iota - toward the center of Auriga - is M38. A short hop southeast will capture M36. Let’s get Sirius and finish this list for tonight. The open cluster M41 is found quickly by drifting south of Sirius. The last three for tonight are M93, M47 and M46 in Puppis... And give yourself a well-deserved pat on the back.

You’ve just conquered 24 Messiers.

TUESDAY, MARCH 28

Tonight we start much later on our week-long “marathon.”

First up will be four binocular targets. Open cluster M50 is roughly a third the distance between Sirius and Procyon. Hop south-southeast of Zeta Monoceros half a fist for open cluster M48. M44 - the “Beehive Cluster” is just north-northwest of Delta Cancri. Drop south and identify Alpha. Fine open cluster M67 is just west.

Back to the scope and west to Leo and Regulus. A fist width east is northern star 52 and southern 53. Head between them for elliptical galaxy M105. Continue south towards 53 for spiral M96. Another degree west is barren spiral M95. Head to the southwestern star of the three that mark Leo’s “hips” - Theta. South you will see faint star 73. One degree to its east-southeast you will locate a same field pair of spiral galaxies - M65 and M66.

Head north for another pair of galaxies - M81 and M82 in Ursa Major. Draw a mental line between Gamma and Alpha and extend it beyond Alpha the same distance. M81 and M82 are viewable in binoculars. A degree and a half southeast of Beta UM you will see a “scratch” of light - edge-on galaxy - M108. Continuing about another half degree southeast will bring you to the planetary nebula M97 - the “Owl” - which can be spotted with binoculars. Continue south to Gamma. In the same field locate eastern M109. Last in Ursa Major is an error on Messier’s part. Labeled as M40, this object is actually double star WNC4, located in the same eyepiece field as 70 Ursae Majoris to the northeast.

Move into Canes Venatici and round up a few more. Double star, Alpha (Cor Caroli) and Beta are easily recognizable to the east of the last star in the “handle” of the “Big Dipper”. Northernmost is Beta and you will find spiral galaxy M106 almost midway between it and Gamma UM less than 2 degrees south of star 3. M94 is found by forming an isosceles triangle with Alpha and Beta Canum with the imaginary apex towards Eta UM. M63 - “The Sunflower Galaxy” - is found about one-third the distance between Cor Caroli and Eta UM. Keep heading towards Eta and the incomparable M51 comes next. Near Eta you will see an unmistakable visual star called 24 CnV, the “Whirlpool Galaxy” is the same distance to the southwest. M101 - “Pinwheel Galaxy” is found by following the same trajectory and distance to the other side of Eta. Let’s continue north and clean “messy mistake.” The accepted designation for M102 is lenticular galaxy NGC 5866, located in Draco south east of Iota.

Now let’s finish up - it’s getting late. Our next stop will be to identify the three primary stars of Coma Berenices now high in the east above Arcturus. You will find small globular cluster M53 northeast of Alpha. M64 - “The “Black-eye Galaxy” is a degree east-northeast of 35 Comae, a star that is one-third the distance between Alpha Comae and Eta UM. The last for tonight, is a globular cluster that can be seen in binoculars - M3. You can find M3 easily by drawing

WEDNESDAY, MARCH 29

Wednesday, March 29 - Born today in 1749, Pierre Laplace was the mathematician who invented the metric system and the nebular hypothesis for the origin of the solar system. Also born in 1693 was James Bradley, an excellent astronomer who discovered the aberration of starlight in 1729, as well as the nutation of the Earth. In 1802, Heinrich W. Olbers discovered the second asteroid, Pallas, while making observations of the position of Ceres. Five years later on this same date in 1807, Vesta - the brightest asteroid - was discovered by Olbers in Virgo, making it the fourth such object found.

If you thought this day was busy in history, then let's add a total solar eclipse! While the path of totality is quite narrow, viewers across portions of Asia, Europe and North Africa will see a partial eclipse. Please check Fred Espenak's Eclipse Home Page for precise times and locations... And the web for live action!

Am I going to ask you to stay up past your bedtime to marathon with me? Darn right... After midnight we'll be walking into an incredibly rich galaxy field. Let's identify the easternmost star in Leo - Denebola - and head about a fist width due east...

Our first will be M98, just west of star 6 Comae. Return to 6 Comae and one degree southeast to capture spiral M99. Back to 6 Comae and two degrees northeast past two stars pointing to M100 - the largest appearing galaxy in the Coma/Virgo cluster. Continue two degrees north for 11 Comae. One degree northeast is round M85. Try a "trick of the trade" to locate two more. Center M99 and turn off your drive. You may now take a break for 14 minutes. When you return, M88 will have "drifted" into the field of view. Wait another two to three minutes and barred spiral M91 joins it.

Now locate Epsilon Virginis due east of Denebola. Hop four and a half degrees west and fade north to locate one of the largest elliptical galaxies presently known - M60. In the same low power field is M59 to the west. Move a degree west for fainter M58. A degree north will call up face-on spiral M89. One half degree northeast is M90. Continue a degree and a half southwest for M87. Just slightly more than a degree northwest is a same field pair, M84 and M86.

Select a new guidestar by going to 31 Virginis and identify variable R about a degree to its west. Move two degrees northwest of R for M49. Shift three degrees southwest for double - 17 Virginis. One-half degree south is the large face-on spiral, M61. Last for tonight is to head for the bright blue beauty of Spica and go just slightly more than a fist width due west. M104 - "The Sombrero Galaxy" - will be your reward for a job well done.

Congratulations! You've just seen 17 of the finest galaxies in the Coma/Virgo region and our "Marathon" total for three days has now reached 65. We're over halfway home...

TAMMY PLOTNER

THURSDAY, MARCH 30

Today celebrates the first flyby of Mercury by Mariner 10 in 1974.

Hey... It's New Moon. While tonight would be the "perfect choice" for completing a Messier Marathon from start to finish, there are no iron-clad guarantees that the sky will cooperate on this date. Even worse? Many of us have to work the next day. So what's an astronomer to do, eh? How about if we try an "early to bed and early to rise" attitude and conquer these next objects well ahead of the dawn? Set your alarm for 3:00 am, dress warm and let's dance.

With Corvus relatively high to the south, the drop is about five degrees to the south-south east of Beta Corvi. Just visible to the unaided eye will be the marker star - the double A8612. Eighth magnitude M68 is a bright, compact globular cluster in Hydra that will appear as a "fuzzy star" to binoculars and a treat to the telescope. Our next is tough for far-northern observers, for the "Southern Pinwheel" - M83 - is close to ten degrees southeast of Gamma Hydrae. (This is why it is imperative to get up early enough to catch this constellation at its highest.)

Now we're going to make a wide move across the sky and head southeast of brilliant Arcturus for Alpha Serpentis. About 8 degrees southwest you will find outstanding globular cluster M5 sharing the field with 5 Serpens. Now locate the "keystone" shape of Hercules and identify Eta in its northwest corner. About one-third of the way between it and Zeta to the south is the fantastic M13, also known as the "Great Hercules Globular Cluster." A little more difficult to find is the small M92 because there are no stars to guide you. Try this trick - Using the two northernmost stars in the "keystone," form an equilateral triangle in your mind with its imaginary apex to the north. Point your scope there. At sixth magnitude, this compact globular cluster has a distinct nucleus.

Now we're off to enjoy summer favorites and future studies. M57, the "Ring Nebula," is located about halfway between Sheilak and Sulafat. You'll find the small globular M56 residing conveniently about midpoint between Sulafat and Alberio. About 2 degrees south of Gamma Cygni is the bright open cluster M29. And equally bright M39 lays a little less than a fist width to the northeast of Deneb. If you remember our hop north of Gamma Sagitta, you'll easily find M27, the "Dumbbell Nebula," and the loose globular, M71, just southwest of Gamma. All of the objects in this last paragraph are viewable with binoculars (albeit some are quite small) and all are spectacular in the telescope.

And now we've made it to 76 on our "Messier Hit List."

FRIDAY, MARCH 31

So, are you having fun yet? Now we're moving into early morning skies and looking at our own galactic halo as we track down some great globular clusters. What time of day, do you ask? Roughly two hours before dawn...

Ophiuchus is a sprawling constellation and its many stars can sometimes be hard to identify. Let's start first with Beta Scorpii (Graffias) and head about a fist's width to the northeast. That's Zeta and the marker you will need to locate M107. About one quarter the way back towards Graffias, you will see a line of three stars in the finder. Aim at the center one and you'll find this globular in the same field. Now go back to Zeta and you will see a pair of similar magnitude dim stars higher to the northeast. The southernmost is star 30 and you will find the M10 globular cluster about one degree to its west. M12 is only about three degrees further along to the northeast. Both are wonderfully large and bright enough to be seen in binoculars.

Now we need to identify Alpha in Ophiuchus. Head toward Hercules. South of the "keystone" you will see bright Beta Hercules with Alpha Hercules to the southeast. The next bright star along the line is Alpha Ophiuchi and globular cluster M14 is approximately 16 degrees south and pretty much due east of M10. Now let's head for bright Eta Ophiuchi (Sabik) directly between Scorpius and Sagittarius. The next globular, M9, is about three and a half degrees southeast.

Now let's move on to an easier one. All you need to know is Antares to find the globular cluster M4 in Scorpius. All you have to do is aim your binoculars there, for this diffuse giant is just a little over one degree to the west. Go back to Antares and shift about four degrees to the northwest and you'll find compact, bright globular M80. It will be very small in binoculars, but it's quite bright. Going back to the scope is best for M19, although it's easy to find around seven degrees due east of Antares. The last for this morning is M62 about a half a fist's width to the south.

Hey, you're doing terrific. Some of these are tough to find unless you've had practice... But now we're up to a total of 85.

APRIL 2006



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SATURDAY, APRIL 1

Today in 1960, the first weather satellite - Tiros 1 - was launched. Let's hope our weather holds as we complete our week long Messier Marathon!

Ready to get up early again? I know it's hard, but what we're after this morning is truly worth it. These are some of the most beautiful objects in the sky.

The lower curve of Scorpius is quite distinctive and the unaided eye pair you see at the "stinger" is beautiful double Shaula (Lambda) and its slightly less bright neighbor Upsilon. Aim your binoculars there and head towards the northeast and you cannot miss M6, the "Butterfly Cluster." Below it and slightly east is a hazy patch, aim there and you will find another spectacular open cluster M7, often known as "Ptolemy's Cluster."

Now go north and identify Lambda Aquilae and you will find M11, the "Wild Duck" open cluster just to the west. About the same distance away to the south/southwest you will spot M26, another open cluster. These are all great binocular targets, but it will take an exceptionally dark, clear sky to see the Eagle Nebula associated with the M16 easy open cluster about a fist's width away to the southwest. Far easier to see is the "Nike Swoosh" of M17 just a little further south. Many of you know this as the "Omega" or "Swan" nebula. Keeping moving south and you will see a very small collection of stars known as M18, and a bit more south will bring up a huge cloud of stars labeled called M24. This patch of Milky Way "stuff" will show a wonderful open cluster - NGC 6603 - to average telescopes and some great Barnard darks to larger ones.

Now we're going to shift to the southeast just a shade and pick up the M25 open cluster and head due west about a fist's width to capture the next open cluster - M23. From there, we are dropping south again and M21 will be your reward. Head back for your scope and remember your area, because the M20 "Triffid Nebula" is just a shade to the southwest. Small scopes will pick up on the little glowing ball, but anything from about 4" up can see those dark dust lanes that make this nebula so special. You can go back to the binoculars again, because the M8 "Lagoon Nebula" is south again and very easy to see.

This particular star hop is very fun. If you have children who would like to see some of these riches, point out the primary stars and show them how it looks like a dot-to-dot "tea kettle." From the kettle's "spout" pours the "steam" of the Milky Way. If you start there, all you will need to do is follow the "steam" trail up the sky and you can see the majority of these with ease.

Our Messier total has now risen to 98...



TIROS 1
CREDIT: NASA

SUNDAY, APRIL 2



“SKYSCAPE AT
CERRO PARANAL”
CREDIT: DAMIAN PEACH

It’s “crunch time” and the first few will be easy, but you won’t have long before dawn steals the last few from the sky.

Lambda Sagittarius, the top of the “teapot” is our marker for two easy binocular objects - small globular M28 to the north/northwest and large globular M22 northeast. Switch back to the scope. Starting with the southeastern star of the “teapot” - Zeta - we’re going to hop across the bottom to the west. Slide southwest to capture globular cluster M54. Three degrees southwest is faint globular M70. Two degrees west is another globular... Say good morning to M69.

Now it’s going to get tough. Small globular M55 is about a fist’s width east/south east of Zeta and the dawn is coming. It will be difficult to find small globular M75, but if you can see Beta Capricorn it will be about a fist’s width southwest. Look low to the east and identify Enif by its reddish color. Power punch globular M15 is northwest. Be thankful M2 is a large globular cluster. It’s two thirds of the way between Enif and Beta Aquarius.

Let’s hope Beta shines bright, because we need to head southwest a fist width away to snag what will now be two very dim ones - globular M72 and open M73 west of Nu Aquarius. We’re running just ahead of the light of dawn and globular M30 is our last. Hang on Delta Capricornus and show us the way south/southwest to star 41! If you can find that? You’ve got the very last one...

We’ve done the Messier Catalog of all 110 objects in just one week!

Today in 1889, the Harvard Observatory’s 13” refractor arrived at Mt. Wilson. Just one month later, it began a long astronomical legacy at Lick Observatory. It was here that the largest telescopes in the world resided from 1908 to 1948. The 60” for the first decade, and followed by the 100”. This latter mirror is still the largest solid piece ever cast in plate glass and weighed 4 1/2 tons. Would you believe it’s just 13 inches thick? In 1845, the first photograph of the Sun was taken. While solar photography and observing is best left to properly filtered telescopes, no special equipment is necessary to see some effects of the Sun - only the correct conditions. We’ll find out why tomorrow night...

Tonight let’s take it easy after our marathon and relax as we take a look at lunar features. Begin by identifying Mare Crisium and shallow crater Cleomides to its north. About twice its width northwest, you will see a sharply well-defined Class I crater Geminus. Named for the Greek astronomer and mathematician Geminus, this 86 kilometer wide crater shows a smooth floor and displays a long, low dune across its middle.



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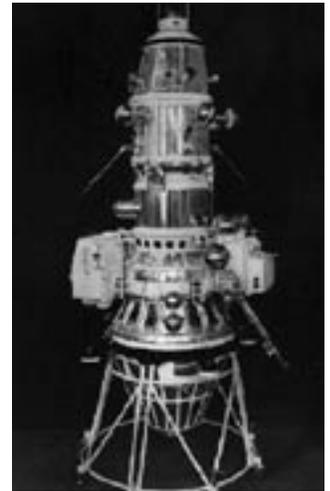
<http://www.universetoday.com>

MONDAY, APRIL 3

Today marks the 40th anniversary of the launch of the first lunar orbiter - Luna 10. That makes another good reason to view the Moon tonight!

Just a short distance north of the southern cusp, look for a twin pair of craters on the terminator tonight. These are Steinheil and Watt. The two are nearly identical in size and overlap each other. Steinheil, named for mathematician, physicist, optician, and astronomer Karl August von Steinheil is just bit deeper and to the north. Watt, named for James Watt, Scottish engineer and first man to patent the use of a telescope for surveying, will show a wee bit more detail on its floor.

Right now Earth's magnetosphere and magnetopause are positioned correctly to interact with the Sun's influencing interplanetary magnetic field (IMF) - and the plasma stream which flows past us as solar winds. During this time after equinox, this phenomenon leaves the door wide open for one of the most awesome signs of spring - aurora! Visit the Geophysical Institute to sign up for aurora alerts and use their tools to help locate the position of the Earth's auroral oval.



LUNA 10
CREDIT: NASA



STEINHEIL AND WATT
(TOP OF FRAME)
CREDIT: TAMMY PLOTNER

TUESDAY, APRIL 4

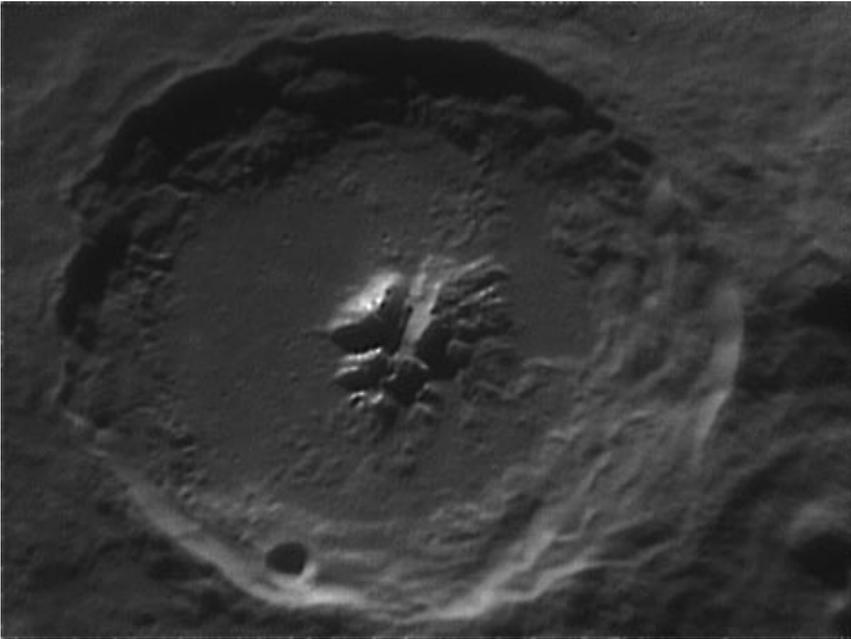
Tonight through binoculars or a telescope, let's head toward the Moon's southern quadrant and view Theophilus. Located on the terminator and bordered on the northern edge by Mare Nectaris and to the south by Mare Tranquillitatis, Theophilus has an average diameter of 105 km and contains a wonderful multiple-peaked center. This particular crater is unusual because the floor is para-

bolic. The interior may be dark, but you should see the Sun catching the summit of its huge central peak.

After the Moon sets, keep the watch for the Kappa Serpentid meteor shower. Its radiant lies near the "Northern Crown" - Corona Borealis. The fall rate is low, with an average 4 or 5 per hour.

Tonight will be the last chance for deep sky studies before the Moon dominates, so let's take advantage. Did you know that there is a galaxy in Cancer? OK - so you did... But, did you know that the galaxy NGC 2775 has been home

to 5 supernovae in the last 30 years, or that it's one of the most unusual but otherwise perfect spiral shapes in the heavens? Then, get a scope out and start by locating Alpha Cancri and head not quite a fist's width southeast and in line with Zeta Hydrae. NGC 2775 is a 10.3 magnitude oval of luminosity within a low power field.

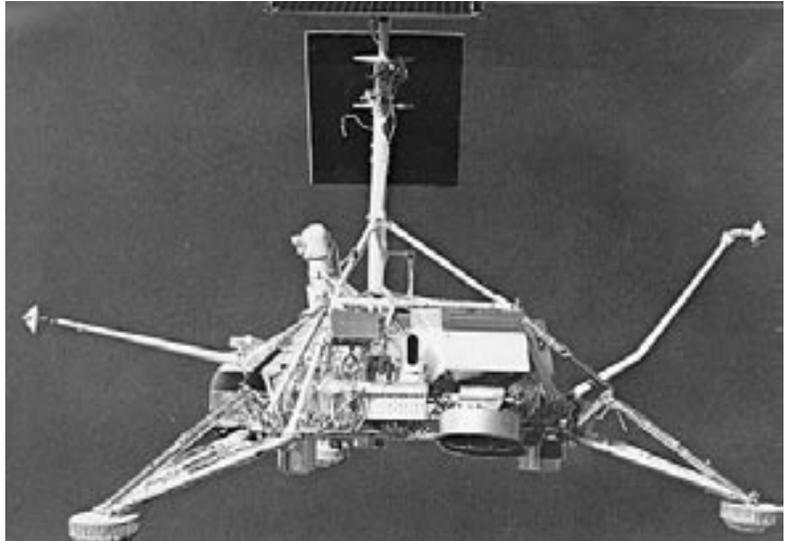


THEOPHILUS
CREDIT: WES HIGGINS

WEDNESDAY, APRIL 5

There's plenty of Moon to explore tonight, so why not try locating an area where many lunar missions left their mark? Binoculars easily reveal the fully disclosed mares of Serenitatis and Tranquillitatis. Set your sites where these two vast lava plains converge. Telescopically you will see a bright "peninsula" where they meet in the west. Look for bright and small crater Pliny to the east of this point.

It is near this rather inconspicuous feature that the remains of Ranger 6 lay forever preserved after "crash-landing" on February 2nd, 1964. Unfortunately, technical errors prevented Ranger 6 from transmitting lunar pictures. Not so Ranger 8! On a very successful mission to the same basic area, NASA received 7137 "postcards from the near



SURVEYOR 5
CREDIT: NASA

side of the Moon" for 23 minutes before a very hard landing. On the "softer side," Surveyor 5 touched down near this area safely after two days of malfunctions on September 10, 1967. Incredibly, the tiny Surveyor 5 endured temperatures of up to 283 degrees F, but still spectrographically analyzed the area's soil and also managed to televise over 18,000 frames of "home movies" from its distant lunar location.

Tonight let's "see double." At magnitude 2.5, Gamma Leonis - or Algieba - is second brightest member of the Leo "question mark." Now we have a question for you. Did you know that Algieba is among the most lovely pairs of color in the night sky? See for yourself! Separated by less than 5 arc seconds, the primary



"HISTORY"
CREDIT: GREG KONKEL

appears ivory, while the secondary is golden. Those with smaller scopes will enjoy the beauty of the "airy disks" displayed by this pair.

THURSDAY, APRIL 6

Tonight let's return to a now familiar lunar feature, Albategnius. A fine challenge for binoculars will be to see if you can make out its bright central peak from the darker lava-covered floor. Power up with a telescope for another challenge. Can you spot the small craters Vogel and Burnham on its southeast edge? Or Ritchey just outside its eastern wall? Look for craters Halley and Hind just between Albategnius and Hipparchus to the north. Hipparchus also holds a very detailed small crater named Horrocks on its northern wall. Shallow crater Saunder is just to its east.

Ready for another challenge? Then let's head for Iota Leonis - just south of the triangle that makes up eastern Leo. At magnitude 4, it will be difficult to see its close 7th magnitude companion. This is known as a disparate double - a pair unevenly matched in brightness. One of the most difficult double stars in the heavens!



SHADOWED HIPPARCHUS
CREDIT: ROGER WARNER

FRIDAY, APRIL 7

Today in 1991, the Compton Gamma Ray Observatory (GRO) was deployed. Part of NASA's Great Observatories program, the CGRO was named to honor Dr. Arthur Holly Compton - a Nobel Prize winning physicist. CGRO scanned six decades of electromagnetic radiation at energy ranges well beyond anything the eye can see. Such energies often happen in bursts as extraordinary and cataclysmic events occur in the cosmos.



GAMMA RAY OBSERVATORY
CREDIT: NASA

Be sure to take your telescope out and have a look at the Moon tonight. One of the most sought-after and unusual features will be visible in the southern half of the Moon near the terminator - Rupes Recta! Also known as "The Straight Wall," this 130 km (75 mile) long, 366 meter (1200 ft.) high feature slopes upward with the steepest angle on the lunar surface (41 degrees). It will be a challenge under these lighting conditions, but look for triple ring of craters Ptolemy, Alphonsus, and Arzachel to guide you. The "Straight Wall" appears as a very thin line stretching across the edge of Mare Nubium.



RUPES RECTA:
"THE STRAIGHT WALL"
CREDIT: ROGER WARNER

Be on the lookout for bright streaks from the Delta Draconid meteor shower. Its radiant lies near the border with Cepheus to the east. The fall rate is quite low - around 5 meteors per hour.

Even with the Moon, let's try for a scattered open cluster toward the west in Auriga. At magnitude 5.4, NGC 2281 should be visible as a nebulous mist in binoculars on a dark night, but you'll need a scope and high power to darken the sky enough to see the bright members found near its core. NGC 2281 is around 1500 light years distant and 50 million years old. It can best be found by extending a line from Capella to Beta Aurigae an equal distance east to a pair of 5th magnitude stars separated by a finger width. NGC 2281 lies less than 1 degree southeast of the eastern member of this pair (58 Aurigae.)



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SATURDAY, APRIL 8

Start your evening by revisiting crater Copernicus as it becomes visible to even the most modest of optical aids. Small binoculars will see Copernicus as a bright “ring” about midway along the lunar dividing line of light and dark called the “terminator.” Telescopes will reveal its 97 km (60 mile) expanse and 120 meter (1200 ft.) central peak to perfection. Copernicus holds special appeal as the aftermath of a huge meteoric impact! At 3800 meters deep, its walls are 22 km thick. Over the next few days, the impact ray system extending from this

tremendous crater will become wonderfully apparent.

Tonight we'll use Copernicus as a guide and look north-northwest to survey the Carpathian Mountains. The Carpathians ring the southern edge of Mare Imbrium beginning well east of the terminator. But let's look on the dark side. Extending some 40 km beyond into the Moon's own shadow, you can continue to see bright peaks - some reaching 2000 meters high! Tomorrow, when this area is fully revealed, you will see the Carpathians begin to disappear into the



CARPATHIAN MOUNTAINS
NORTH OF COPERNICUS
CREDIT: GREG KONKEL

lava flow forming them. Continuing onward to Plato - on the northern shore of Mare Imbrium - look for the singular peak of Pico. Between Plato and Mons Pico you will find the many scattered peaks of the Teneriffe Mountains. It is possible that these are the remnants of much taller summits of a once precipitous range. Now the peaks rise less than 2000 meters above the surface. Time to power up! West of the Teneriffes, and very near the terminator, you will see a narrow line of mountains, very similar in size to the Alpine Valley. This is known as the Straight Range and some of its peaks reach as high as 2000 meters. Although this doesn't sound particularly impressive, that's over twice as tall as the Vosges Mountains in west central Europe and on average, comparable to the Appalachian Mountains of the eastern United States.

SUNDAY, APRIL 9

Tonight let's continue our lunar mountain climbing expedition and revisit the "big picture" on the lunar surface. Tonight all of Mare Imbrium is bathed in sunlight and we can see its complete shape. Appearing as a featureless ellipse bordered by mountain ranges, let's identify them all again. Starting at Plato and moving east to south to west you will find the Alps, the Caucasus, the Apennine and the Carpathians mountains. Look at the form closely...doesn't it look like it's possible that an enormous impact created the entire area? Compare it to the younger Sinus Iridium ringed by the Juras Mountains. It may have also been formed by a much later and very similar massive impact event.

In the mood for a double star? Then let's head west and away from the Moon. Begin your search right after skydark with El Nath - Beta Tauri. From Beta shift about two finger-widths east-northeast to identify very dim 26 Aurigae. At low power, look for an 8th magnitude companion due west of the 5.5 magnitude primary. The brighter star should give a warm yellow appearance while the fainter appears slightly more blue. This pair shares space with a third member (magnitude 11.5) - some three times further out from the primary than the closer, brighter secondary. Thanks to lunacy, small instruments will have difficulty distinguishing the C star in such bright skies.



MOUNTAIN RANGES
CREDIT: ROGER WARNER

MONDAY, APRIL 10

Be sure to get up before dawn to enjoy the Virginid meteor shower. The radiant point will be near Gamma in the bowl of Virgo. The fall rate of 20 per hour is above average for meteor showers, and with the Moon out of the equation this morning, you're in for a treat!

Tonight we'll start by identifying the large mare just south of central on the lunar disc called Oceanus Procellarum. Look almost centrally within its



grey expanse for a large crater which has mostly melted down. This “ghost crater” has no name, but look along its edge for Class I Flamsteed. It is very near here that Surveyor 1 still stands. It made its landing on June 2, 1966 and sent back more than 11,000 pictures of the rock strewn, desert-like floor. This area was one of the first chosen for an Apollo mission landing, but was later scratched for a more central location.

Now let's move on to 3.2 magnitude Mabsuta - Epsilon Geminorum. Mabsuta is the brightest star (other than Castor) in northwestern Gemini. It has a very distant 9th magnitude companion. As you observe Epsilon, keep in mind its spectral class (G8)

FLAMSTEED
CREDIT: RICARDO BORBA

is very similar to our Sun. Despite this, Mabsuta glows with an intensity of light 7600 times brighter. It's one of a rare class of stars called “yellow supergiants” - stars whose nuclear cores are vastly swollen due to advanced age and which have taken on “planetary” proportions. Why planetary? Because the planet Venus would find itself orbiting inside Mabsuta's 4600 degree C temperature photosphere!

TUESDAY, APRIL 11

Today is the birthday of William Wallace Campbell. Born in 1862, Campbell went on to become the leader of stellar motion and radial velocity studies. He was the director of Lick Observatory from 1901 to 1930, and also served as president of the University of California and the National Academy of Sciences. Also born on this day - but in 1901 - was Donald H. Menzel - assistant astronomer at Lick Observatory. Menzel became Director of Harvard Observatory, an expert on the Sun's coronosphere and held a genuine belief in the extraterrestrial nature of UFOs. Today in 1960, the first radio search for extraterrestrial civilizations was started by Frank Drake (Project Ozma). In 1986, Halley's Comet closed within 65 million kilometers of the Earth – as close as it would get.

If you would like to try out a pair of less obvious lunar features, start out again tonight at Oceanus Procellarum - a vast, grey "sea" encompassing most of the northwestern portion of the Moon. On the terminator to its southwest, (and almost due west geographically) you will see two craters nearly identical in size and depth. The southern crater is Billy - one of the darkest floored areas on the Moon. Inside Billy's bright rim, you will notice an interior as featureless as a mare. North of Billy is Hansteen, whose interior is much brighter and shows complex details. Comparing the two will show Billy was once filled with smooth lava, while Hansteen avoided that fate and shows its native scarred interior.

Although skies will be bright this evening, we can still have a look at brilliant Arcturus - a star whose distance from the Earth (10 parsecs) and radial velocity (less than 200 meters per second) can almost be considered a benchmark. By skydark you will see 0.2 magnitude Arcturus - the brightest star in Bootes and 4th brightest star in the night sky - some 30 degrees above the eastern horizon. Apparent to the eye is Arcturus' orange color. Because a star's intrinsic luminosity relates to its apparent brightness and distance, Arcturus' absolute magnitude is almost precisely the same as its apparent magnitude. Just because Arcturus' radial velocity is nearly zero doesn't mean it isn't on the move relative to our Sun. Arcturus is now almost as close as it will ever get and its large proper motion - perpendicular to our line of sight - exceeds 125 kilometers per second. Every 100 years Arcturus moves almost 1 degree across the sky!



WILLIAM WALLACE CAMPBELL
CREDIT: MARY LEA SHANE
ARCHIVES/LICK
OBSERVATORY



HANSTEEN AND BILLY
CREDIT: TAMMY PLOTNER



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WEDNESDAY, APRIL 12

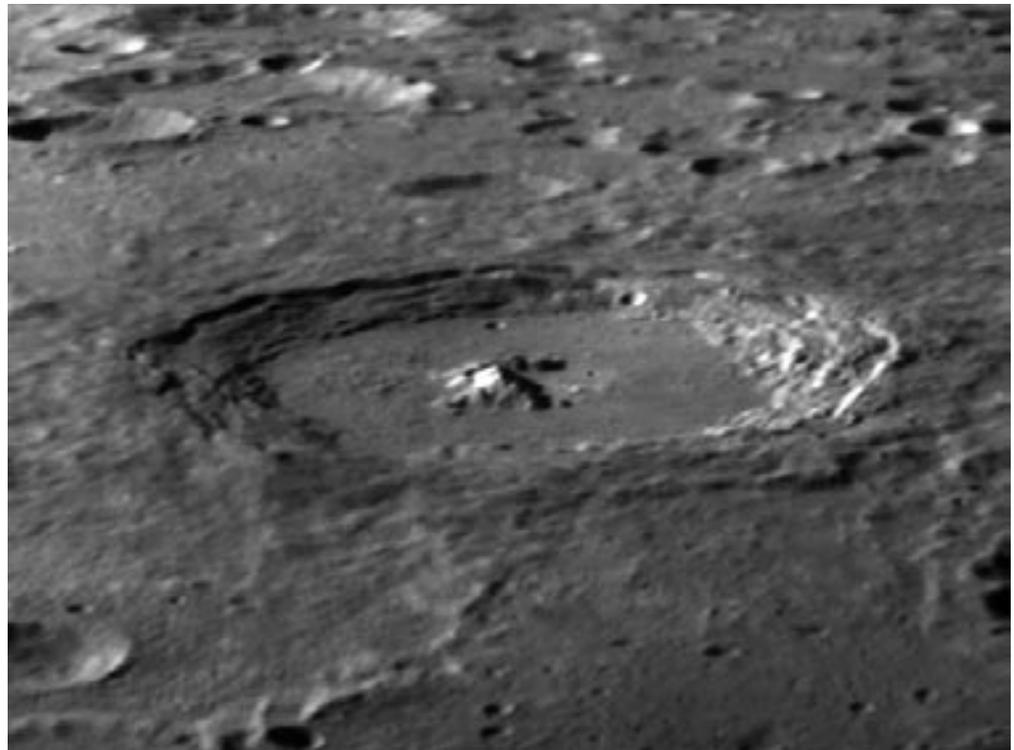


YURI GAGARIN
CREDIT: NASA

Today in 1961, Yuri Gagarin made one full orbit of the Earth aboard Vostok 1, while also becoming the first human in space. Also today (in 1981) Columbia became the first Space Shuttle to launch.

Tonight let's launch our lunar explorations as we head for the far north for an "on the edge" feature - Pythagoras. Named for the Greek philosopher and mathematician, you will see this smooth, walled plain as a thin, bright ellipse standing out well against the background of northern Sinus Iridum. Pythagoras is one of the deepest craters in the northern quadrant and would be even more spectacular if visible from overhead - rather than at an angle. Look for its tall and prominent central peak.

Although the Moon will interfere with most studies, we can still check out Iota Cancri - a fine wide disparate double of magnitudes 4.0 and 6.6 separated by some 30 arc seconds. This true binary is so distant from one another that they take over 60,000 years to complete a single orbit around their common center of gravity! Located slightly less than a fist's width due north of M44, this pair is about 300 light years distant. Both stars shine with a light considerably brighter than our Sun and observers may note a subtle gold and pale blue color contrast between them.



PYTHAGORAS
CREDIT: DAMIAN PEACH

THURSDAY, APRIL 13

Tonight's Full Moon is often referred to as the "Pink Moon" of April. As strange as the name may sound, it actually comes from the herb moss pink- or wild ground phlox. April is the time of blossoming and the "pink" is one of the earliest widespread flowers of the spring season. As you might expect, this Full Moon is also known by other names as well. How about the "Full Sprouting Grass Moon," the "Egg Moon," or the coastal tribe based "Full Fish Moon" as we've entered the season when fish swim upstream to spawn.

Tonight let's take a journey towards the 25th brightest star in the night sky - 1.3 magnitude Regulus. Regulus, known as "The Little King," is the brightest star in Leo. At 77 light-years away, this star is considered a "dwarf" despite shining with a visible light almost 150 times that of Sol. The orange-red giant Arcturus, and the blue white "dwarf" Regulus both share a common absolute magnitude very close to 0. The reason the two stars shine with a similar intrinsic brightness - despite widely different physical sizes - is Regulus' photosphere is more than twice as hot (12,000 C) as Arcturus. While observing Regulus, look for a distant companion of magnitude 8.5. Normally low powers would best concentrate the companion's light, but try a variety of magnifications to help improve contrast. For those with large aperture scopes, look for a 13.1 magnitude "companion's companion" a little more than 2 arc seconds away!



THE FULL MOON SETTING OVER THE DOME OF
THE 3.5-METER WIYN TELESCOPE AT THE KITT PEAK NATIONAL OBSERVATORY
CREDIT: PHIL MASSEY, LOWELL OBS./NOAO/AURA/NSF

FRIDAY, APRIL 14



CHRISTIAN HUYGENS
CREDIT: NASA

Today is the birthday of Christian Huygens. Born in 1629, the Dutch scientist went on to become one of the leaders in his field during the 17th century. Among his achievements were promoting the wave theory of light, patenting the pendulum clock, and improving the optics of telescopes by inventing a new type eyepiece and reducing false color through increasing the focal length of refractor telescopes. Huygens was the first to discover Saturn's rings and largest satellite - Titan. Of the rings, Huygens said, "Saturn: encircled by a ring, thin and flat, nowhere touching, and inclined to the ecliptic."

To honor Huygen's achievements and get a sense just how "on the edge" his observations were at the time, consider the fact Huygens used a home built instrument of 12 foot (336.7) focal length and little more than 2 inches in aperture (57mm). Tonight, why not have a low power look at Saturn using your smallest scope. At what magnification does it become clear to you that the planet has "lost its ears" and gained a ring?



SATURN
CREDIT: DAMIAN PEACH

SATURDAY, APRIL 15

Tonight keep a watch for the “April Fireballs.” This unusual name has been given to what may be a branch of the complex Virginid stream which began earlier in the week. The absolute radiant of the stream is unclear, but most of its long tails will point back toward southeastern skies. These bright bolides can possibly arrive in a flurry - depending on how much Jupiter’s gravity has perturbed the meteoroid stream. Even if you only see one tonight, keep a watch in the days ahead. The time for “April Fireballs” lasts for two weeks. Just seeing one of these brilliant streaks will put a smile on your face!

While thinking of Jupiter, why not search for the planet’s ghost? The “Ghost of Jupiter” sits prime after skydark in the constellation Hydra. Start at Alpha Hydrae and head east about a fist’s width to find Lambda within a field of nearby fainter stars. Continue less than a fist southeast and locate Mu. You’ll find the “Ghost of Jupiter” (NGC 3242) lurking in the dark less than a finger-width due south. At magnitude 9, the NGC 3242 gives a strikingly blue-green appearance in even small scopes - despite being more than 1500 light years away.

Before we call it a night, let’s visit with Luna as we look along the southern shore of Mare Humorum and identify ancient crater Vitello. Notice how this delicate ring resembles an earlier study Gassendi on the opposite shore.



VITELLO
CREDIT: DAMIAN PEACH

SUNDAY, APRIL 16

With tonight's later Moon, it's a fine opportunity to study a group of galaxies between Leo's paws. Start at Regulus and look due east toward Iota Leonis. Halfway between the two (less than a fist from Regulus) and two finger-widths northeast of Rho Leonis, you'll encounter Messier Galaxies M95 and M96 - both within the same low power field of view. At magnitude 9.2, the brighter M96 lies northeast of 9.7 magnitude M95. Pierre Méchain discovered both galaxies on March 20, 1781 and Messier added them 4 days later. These galaxies



are two of the brightest members of the Leo I galaxy group located some 38 million light-years away.

To see another member, center on M96 and bump north at low power. 9.3 magnitude galaxy M105, nearby 10th magnitude NGC 3384, and 12th magnitude NGC 3389 will come into view. M105 was discovered by Méchain on the night Messier catalogued M95 and 96 but was not formally added. Based on Méchain's observing notes, Helen Sawyer Hogg included it in 1947 - along with galaxy M106 and globular cluster M107. Méchain failed to

M95, M96 AND M105:
"THE LEO I GROUP"
CREDIT: NOAO/AURA/NSF

notice M105's bright neighboring galaxy - NGC 3384. Center M105 and shift due north about a degree to encounter 10th magnitude NGC 3377 - a small elongated galaxy with a stellar core. There's a dozen galaxies visible to average scopes in the Leo I region!

If you're out late to study the Moon, look for Petavius on the southern terminator. Beyond its east wall is a bright ridge extending north/south and separated by darkness. This is Palitzsch, a strange, gorge-like formation which appears to be caused by a meteor plowing through surface. Palitzsch's true nature wasn't known until 1954 when Patrick Moore resolved it as a "crater chain" using the 25" Newall refractor at Cambridge University Observatory.

MONDAY, APRIL 17

Are you ready for more meteors? Tonight is the peak of the Sigma Leonids. The radiant was originally located at the Leo/Virgo border, but has now migrated into Virgo. Thanks to Jupiter's gravitational tug, this shower may eventually become part of the Virginid Complex as well. The fall rate is very weak - at one to two per hour.

With tonight's Moon heading west, let's have a look at a bright galaxy in Sextans - NGC 3115 - the "Spindle Galaxy." One look through the eyepiece leaves little doubt as to why. This edge-on lenticular beauty shows a brightly elongated central bulge and two nearly symmetrical extensions tapered north-east and southwest. Unlike other bright edge-on spirals, this galaxy shows little sign of a dark lane. NGC 3115 is a mature galaxy located some 20 million light years away. To find it, use low power and center your scope at the northern corner of a right triangle formed by Alphard and Lambda Hydrae.

TUESDAY, APRIL 18

Tonight let's have a look at the Leo Trio - a superb group of two Messier galaxies and NGC 3628. Located some 35 million light years away, they make up their own smaller collection - the M66 galaxy group. All three may be framed together



at low power and can best be located by first centering on Theta Leonis and sweeping a little more than a finger-width south to 73 Leonis. By putting star 73 less than a degree west, you will first see 9.5 magnitude M65 enter the low power field. M65 will soon be followed by brighter, larger and more face-on 9.0 magnitude M65. Both were discovered by Charles Messier on March 1, 1780. Larger and fainter yet is the irregular galaxy NGC 3628, which can be included in the low power field by shifting the pair south. Despite having a similar apparent magnitude, one look at this low surface brightness galaxy and you will easily forgive the famed comet hunter and his hard-working friend for missing it!

Want a challenge? Center your scope on 73 Leonis again and shift slightly more than half a degree southwest. Look for mid-sized 11th magnitude NGC 3593. Something

"THE LEO TRIO"
CREDIT: NOAO/AURA/NSF

even more difficult? How about 12th magnitude galaxy NGC 3596. This face-on spiral galaxy is also of low surface brightness and requires a large scope. Start at bright Chertan and shift less than a degree south-southeast to locate it.

WEDNESDAY, APRIL 19

Tonight is an ideal time to study “Bode’s Galaxies” - now high in the northwest of the constellation of Ursa Major. To find this extraordinary pair of small scope studies, first locate Phecda (Beta) and 2 Dubhe (Alpha). Draw a line between this bright pair and extend that line an equal distance northwest beyond Alpha. Both galaxies are visible in large finderscopes or binoculars - but if you overextend, look for faint 24 Ursa Majoris and drop a finger-width southeast.

Discovered in December 1774 by J.E. Bode, these two deep sky favorites hold secrets between themselves. Photographed as early as March, 1899, the pair is central to a group of galaxies en-

compassing the northern circumpolar constellations Ursa Major and Camelopardalis. In small scopes and low powers, the two galaxies give the appearance of “Cat’s eyes” glowing in the night. Mid-sized scopes reveal the spiral nature of the brighter more southerly M81, while mottling can be seen in the irregular spindle shaped M82.

Center on M81 and make a shift of less than a degree southeast. This reveals two 8th magnitude stars forming a right triangle with 10th magnitude face-on spiral galaxy NGC 3077. More difficult is larger and fainter NGC 2976 - a tough find for even mid-aperture due to its low surface brightness and lack of a bright core. To locate NGC 2976, return to M81 and head about one and a half degrees southwest.

All four galaxies are part of the M81 group - a small galaxy cluster located some 12 million light years away. M81 and M82 are bound together in a powerful gravita-

tional embrace. Only a few million years ago the two had a close encounter of a most difficult kind - one that largely devastated the structure of the less massive M82 but left its heavier companion completely intact with unrivaled spiral structure of great symmetry and beauty.



M81
CREDIT: R. JAY GABANY



M82
CREDIT: R. JAY GABANY

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THURSDAY, APRIL 20



M98

CREDIT: NOAO/AURA/NSF



M99

CREDIT: NOAO/AURA/NSF



M100

CREDIT: NOAO/AURA/NSF

Are you ready to explore further? Then hold on to your star charts and get ready to be lost... The Coma Berenices galaxy group now enters the scene and there are so many galaxies visible that the hard part is being sure of what you are looking at! To get your bearings, start at Denebola (Beta Leonis) and move due east 6.5 degrees to the star 6 Coma Berenices. Once centered on 6 Comae, shift back toward Denebola a half degree to view one of the faintest of the Messier galaxies - M98 - a large near edge-on spiral. Discovered along with M99 and 100 by Pierre Méchain on March 15, 1781, the three discoveries became Messier's last entries in the original published 3rd edition of his catalog. Although the view of 10th magnitude M98 may be disappointing through smaller scopes, this galaxy comes into its own using larger instruments where its nicely defined and expansive edge-on appearance becomes obvious.

By re-centering 6 Comae in the field and shifting less than one degree southeast, our next study - 9.8 magnitude spiral galaxy M99 - can be reliably identified. Should you go the same distance due east instead, you will encounter 11.5 magnitude NGC 4262. While due south this same distance you will find 11.2 magnitude NGC 4212 and its 13th magnitude neighbor - IC 3061. Although scopes can reveal M99 is a spiral today, it was Lord Rosse (in the spring of 1846) who first recognized the spiral nature of some galaxies.

M100, last on the originally published list, is found by again centering on 6 Comae. At low power, move 2 degrees northeast along a line of finder scope stars. M100 - at magnitude 9.4 - appears no brighter on the surface than M99 due to its greater apparent size. Like M99, M100 was included in Lord Rosse's original 1850's list of 14 spiral nebulae. Although face-on in presentation, M100 has two widely displaced and asymmetric spiral arms that can be detected visually through large scopes. Observers using mid-sized scopes should also look for 11.8 magnitude NGC 4312 south of M100. It's also possible to see 13th magnitude IC 783 roughly that same distance due west.



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FRIDAY, APRIL 21

With dark sky to spare, tonight we continue our explorations of the Coma Berenices galaxy group - part of the larger Virgo supercluster of galaxies lying perpendicular to the plane of our own Milky Way galaxy.

Begin by first centering 6 Comae in the finder, then shift north-northeast 3 degrees to the disparate double, 11 Comae. Shift a little more than a degree due east to one of the brighter Messier galaxies in the Virgo cluster - 9th magnitude M85. In photographs, M85 looks like a giant elliptical galaxy but it's a lenticular spiral completely devoid of arm structure. Located some 60 million light years away, this luminous mass of stars is relatively free of dust and has a diameter of 125,000 light years. M85 is larger than our own Milky Way, and more densely packed with stars.

A breath west of M85 is tiny 11th magnitude NGC 4394 - an easy study in moderately sized scopes. Slightly more than a degree in the opposite

direction, is larger 11th magnitude NGC 4293 - another round galaxy but one having a brighter core.

Before you call it a night, take a look east. Brilliant Jupiter is now taking up a year-long residence in Libra. You'll need to wait for the planet to rise higher in the later evening to get a good view.



M85
CREDIT: NOAO/AURA/NSF

SATURDAY, APRIL 22



SIR HAROLD JEFFREYS
(WIDELY USED
PUBLIC IMAGE)

Today celebrates the birthday of Sir Harold Jeffreys. Born in 1891, Jeffreys was an early astrophysicist and the first person to envision an Earth with a fluid core in its center. Jeffreys also helped improve our understanding of tidal friction, overall planetary structure, and the origins of the solar system.

Up before dawn? Then enjoy the peak of the Lyrid meteor shower! Since the radiant originates near Vega, improve your odds of spotting them when the constellation Lyra is as high as possible. The Lyrid stream comes from parent comet Thatcher and produces about 15 bright, long-lasting meteors per hour. Plan tonight to head into the Coma-Virgo galaxy cluster for more challenges. This time we'll approach from Vindemiatrix (Epsilon Virginis) and move west-northwest along a chain of bright galaxies in the direction of distant Denebola. We'll start with "Messier-quality" NGC 4762 followed by the M60, M59 and M58. Ready to starhop?



M58
CREDIT: NOAO/AURA/NSF

Our first stop lies a little more than a finger width west-northwest of Vindemiatrix: NGC 4762 is a 10.2 magnitude edge-on galaxy with a nearby 10.6 magnitude neighbor, NGC 4762. Most scopes show reveal a faint, thick lens-shaped patch of light oriented north-south. Like dozens of other bright NGC studies, NGC 4762 could have been discovered by Messier and friends in the eighteenth century - but wasn't!



M59
CREDIT: NOAO/AURA/NSF

Continuing west-northwest another finger width reveals M60 - one of the brightest (magnitude 8.8) Coma-Virgo cluster members. This mid-sized elliptical galaxy condenses toward a bright core and shares the field with a pair of nearby companions (11.4 magnitude NGC 4647 and 11.3 magnitude NGC 4638). A touch west-northwest of the M60 group is a fainter (9.8) flattened elliptical galaxy M59. A bit further west is 10.9 magnitude galaxy NGC 4606 - a faint spindle of luminosity. All five of these galaxies can fit into a single low power field of view and will appear roughly as a line of nebulous islands hopping east to west!



M60
CREDIT: NOAO/AURA/NSF

Returning slightly east to center again on M59, we shift the scope a degree slightly north and further west to 9.8 magnitude M58. This small, face-on barred spiral is an original discovery of Messier - who found it along with M59 and 60 - while following a comet in the spring of 1779. Unknown to Messier was that the galaxies designated M59 and M60 in his log had already been discovered 4 days earlier (on April 11) by Johann Gottfried Koehler while pursuing the same comet!



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SUNDAY, APRIL 23

Pioneering quantum physicist Max Planck was born this day in 1858. In 1900, Plank developed the equation explaining the distribution of light emitted by a theoretical “blackbody.” Interestingly, almost all light seen in the heavens originates as “blackbody radiation” from the surface gases of stars. But where does the “absorbed light” come from? Nuclear fusion and the type of light that is far too vibrant for the human eye to see...



MAX PLANCK
(WIDELY USED PUBLIC IMAGE)

In honor of this principle, let’s turn our telescopes on the combined light of trillions of stars as we continue our exploration of the Coma-Virgo cluster. Start at Nu and extend a line to Omicron Virginis. Continuing the same distance places NGC 4429 at the northeast edge of a low power field. Fainter NGC 4371 may be seen less than a degree away northwest. NGC 4429 is a near edge-on galaxy shows wispy spiral extensions and a bright star-like core.



M86
CREDIT: NOAO/AURA/NSF

Move 1.5 degrees north for magnitude 8.6 elliptical galaxy M87. Look for its 11.2 magnitude companion, NGC 4478. Photographs of M87 reveal this 120,000 light year diameter galaxy as an “all stars” phenomenon - similar to a massive globular cluster! M87 has collected tens of thousands of globular clusters, numerous smaller galaxies, and converted almost all of its matter to stars - a galaxy with a total mass exceeding several trillion suns.



M87
CREDIT: NOAO/AURA/NSF

Look east-southeast for M58, M59, and M60. West-northwest are the “twin lenticular galaxies” - M84 and 86. A finger-width north of M87 is 9.5 magnitude tilted spiral M88. Head less than a degree west of M88 to find 10.2 magnitude barred spiral M91 in the same low power field. Less than a finger-width south-southeast of M91 is 9.5 magnitude M90 - another tilted spiral found and later added to Messier’s list on the same productive night of March 18, 1781.

How’s that for a night out under the stars?



M90
CREDIT: NOAO/AURA/NSF



M91
CREDIT: NOAO/AURA/NSF



M88
CREDIT: NOAO/AURA/NSF



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MONDAY, APRIL 24



SIR HAROLD JEFFREYS
(WIDELY USED
PUBLIC IMAGE)

Before dawn, Venus and the Moon have a very close encounter... Of the occultation kind! Be sure to check IOTA, you won't want to miss this. Today in 1970, China launched its first satellite - the beginnings of a national space program that later saw its first "taikonaut" in space.

Tonight, let's use our binoculars and telescopes and take a break from galaxy quest. An alternative is to find one of the best northern hemisphere globular clusters - M3. You can locate M3 easily by identifying Cor Caroli (Alpha Canes Venatici) and Arcturus. Sweep your binoculars along a line halfway between the two and you will uncover this condensed beauty just east of Beta Comae. With added inches and magnification, the stars are out to play!

Discovered by Charles Messier on May 3, 1764, this condensed ball of approximately a half million stars is one of the oldest formations in our galaxy. At 35-40,000 light years distant, this awesome globular cluster spans 220 light years and is believed to be 10 billion years old.



M3
CREDIT: N.A. SHARP AND
VANESSA HARVEY/REU
PROGRAM/NOAO/AURA/NSF



<http://www.universetoday.com>

TUESDAY, APRIL 25

Today marks the 15th anniversary of the deployment of the Hubble Space Telescope (HST). While everyone in the astronomical community is aware of what this magnificent telescope “sees,” did you know that you can see it with just your eyes? The HST as a satellite can be tracked and observed. Visit the website Heavens-Above and enter your location. This will provide you with a list of times for visible satellite passes from your locale. Although you can't see a detailed view of the satellite itself from Earth, it's great fun to use binoculars and watch the Sun glint off all those highly polished surfaces!

Keep a watch on the skies tonight as the Mu Virginid meteor shower reaches its peak of 7 to 10 visible trails per hour. With the dark skies this evening, you might catch one of these medium speed meteors radiating from a point near the constellation of Libra.

Tonight is another “Missed Messier” - 8.9 magnitude NGC 3521. Often ignored by observers because of its isolated location in southern Leo, this tilted galaxy is a “must see” and fine representative of the grand spiral tradition. A delight even in small instruments, the galaxy reveals definite spiral structure in larger scopes and has been compared to M63 in overall structure.

To locate NGC 3521, start at Sigma Leonis and head almost three degrees south to 10.3 magnitude NGC 3640. Power up for a view of this oval-shaped elliptical beauty - then resume your quest for NGC 3521 by heading south-southwest another 1.5 degrees to 75 Leonis. Continue a little more than a finger-width south-southwest to 69 Leonis. NGC 3521 is located a finger-width due west of 69 Leonis.

Now that's “star hopping”!



THE HUBBLE SPACE
TELESCOPE
CREDIT: STS-03, STSCI,
ESA, NASA



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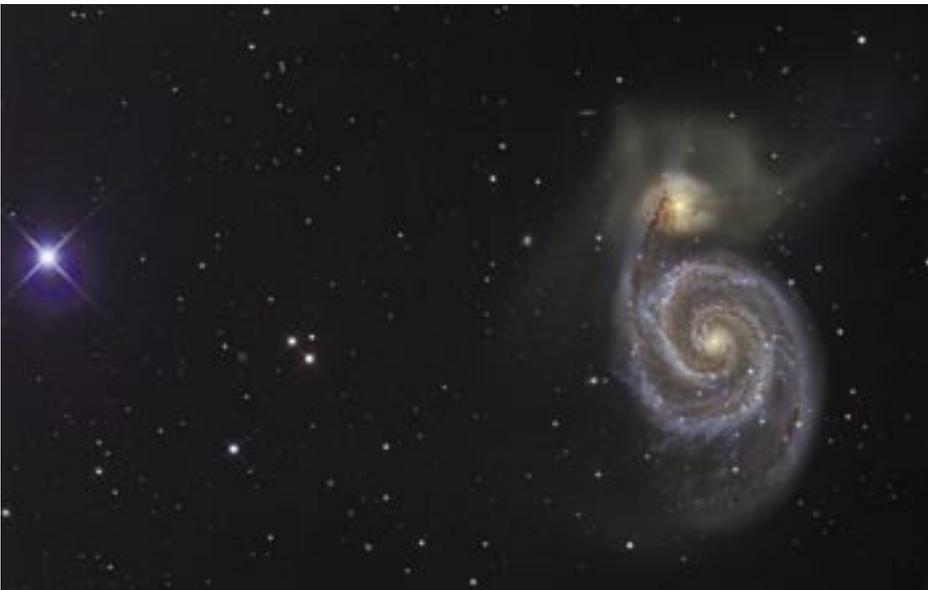
WEDNESDAY, APRIL 26



ARNO PENZIAS
(WIDELY USED
PUBLIC IMAGE)

Before dawn this morning, look for Mercury just slightly south of the Moon! On this date in 1920, the Shaply-Curtis debate occurred on the nature and distance of spiral nebulae. Shaply contended all were part of one huge galaxy - the Milky Way, while Curtis maintained they were distant galaxies. Thirteen years later on the same date, Arno Penzias was born - a Nobel Prize winner for his part in the discovery of cosmic microwave background radiation (CMBR) with a simple horn-shaped antenna. The discovery helped further our understanding of cosmology in ways Shaply and Curtis could have never dreamed!

By 1850, Lord Rosse had used the 72 inch speculum-mirrored “Leviathon at Parsontown” (Birr Castle, Ireland) to catalogue fourteen previously indecipherable glowing clouds in deep space as “spiral nebulae.” The first resolved was originally a discovery of Messier - found while chasing a comet on the night of October 13, 1773. That discovery, M51, had to wait 72 years until large



M51 (FEATURING
SUPERNOVA 2005CS)
CREDIT: R. JAY GABANY

reflecting telescopes unveiled its spiral form. It would take another 75 years before M51’s extragalactic nature became an indisputable fact! Even mid-sized scopes can see M51 - the Whirlpool Galaxy - as a “Grand Spiral.” Tonight see what Rosse saw for yourself.

Start in Ursa Major by locating Mizar (Zeta) and Alkaid (Eta), then rotate the line between them 90 degrees south using Eta as the pivot. With the line oriented to the

southwest, cut it in half. With good conditions and a mid-sized scope, you can be initiated into the mystery of the spiral nebulae - nebulae whose individual stars had to await the development of very large professional scopes and long-exposure photography to reveal their stellar nature.

THURSDAY, APRIL 27

Tonight is New Moon and a great time to “go deep!”

Start with M87 and fade a degree west for the and neighboring M86. These two massive galaxies can be revealed with almost any optical aid. They appear as a matched set of isolated ellipticals - but on an exceptional night, even small scopes will show much more to this region. The western member of the pair – the M84 - appears slightly brighter and visibly smaller than the M86 yet the nucleus of M86 is broader, and less intensely brilliant. In large scopes, these two galaxies “leap” out of the eyepiece even at modest magnifications yet reveal no additional structure.

The most fascinating characteristic of the area becomes apparent when looking around M84 and M86. Within the same low power field, no less than five additional galaxies may be made out in a 6” scope. Forming an easy triangle with the two Messiers, lies southern NGC 4388. At magnitude 11, this edge-on spiral shows a dim star-like core, and reveals classic edge-on structure at double the aperture. In the midst of the triangle formed by the two Messiers and NGC 4388, is 12th magnitude NGC 4387. This dim galaxy will only display a faintly stellar nucleus at mid-aperture, while larger scopes will see a very small face-on spiral with a bright nucleus. Just north of M86 is even dimmer NGC 4402.

Like NGC 4388, NGC 4402 demands higher magnifications for positive identification through modest aperture scopes, and at large power you may notice a dust lane with the central core as a curved “bar” of light.

We’ve now gone as “deep” as we can. East of M86 are two brighter NGC galaxies - 4435 and 4438. Through a 6” scope, NGC 4435 is easily picked out at low power with its simple star-like core and wispy round mantle. NGC 4438 is dim, but even with large aperture elliptical galaxies tend to be rather uninteresting creatures. The beauty of NGC 4435 and 4438 are simply their proximity to each other. NGC 4435 shows true elliptical structure, evenly illuminated and visibly faded toward the edges. But, 4438 is quite a different story! This elliptical is much more elongated. A highly conspicuous wisp of galactic material can be seen stretching back toward the brighter, nearby galaxy pair M84/86.



M84/86:
“FIELD OF DREAMS”
CREDIT: NOAO/AURA/NSF

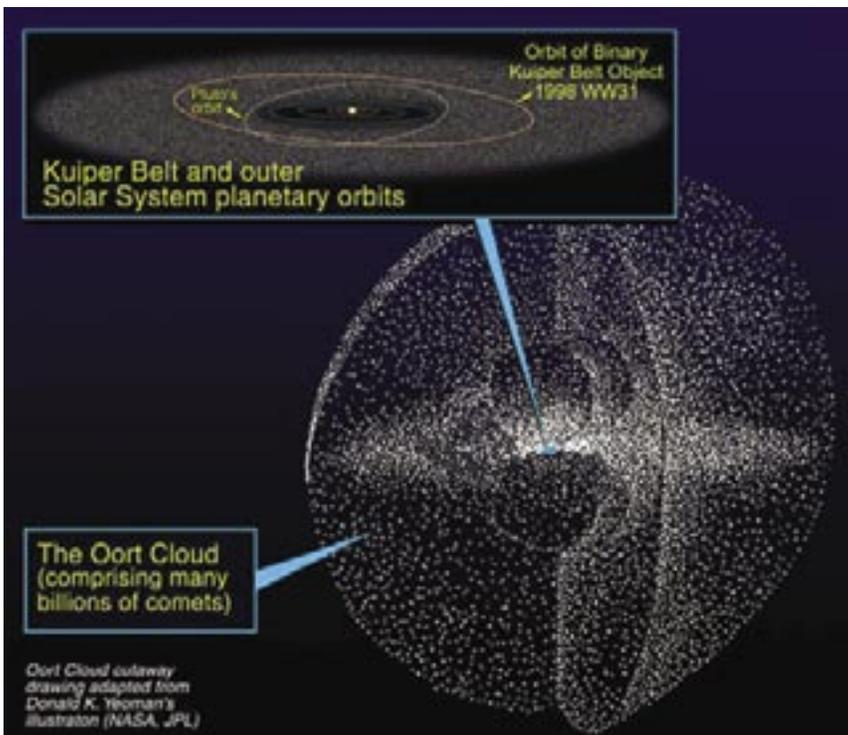
FRIDAY, APRIL 28



JAN HENDRICK OORT
(WIDELY USED
PUBLIC IMAGE)

Today was a busy day in astronomical history. Isaac Newton published his *Principia* in 1686. Newton was an obscure mathematician and early physicist who developed a new form of mathematics to describe planetary motion. In 1774, Francis Baily was born. Baily went on to revise star catalogs and explain the phenomenon now known as “Baily’s Beads” - seen at the start and end of a total solar eclipse. 1900 saw the birth of Jan Hendrick Oort, who quantified the Milky Way’s rotation and envisioned a vast, spherical area of comets outside the solar system now called the Oort Cloud. Today (in 1906) was also the birth date of Bart Jan Bok who studied the structure and dynamics of the Milky Way galaxy and like Oort had a class of objects - Bok Globules - named after him.

And the Milky Way is nowhere to be found! This is the reason we can see so many galaxies during the spring season. The great realm of galaxies we call the “Coma-Virgo Galaxy Cluster” has more in common with our own galaxy than



KUIPER BELT AND
OORT CLOUD ILLUSTRATION
CREDIT: JPL/NASA

simply not being hidden by the vast array of stars, gas, and dust. Our galaxy and its neighbors (making up the “Local Group”) are inexorably being drawn toward this massive assemblage of island universes based on forces first described by Isaac Newton. Yes, we are slipping. Slipping into a vast gravity well whose center is the giant elliptical galaxy M87!

For skywatchers, no equipment is necessary to enjoy the Alpha Bootid meteor shower tonight. Pull up a comfortable seat and face toward orange Arcturus climbing skyward in the east. These slow meteors have a fall rate of

6 to 10 per hour and leave very fine trails, making an evening of quiet contemplation most enjoyable.

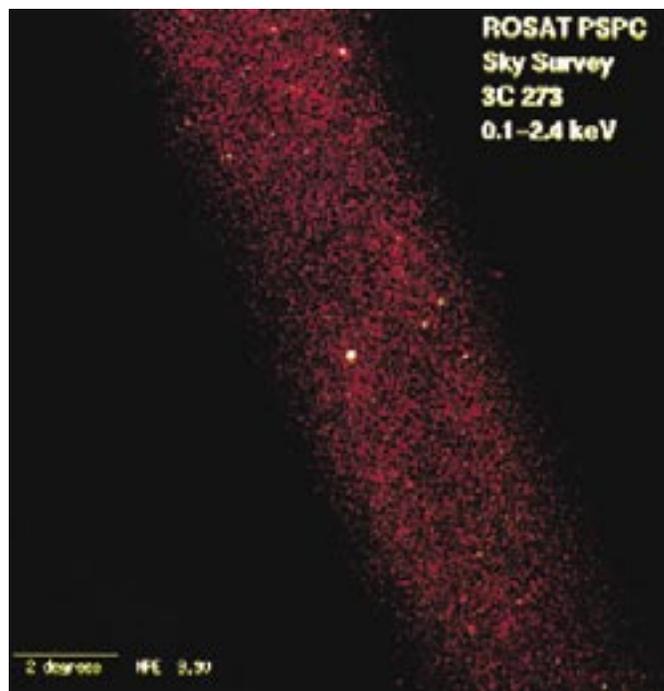
SATURDAY, APRIL 29

Tonight see if you can spot the tender beginnings of the Moon after sunset. Observers take pleasure in sweeping the sky with small scopes and binoculars in hopes of finding the thinnest possible lunar crescent. This technique is also employed to turn up “the inferior planets” - Venus and Mercury. But both planets rise just before the Sun! If you rise early, look for them both about an hour before dawn.

Tonight let's take advantage of dark sky and track down one of the most distant observable studies in the Universe that can be seen in amateur equipment - 2 billion light year distant quasar 3C273. You will need aperture - at least 8" - and a star chart showing the detailed field in which the quasar is located. This study is so distant that we can only see its super-luminous radiant core looking precisely like a faint 13th magnitude blue star!

Start by re-locating M61 and drop 2.5 degrees southeast for the approximate location of a quasar 3c273 - the incredibly luminous core of a brilliant galaxy possessed of a super-supermassive black hole of more than 500 million solar masses. A galaxy whose brilliance is such that it would almost outshine our own Sun were it placed 33 light years (1 parsec) away and outshine all the light of the Milky Way galaxy 100 times over!

To verify 3C273, you will need a detailed star chart. But knowing you're looking at one of the most distant objects an amateur can see makes it worth the hunt!



QUASAR 3C273
CREDIT: NASA

SUNDAY, APRIL 30



CARL FRIEDRICH GAUSS
(WIDELY USED
PUBLIC IMAGE)

Karl Frederich Gauss was born on this day in 1777. Known as the “Prince of Mathematics,” Gauss contributed to the field of astronomy in many ways - from computing asteroid orbits to inventing the heliotrope. Out of Gauss’ many endeavors, he is most recognized for his work in magnetism. We understand the term “gauss” as a magnetic unit - a refrigerator magnet carries about 100 gauss while an average sunspot might go up to a 4000. On the most extreme ends of the magnetic scale, the Earth produces about 0.5 gauss at its poles, while a magnetar can produce as much as 10 to the 15th power in gauss units!

While we cannot directly observe a magnetar, those living in the Southern Hemisphere can view a region of the sky where magnetars are known to exist - the Large Magellanic Cloud. Located in the constellation of Dorado, this unaided eye gem is visible even during full moonlight. It’s stuffed with wonderful features such as the Tarantula Nebula - the largest diffuse nebula known in the Universe. It also holds many star clusters, so get out those telescopes and binoculars and explore for your friends in the northern hemisphere!



THE LARGE MAGELLANIC CLOUD
AND TARANTULA NEBULA
CREDIT: NOAO/AURA/NSF

MAY 2006



<http://www.universetoday.com>

MONDAY, MAY 1



NEREID
(WIDELY USED
PUBLIC IMAGE)

On this day in 1949, Gerard Kuiper discovered Nereid. It's a 150 kilometer diameter satellite of Neptune so distant from the planet that it requires almost one Earth year (360 days) to complete a revolution! At magnitude 18.7, Nereid is beyond direct visual detection by all but the most exotically large amateur scopes. However, it can be "seen" using long exposure CCD image stacking devices hooked to modern personal computers and telescopes equipped for the purpose!

Tonight will mark the peak of the Phi Bootid meteor shower whose radiant is near the constellation Hercules. While the best time to view most meteor showers is around 2:00 a.m. local time, you may have good success watch-

ing for these meteors during the late evening before moonrise. The average fall rate is about 6 per hour.

Did you spot the slender crescent of the Moon at sunset? Be glad it sets early, because tonight we're off to look at a pair of "neighboring" globular clusters - one of which is a real challenge for any mid-sized scope.

To locate this pair, find 4 Alpha Comae which appears a little less than halfway between Arcturus and Denebola. Centering your scope on Alpha at low power. Head northeast about a fingerwidth to reveal M53. In smaller scopes you will see what might be described as a mid-sized, unresolved mass of faintly glowing stars. The very brightest members begin at around magnitude 12.5.



M53
CREDIT: REU
PROGRAM/NOAO/AURA/NSF

Now for the challenge. Slightly less than one degree east-southeast of M53 is a sprawling, faint, loosely constructed globular cluster - NGC 5053. To even get a hint of this 9.8 magnitude, low surface brightness globular definitely requires some aperture and a dark sky!

M53 was first noted by J.E. Bode in February of 1775. Spanning 220 light-years in diameter and around 58,000 light-years from the Earth, it's rapidly approaching us at about 100 kilometers per second. But, don't expect it to arrive any time soon! NGC 5053 is about 4500 light-years closer than M53 - so it really is as faint as it appears to be. The two are definitely neighbors in space and not just a chance alignment.

TUESDAY, MAY 2

For early evening viewers, tonight's Moon provides a great opportunity to visit telescopically with some smaller features located within the fully disclosed Mare Crisium area. Look for two bright mountainous areas near the terminator of on the central western border of Crisium. These two regions include the Olivium and Lavinium Promontoriums. Voyaging across Crisium's smooth floor toward the east, you will see the small punctuations of Craters Picard to the south and Pierce to the north. Try to follow these features over the lunar cycle and see how many nights you can continue to see them.

As the Moon sets, let's have a look at three entirely different type studies around the constellation Corvus the "Crow."

The most recognizable shape of Corvus is an irregular box of visible stars southwest of Spica. The southeastern-most star is Beta Corvi. Look around two finger-width's south for faint star SAO 180965. By aiming your low power scope or large binoculars there, you will find 8.2 magnitude globular cluster M68 to the northeast. The several hundred thousand stars comprising M68 spread out over a region 110 light-years in diameter. Located about 35,000 light-years away, it's a nice challenge.

Now head for the northeast star in the box, and you notice that it's a nice visual pair - Eta and Delta. Around two finger-widths southwest will put you in the area to find planetary nebula NGC 4361. This fairly large, irregular, 10th magnitude planetary has a faint central star surrounded by a "square fuzzy shell" of nebulosity. Notice how it appears to flare outwardly as the eye moves about the field of view. Perhaps there's more to this planetary than meets the eye!

To locate our next study, just head 11 degrees (very slightly more than a fist width) due west of Spica to locate the Sombrero Galaxy - M104. Showing surprising structure through binoculars and small scopes, this 8.3 magnitude, near edge-on spiral is one of the most massive known. Mid-sized scopes should look for M104's large central bulge and extended tightly wound arms. Viewers with large aperture will easily see the dark lane breaking across the galaxy's equator through the bulge of the nucleus.

Be sure to look for a striking "Scorpio-shaped" asterism of equally bright stars just northwest of the mighty "Sombrero!"



M68
CREDIT: NOAO/AURA/NSF



MARE CRISIUM
CREDIT: GREG KONKEL

WEDNESDAY, MAY 3



JUPITER
CREDIT: WES HIGGINS

Tonight the Moon is the prominent sky feature, so why not venture to the surface and visit one of the oldest features left on the visible lunar side? Start by identifying two prominent craters in the southeast quadrant - Metius and Fabricus. While viewing the area around them, note that Fabricus' walls actually intrude on Metius - pointing to a younger age of formation. Around Fabricus, but not including Metius, is the boundary of a mountain-walled plain extending into the terminator. High power will reveal many breaks in its hexagonal walls surrounding a floor marred by many smaller craters and fine fissures. This is Janssen. Look for three prominent interior craters, as well as an ancient rima falling near the shadow's edge. It may not seem exciting, but remember Janssen could go back to the time when the Moon first formed - more than four

billion years ago!

Even under bright skies, we can still study open clusters - right? Well, not really. Have you noticed how few there are in the spring sky? In fact, the ones that can be seen are rapidly dropping off the edge of the world to the west. (Oops, there goes another one!) They are associated with the winter Milky Way. That's why open clusters have another name - "galactic clusters!"

Instead, let's have a look at another interesting subset of things visible in the night sky - galaxies located near bright

stars. For instance, Phecda is the southeastern star in the bowl of the Big Dipper, but look again. If you center on Phecda and look slightly southeast, you will turn up 9.8 magnitude M109, which is over 55 million light-years further away than its "companion" star.

Tonight Jupiter, with its four bright moons and striking cloudtop features, comes into its own as it reaches opposition. Be prepared for whatever sky conditions permit you to see among the many fine features associated with this mirthful member of our solar family!



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THURSDAY, MAY 4

Tonight we'll continue our lunar explorations as we look for the "three ring circus" of easily identified craters - Theophilus, Cyrillus, and Catherina. Are you ready to discover a very conspicuous lunar feature that was never officially named? Cutting its way across Mare Nectaris from Theophilus to shallow crater Beaumont in the south, you'll see a long, thin, bright line. What you are looking at is an example of a lunar dorsa - nothing more than a wrinkle or low ridge. Chances are good that this ridge is just a "wave" in the lava flow that congealed when Mare Nectaris formed. This particular dorsa is quite striking tonight because of low illumination angle. Has it been named? Yes. It is unofficially known as "Dorsa Beaumont," but by whatever name it is called, it remains a distinct feature you'll continue to enjoy!

It's still a bit early to begin viewing Jupiter, so let's look at a double star while we wait for it to gain sky position. Named in honor of King Charles II of England by Astronomer Royal Edmund Halley in 1725, Cor Caroli "the Heart of Charles" (Alpha Canes Venatici) is a splendid example of a bright easily resolved "double of color." At magnitude 2.9, Cor Caroli is best found by moving a little more than a fist width southwest of Eta Ursa Majoris (Alkaid.) Although the pair is not resolvable in low power binoculars, just about any telescope will distinguish between the pale yellow primary and nicely "spaced" blue secondary.

Tonight Jupiter appears some 44.6 arc seconds in diameter - almost twice as large as the planet Mars ever appears from Earth. At its current apparent size, it only takes 40x magnification to make the planet's disk appear the size of the Moon unaided. This magnification will reveal the three main cloudtop features in the planet's atmosphere. Look for the darkly textured northern and southern equatorial belts (NEB & SEB) separated by the bright equatorial zone (EZ). These belts and zone were first seen as early as 1664 and several astronomers including Niccolo Zucchi, Gian Dominico Cassini, Robert Hooke, and Gilles-François Gottigniez are credited with their discovery. This same magnification easily distinguishes the four bright satellites as well. These moons were first reported by Galileo Galilei after a week of observing beginning January 7, 1610.



THEOPHILUS, CYRILLUS
AND CATHERINA ON
THE TERMINATOR WITH
DORSA BEAUMONT
CREDIT: ROGER WARNER

FRIDAY, MAY 5



ALAN SHEPARD AND
FREEDOM 7
CREDIT: NASA

On this date in 1961, Alan Shepard became the first American in “space.” It was only a 15 minute suborbital ride aboard Mercury craft Freedom 7... But what a ride!

For moon watchers tonight, we celebrate 36 years of space exploration as the Apollo 11 landing site now becomes visible. For telescopes and binoculars the landing area will be found near the terminator along the southern edge of Mare Tranquillitatis. For those who would like a real challenge, try spotting small craters Armstrong, Aldrin, and Collins just east of easy craters Sabine and Ritter. No scope? No problem. Find the dark round area on the lunar northeastern limb - Mare Crisium. Then locate the dark area below that - Mare Fecundatatis.

Now look mid-way along the terminator for the dark area that is Mare Tranquillitatis. The bright point west where it joins Mare Nectaris further south is the target for the first men on the Moon.

We were there...

Still up for adventure? What about an observation that happened more than 240 years ago? Like Charles Messier, Johan Hevelius (1611 - 1687) kept a log of things seen while sweeping the night sky using a small telescope. The third object on Hevelius list of 16 “Nebulosae” (designated Hev 1496)

came to the attention of Messier who - based on Hevelius’ description - swept the same part of the sky in an attempt to locate it. Failing to discover anything nebulous in the region, Messier added the one and only double star to his famed list as M40.

Start at Mizar and Alcore, and hop about a finger-width northwest. Look for a pair of 9th magnitude stars separated by 49 arc seconds with the fainter 9.3 magnitude component oriented east-northeast. Try turning high power binoculars toward this pair - it’s just possible you may re-discover Hevelius’ “Nebulosa!”



MARE SERENITATIS
CREDIT: GREG KONKEL



M40
CREDIT: NOAO/AURA/NSF

SATURDAY, MAY 6

Tonight is a wonderful chance for binoculars and small scopes to study the Moon. Craters Aristotle and Eudoxus to the north are easily apparent, along with the Caucasus and Apennine mountain range. Looking for a spectacular lunar feature? Look no further than the Valles Alpes. Known also as the “Alpine Valley,” this deep slash across the northern surface is easily visible and lighting conditions will be just right to explore its 1.5 to 21 kilometer wide, and 177 kilometer long expanse.

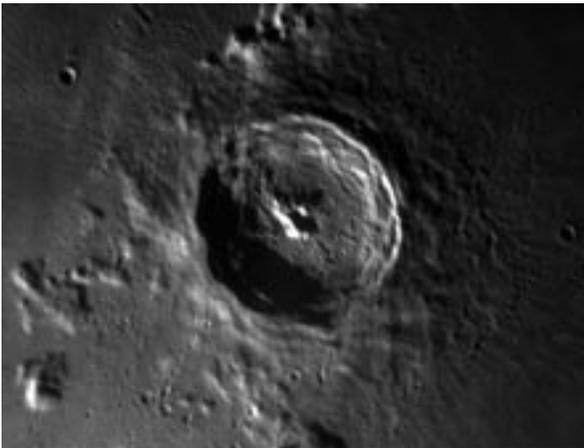
Even with bright moonlit skies, we still have the opportunity to study doubles - so let's head towards Corvus and see if we can collect enough starlight to resolve Delta Corvi. Look for a distant and relatively faint companion!



VALLIS ALPES:
"THE ALPINE VALLEY"
CREDIT: WES HIGGINS

SUNDAY, MAY 7

Tonight, we'll have a look at crater Eratosthenes. Just slightly north of lunar center and on the terminator, this easily spotted feature dangles at the end of the Apennine Mountain range like a yo-yo caught on a string. Its rugged walls and central peaks make for excellent viewing. If you look closely at the mountains northeast of Eratosthenes, you will see the high peak of Mons Wolff. Named for



ERATOSTHENES
CREDIT: DAMIAN PEACH

the Dutch philosopher and mathematician, this outstanding feature reaches 35 kilometers in height. To the southwest of Eratosthenes you may also spot the ruined remains of crater Stadius. Very little is left of its walls and the floor is dotted with small strikes. Near the twin pair of punctuations to its south lie the remains of Surveyor 2!

Two nights ago, Jupiter came as close as it's going to get to Earth. Now let's have a "deeper" look at this giant planet. There's much more to be seen at high power and through stable skies. Wait until Jupiter gains some altitude, then mag-

nify to catch more of those whirling "bands on the run!"

At mid-magnifications the two equatorial belts (NEB and SEB) can be seen flanked by two lesser belts - the North Temperate Belt (NTB) and the South Temperate Belt (STB). These thin and sometimes almost undetectable belts are found at latitudes that move more slowly around the planet's girth than its equator. Like the NEB and SEB, they come about as a combination of condi-



JUPITER
CREDIT: DAMIAN PEACH

tions - winds, temperature, and chemical composition. They gang up to darken the albedo (reflectivity) of different parts of Jupiter's atmosphere under the influence of all the energy unleashed by Jupiter's less than ten hour rotation.

While observing Jupiter's features, keep in mind that you are looking through various depths into its atmosphere. In general, things of a blue tint are deeper than things brown. The reds are highest - just above the whites. Unlike our Earth, most of the energy driving "weather" on Jupiter comes from Jupiter itself - since it emits more heat energy than it receives from the Sun. Of course, there is that "whirling dervish" of a rotational speed - some 45,000 kilometers per hour!

MONDAY, MAY 8

A little more than 35 years ago, the Apollo 13 crew was on a mission to land in the Fra Mauro highlands. Although a near-disaster kept the crew from completing the mission, Apollo 14 carried out the plan less than a year later. Tonight we will be able to see this landing area on the lunar surface. Along the terminator to the south, you will see a dark expanse known as Mare Nubium. On its northern shore and near the terminator's center, you will see an inlet of small shallow craters. The brightest of these small rings is crater Parry with Fra Mauro appearing larger and shallower to its north. Power up! Fra Mauro has a long fissure running between its north and south borders. At the northern crater edge you will see the ruins of an ancient impact. Appearing as an X, it definitely marks the spot of this successful lunar landing.

Tonight let's use binoculars to hunt down a large open cluster - Melotte 111 - northwest of Arcturus. Like other visible clusters such as the Hyades, Pleiades and Praesepe, this Coma Berenices star cluster has a place in history. Known as the "Queen's Hair," it was first noted by Ptolemy. In more recent times, R.J. Trumpler identified 37 stars in Melotte 111 that share common movement. This discovery revealed the Coma Berenices cluster as a true group and not just a random collection.

Satellite observatories, like ESA's Hipparcos, show us the members of Mel 111 are located around 288 light-years distant, making it one of the closest clusters in the heavens. Of the 37 stars identified by Trumpler, the brightest is 4.35 magnitude Gamma and the faintest members range to magnitude 10.5. Of the 400 stars gathered in this region, only about 129 are not true members of the group.



FRA MAURO
CREDIT: WES HIGGINS

TUESDAY, MAY 9

Today in 1962, the first Earth-based laser was aimed at crater Albategnius. While the terminator has moved well beyond its position, you can still pick it out of the jumbled landscape. Look centrally on the lunar surface for the small, heart-shaped, grey area known as Sinus Medii. Just south of it lie a pair of prominent craters, Ptlomaeus to the west and Albategnius to the east.

The Moon will also offer many features such as the fully disclosed Tycho, the incomparable Copernicus and the fascinating Bullialdus, but tonight we'll be looking for "The Great Wall." Start by drawing a mental line from Tycho to Copernicus, then extend that line by two-thirds the distance north. Here you



SINUS MEDII
CREDIT: GREG KONKEL

will discover what looks like huge wall on the lunar surface. At 48 kilometers high and 161 kilometers long, that would be a great wall! It is nothing more than the western portion of the Juras Mountains surrounding the lovely Sinus Iridum, but it's definitely a rather striking feature and well worth the time to look in both binoculars and telescopes. Klare nacht!

Ready for more? How about another unexpected "open" cluster? Then look at Ursa Major. The primary stars - Merak, Phecda, Megrez, Mizar, and Alioth - have their own designation. Known as Collin-

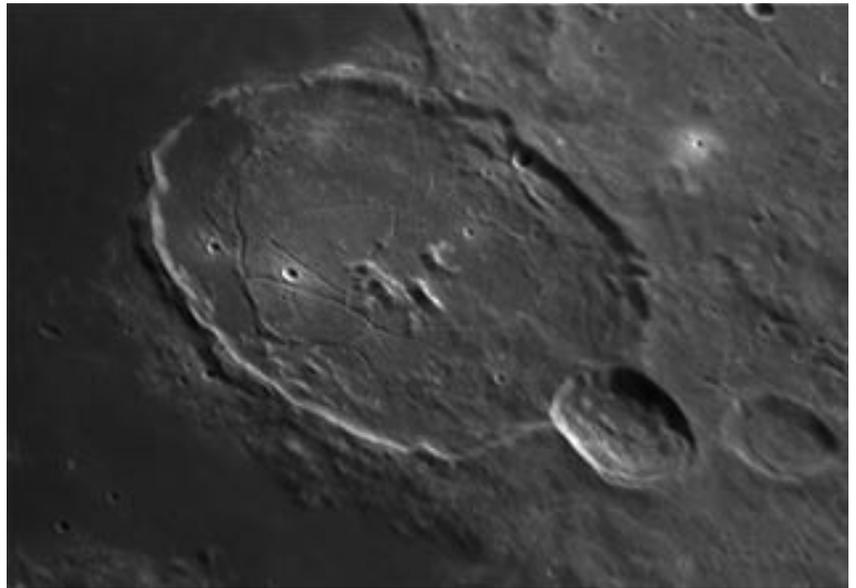
der 285, it was first recognized as a cluster by R.A. Proctor in 1869. The Ursa Major "Moving Cluster" is headed south and east toward a spot in Sagittarius (RA 20:24 and Dec -37). The center of Collinder 285 is located 75 light-years away and its most distant bright member is outlying Alpha Coronae Borealis. The stars in this group are very similar to those in the Hyades - giving a cluster age of roughly 750 million years. Motion studies of over 100 stars throughout the sky (including Sirius, Alpha Ophiuchi, Delta Leonis, and Beta Aurigae) all show a similar "drift" across the heavens at a speed of almost 50 kilometers per second. That's faster than the average speed of Mercury orbiting the Sun!

WEDNESDAY, MAY 10

Tonight bright Spica will join the Moon - making a very close appearance for some - and an occultation for others! Be sure to check IOTA for details. The most prominent lunar feature will be the ancient and graceful Gassendi. Its bright ring stands on the north shore of Mare Humorum - an area about the size of the state of Arkansas. At 113 kilometers in diameter and 2012 meters deep, you will see a triple mountain peak in its center and the south wall eroded by lava flows. Gassendi offers numerous fine details to telescopic observers on its ridge and rille covered floor.

When you have finished your lunar observations, let's revisit a fascinating double star and try a simple experiment. Center your scope on Cor Caroli and watch as the "Heart of Charles" drifts west. The warm yellow primary is a magnetic spectrum variable and the pale blue secondary makes watching this 120

light-year distant pair pure pleasure. Now wait two and a half minutes as widely separated double Struve 1702 comes into view. Now that's finding faint double stars made easy!



GASSENDI
CREDIT: WES HIGGINS

THURSDAY, MAY 11

Tonight's lunar observations will be a challenging study worthy of larger scopes. Start by identifying previous study craters, Hansteen and Billy. Due west of Hansteen you will find a small crater known as Sirsalis near the terminator. It will appear as a small, dark ellipse with a bright west wall along with its twin, Sirsalis B. The feature you will be looking for is the Sirsalis Rille - the longest presently known. Stretching northeast of Sirsalis and extending 459 kilometers

south to the bright rays of Byrgius, this major "crack" in the lunar surface shows several branchings - like a long dry river bed.

Tonight let's go from one navigational extreme to another as viewers in the northern hemisphere try their hand at Polaris. As guide star for the north, Polaris is also a wonderful double with an easily resolved, faint blue companion. But what about the south? Viewers in the southern hemisphere can never see Polaris - is there a matching star for the south? The answer is yes. Sigma Octantis. But at magnitude 5, it doesn't make a very good unaided eye guide.

Ancient navigators found better success with the constellation Crux - better known as the "Southern Cross" - to guide them. Two bright stars of the Southern Cross, Gacrux and Acrux, are oriented north-south and point across the pole to brilliant Archenar. Splitting

the distance between Gacrux and Archenar puts you within two degrees of the rather desolate south pole of the sky. Southern hemisphere observers wishing to see a double star comparable to Polaris in appearance should choose Lambda Centauri. The difference in magnitude between components and separation are about the same.



SOUTHERN CROSS
(PUBLIC IMAGE)

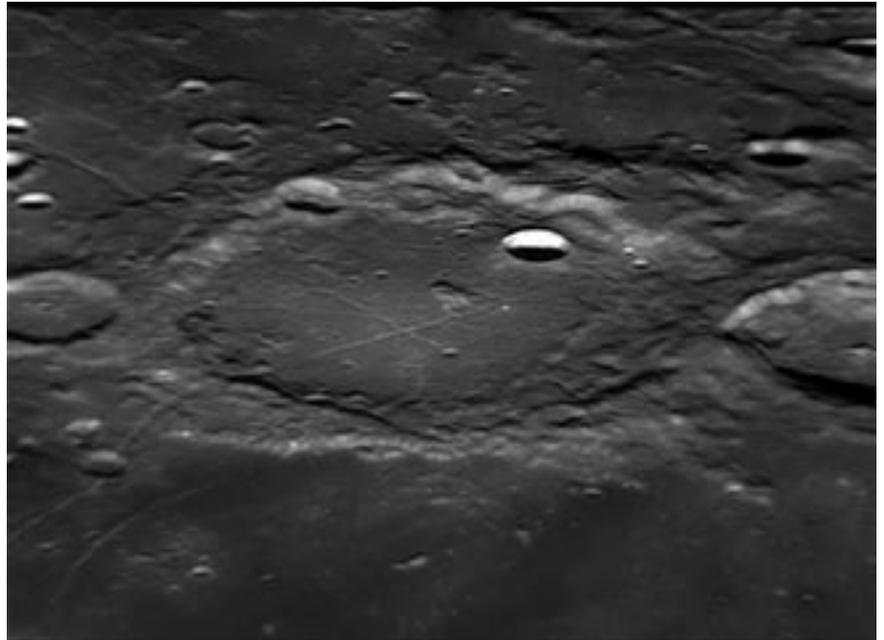
FRIDAY, MAY 12

The Moon and Jupiter rise tonight shortly before the Sun sets. Despite lunar surface brightness, we can do some exploring. Start by identifying the grey oval of Grimaldi central on the western terminator. Just north of Grimaldi is Hevelius. It appears as a bright oval, similar to Grimaldi, but contains an off-center mountain peak. Hevelius' north wall is broken by well defined Cavalerius, a narrow, bright ellipse with thin, black border to the east. 100 kilometers west of Cavalerius on the edge of Oceanus Procellarum are the remains of the very first successful lunar landing. It was here on February 3, 1966 that the Soviet probe Luna 9 touched down. The man-sized craft sent back panoramic television images revealing an uneven, jagged surface covered with dust. So good were the probe's images, that scientists were able to discern small depressions and protrusions only millimeters in size.

While we're out, let's take a look at bright Spica - Alpha Virginis. Located 262 light-years away, 1.0 magnitude Spica glows with the combined light of

four unresolved stars and has a visual luminosity 2100 times that of the Sun. As a rotating ellipsoidal variable, the four stars cause complex changes in luminosity by distorting the shape of the brightest components.

The dominant star - Spica A - has a mass 11 times that of the Sun and fluctuates in physical size as it varies in brightness. The primary star is at maximum when smallest, giving it the highest photospheric surface temperature. Spica B has a mass of 7 suns. As a spectral type B, these two components produce more light in ultraviolet due to exceedingly high surface temperatures. Spica has two distant telescopic companions - magnitude 12 to the north-northeast, and magnitude 10.5 to the east-northeast.



HEVELIUS
CREDIT: DAMIAN PEACH

SATURDAY, MAY 13

Tonight is Full Moon. By May in most areas, flowers are everywhere, so it's not hard to imagine how this came to be known as the "Full Flower Moon." Since northern hemisphere Earth is re-awakening after the winter season, the agricultural cycle has begun and this is also known as the "Full Corn Planting Moon." Another name? The "Milk Moon" due to the increased productivity from cows grazing on the rapidly greening pastures. No matter what you call it, the Moon

still rises majestically upward from the eastern horizon!

Just because we have a full Moon doesn't mean we can't have any fun. Tonight let's explore the star in the middle of the handle of the "Big Dipper." Its name is Mizar, but if you have exceptional eyes you may also see its companion Alcor as well! The ancient Arabs used this star as an "eye test" for warriors - if you could see both stars, you were given a horse. The names Mizar and Alcor literally trans-



FULL MOON WITH HALO
CREDIT: STEVE MANDEL

late to "the horse and rider." If it's not clear to you, even the slightest optical aid will separate the two, but a treat is in store for telescope users. Mizar itself is a double star. It was the very first to be discovered and photographed. In the eyepiece, Alcor appears to the east of Mizar A and B, but look for a faint star in between. It has the very impressive name of Sidus Ludovicianum and was once believed to be a planet.

SUNDAY, MAY 14

With just a little time to spare tonight before lunacy, let's take a look at the fine double star - Epsilon Bootes. At magnitude 2.7, Izar is easily located a fist width north-northeast of brilliant Arcturus. A "test double" for small scopes, the real limiting factor to resolving this disparate pair is the stability of the night sky. Look for the blue 5.1 magnitude companion 2.6 arc seconds north-northwest of the yellow-orange 2.7 magnitude primary.



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MONDAY, MAY 15



ABBE NICHOLAS
DE LACAILLE
(WIDELY USED
PUBLIC IMAGE)

Today is the birthday of Nicholas Louis de Lacaille. Born in 1731, the French astronomer and mapmaker was the first to describe Earth's bulge at its equator. From 1751 to 1753, he had the great fortune to observe southern skies from the Cape of Good Hope. Putting his cartography skills to use, he mapped the southern skies and established the 14 constellations that remain in use to this day. Using a small half-inch spyglass telescope he discovered a number of "nebulosae" - some of which prompted Charles Messier to explore the southern reaches of Sagittarius from his northern locale.

While we have a short time before the Moon rises, let's head towards the stars and revisit the fourth brightest in the sky - Arcturus.

Located some 37 light-years away, the "Watcher of the Bear" was one of the very first stars to be seen during daylight in 1635. It achieved public fame when light from Arcturus activated a photoelectric cell which actuated a relay to turn on floodlights to open Chicago's "Century of Progress" Exposition in 1933. This nearby star was chosen for the honor because the light reaching Earth that night was thought to have left Arcturus during Chicago's 1893 Exposition. Here's to guessing you couldn't see Arcturus once the lights were on....

But keep your lights off and your eyes on the skies as we explore four celestial "neighbors" of Arcturus. About a fist width east, you'll see four stars arranged roughly north/south. The northernmost is 4.6 magnitude Xi - a very pretty double with yellow primary and disparate orange secondary. The next star south is 4.7 magnitude Omicron, followed by 4.9 magnitude Pi to the southwest. Pi is a double with a closely matched magnitude companion trailing it to the east. Keep heading south for Zeta - also close to being a matched set. But, beware... It takes at least a larger scope and high magnification to split this pair!

TUESDAY, MAY 16

With plenty of time before the Moon rises, let's revisit a galaxy very similar to our own Milky Way - NGC 2903. Located less than two degrees south of Lambda Leonis, this magnificent 9.0 magnitude barred spiral can be spotted with binoculars from a dark location, and is easily seen in a small scope.

While NGC 2903's size and central bar closely resemble our own galaxy's structure, the Hubble Space Telescope crossed the 25 million light-year gap and found evidence of young globular clusters in its galactic halo - unlike our own old structures. This widespread star forming region is believed to be attributed to the gravity of the central bar. Small telescopes will show the bar as a lateral concentration across the central structure, while larger apertures will reveal spiral arms and condensed regions of innumerable stars.

Want to try something new? How about the exquisite 9.6 magnitude globular cluster - NGC 5634. Found about half-way between Iota and Mu Virginis and almost due south of Phi, what makes it special is its environs. The little globular shows half its size in smaller scopes, but shares the field with an 8th and a 12th magnitude star. This gives it the appearance of a trinary star system!



NGC 2903
(PUBLIC IMAGE)

WEDNESDAY, MAY 17



ABBE NICHOLAS
DE LACAILLE
(WIDELY USED
PUBLIC IMAGE)

Today in 1835, J. Norman Lockyer was born. While the name might not be widely recognized, Lockyer was the first to note previously unknown absorption lines in the Sun's spectrum while making visual studies in 1868. Little he knew that he had correctly identified the electromagnetic signature of the second most abundant element in the universe - helium - an element not discovered on Earth until 1891! Also known as the "Father of Archeoastronomy," Sir Lockyer was one of the first to note the astronomical nature of ancient structures such as Stonehenge and the Egyptian pyramids.

If you would like to see a helium rich star, look no further tonight than Alpha Virginis - Spica.

Also on this day in 1882, a sun-grazing comet was discovered on photographs of the solar corona taken during a total solar eclipse - but the mysterious comet has not been seen since.

THURSDAY, MAY 18

Before the Moon rises tonight, let's locate Iota Centauri - another "bright star and galaxy" view. NGC 5102 is a 9.7 magnitude lenticular galaxy which displays a brilliant core. The core region is about all you will see with a 2.9 magnitude star so nearby! A challenge? You bet...

On this day in 1910, Comet Halley transited the Sun, but could not be detected visually. Since the beginning of astronomical observation, transits, eclipses and occultations have provided some very accurate determinations of size. Since Comet Halley could not be spotted against the solar surface, we learned almost a century ago that a cometary nucleus had to be smaller than 100 kilometers in diameter.

Would you like to get a grasp on that concept? Wait until the Moon rises tonight and revisit the most prominent crater of all - Copernicus. In a study done by Shoemaker, this ancient crater was proven to be formed by a gigantic impact. Feature after feature so closely resembles geological impact craters on Earth, that we can say with complete certainty this crater was formed by a large meteoritic body. And just how large is crater Copernicus? Oh, about the size of a certain famous comet's nucleus - 100 kilometers...

Now let's head for Omega Centauri. At magnitude 3.7, NGC 5139 is one of the few studies in the night sky receiving a Greek letter despite being decidedly "unstarlike!"

Recorded by Ptolemy as a star, given the designation "Omega" by Bayer, and first noted as non-stellar by Edmond Halley in 1677, J.L.E. Dreyer went on to add three exclamation marks (!!!) to his abbreviated description after including it as entry 5139 in the 1888 New General Catalogue. As the largest globular cluster in our own galaxy, this 5 million solar mass "star of stars" contains more matter than Sagittarius A - the supermassive black hole on which the Milky Way pivots. Omega's mass is greater than some dwarf galaxies. Of the more than thirty galaxies associated with our Local Group, only the Great Andromeda possesses a globular (G1) brighter than Omega!



COMET HALLEY'S
NUCLEUS
CREDIT: NASA



COPERNICUS IMPACT AREA
CREDIT: ROGER WARNER



<http://www.universetoday.com>

FRIDAY, MAY 19

Tonight let's begin by locating the constellation Canes Venatici as we pick out the "Sunflower Galaxy" - M63. Located about a fist width southwest of M51, you can sometimes spot it by scanning the area midway between Alkaid and Cor Caroli.

Originally discovered in 1779 by Méchain, bright M63 is located about 37 million light-years away and believed to be part of a group of galaxies including



M51. To binoculars, M63 appears as a faint misty oval, but larger scopes will reveal the galaxy's spiral arms as a grainy background - brightening considerably towards the center. The most interesting feature of M63 is its arm structure. Most typical spiral galaxies contain two or three distinct arms, yet this structure is multiple - showing short spiral arcs reminding many observers of a "celestial flower." Studies of M63 reveal that the ga-

M63
CREDIT: STEVE MANDEL

lactic material at the edges of these arms is moving much faster than normal. Given the amount of visible matter, this additional rotational velocity indicates the presence of significant amounts of dark matter in its overall structure.

If you're in the mood for a challenge, why not try faint globular cluster - NGC 5466. Located in Bootes, NGC 5466 gives a splendid view in larger scopes. - showing a "pin-cushiony" distribution of its fainter stars. Small instruments might be able to pick this one up on a dark night. The cluster is 52 million light-years away - a value very similar to that of M53 and neighboring globular cluster NGC 5053. To locate NGC 5466, start at M3, about halfway between Arcturus and Cor Caroli. Head due east about five degrees past a lone 6th magnitude star.

SATURDAY, MAY 20

Early evening dark means a good time to look for “the Owl and the Edge-On.”

Start with Beta Ursae Majoris - southwestern star of the Big Dipper. About a finger-width between it and Phecda to the southeast, you'll catch the 10.1 magnitude Edge-On galaxy first seen by Pierre Méchain on February 19, 1781. Although it was later verified by Charles Messier, it didn't formally enter the Messier catalog until 1953 when Owen Gingerich entered it. Despite being faint, M108 contrasts well on a good dark night sky and larger scopes will make out irregular patches of detail.

Less than a finger-width further southeast, you'll spot M97 - the Owl Nebula. But let's ask a tough question: Which came first, the Owl or the Edge-On? According to Owen Gingerich's research, the Owl (M97) was discovered by Pierre Méchain three days earlier than the Edge-On - and what an accomplishment that was! Many observers cite M97 as one of the most difficult of the Messier studies to detect - especially through the kind of contrast-robbing skies found near larger cities. Pollution!

The “Owl” gets its name for the vague gray-greenness of its light, and the two curious voids visible through larger scopes. These voids are thought to be the result of looking at a globe of nebulosity whose lowest-density poles lie at an oblique angle to our line of sight. The material making up M97 and the light causing it to glow are associated with a high surface temperature central star in the last stages of life. At the center of M97 is a faint 16th magnitude dying star.

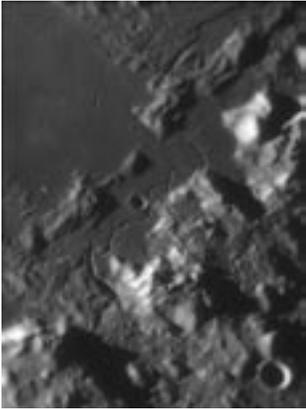


M97
CREDIT: NOAO/AURA/NSF



M108
CREDIT: NOAO/AURA/NSF

SUNDAY, MAY 21



MONS HADLEY
AND HADLEY RILLE
CREDIT: WES HIGGINS

Are you ready for something new? Then let's start by locating the two northernmost stars of the Big Dipper - Dubhe and Megrez. Now imagine that these two bright stars are the base of a pyramid. Use lowest power and center at the apex of this pyramid to the north. There you will see a fine, mid-sized spiral galaxy - NGC 4125. Average scopes will see a stellar nucleus in the 9.8 magnitude structure, along with an expansive core region and faint spiral extensions. A "Missed-Messier" perhaps? You bet!

Something old? Return to Omega Centauri and the 7.0 magnitude, almost incomprehensibly structured galaxy NGC 5128. It's otherwise known as radio-source Centaurus A! NGC 5128 is easily found halfway between Omega and Iota Centauri.

And now for Moon rise...

In 1961, United States President John F. Kennedy launched the country on a journey to the Moon as he made one of his most famous speeches to

Congress: "I believe this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the Moon and returning him safely to Earth. No single space project in this period will be more impressive to mankind or more important for the long-range exploration of space..."

While the Apollo 11 landing site is hidden behind the terminator tonight, it is still possible to see another - that of Apollo 15. Locate previous northern study crater Plato and look due south past the isolated Spitzbergen Mountains to comparably-sized Archimedes.

Spend a few moments enjoying Archimedes' well-etched terraced walls and textured bright floor. Then look east look for the twin punctuations of Aristillus and the more northern Autolycus. South of Aristillus note the heart-shape of Paulus Putredinus. There you will see Mons Hadley very well highlighted and alone on its northeastern bank. Power up to see that the Mons Hadley area includes a cove known as the Hadley Delta, and there on that plain just north of the brilliant mountain peak is where Apollo 15 touched down.

Be aware that Uranus is also very nearby and will be occulted by the Moon! Check IOTA for specifics in your area.



NGC 5128
(PUBLIC IMAGE)



<http://www.universetoday.com>

MONDAY, MAY 22

Tonight would be a great opportunity to do some binocular hunting. Starting at Regulus, see how many faint galaxies you can spot about a fist width due east. Among the brightest will be M105, M95 and M96. Another fist width east will take you just below Theta Leonis for the must easier M65 and M66.

Now return to Regulus. About a thumb's length to the west-southwest you will spot dim R Leonis - a Mira-type variable. Discovered in 1782 by J.A. Koch, this awesome star moves from magnitude 4.4 to 11.0 magnitude in less than a year. As one of the earliest discovered, you will find it a ruby red color that goes to deep purple during its cycle. A true gem!



M65 AND M66
(PUBLIC IMAGE)

TUESDAY, MAY 23

Tonight we move on to small telescope studies as we begin at Beta Leonis (Denebola) and look about a hand span west-southwest for Epsilon Virginis (Vindemiatrix). Almost directly between them is the most heavily galaxy populated portion of the sky for a small scope!

About three finger-widths west of Epsilon, you will find M59 and M60 with M58 just a breath further west. At low power, shifting northwest one field of view will bring you to M89 and then go northeast another field for M90. Return to M89 and go less than two fields away for M87. Two fields north will bring you to M88, while one east will help you find M91.

If you get lost, don't worry. One of the most beautiful experiences in Virgo is to simply enjoy all you can see!



M58
CREDIT: NOAO/AURA/NSF



M59
CREDIT: NOAO/AURA/NSF



M60
CREDIT: NOAO/AURA/NSF

WEDNESDAY, MAY 24

Be sure to check the sky this morning as brilliant Venus and the Moon have a scenic encounter.

Tonight we'll head into larger scope territory as we explore the area around the galactic pole and star 31 Comae.

As a known member of Melotte 111, 31 Comae is an eclipsing variable star with a faint companion. Begin by centering on 31, and move south a little more than two degrees for a large, 9.2 magnitude spiral galaxy - NGC 4725. Encircled by a halo, this study contains a luminous oval nucleus. A little more than 3 degrees west-northwest will bring you to the spectacular NGC 4565. This large, slender, edge-on presentation is an easy 9.6 magnitude which shows a dark dust lane.

Now shift NGC 4564 a little more than a degree east to view the small, 9.9 magnitude elliptical galaxy - NGC 4494. Return to NGC 4564 and move two degrees north for NGC 4559. This large, 9.9 magnitude, tilted spiral will show a multi-armed structure and some patchiness to its detail. To complete the tour, four degrees east again and you'll find yourself back at 31 Comae!



"THE MOON AND VENUS"
CREDIT: CHIARA RIEDO
AND SIMONE BOLZONI



<http://www.universetoday.com>

THURSDAY, MAY 25



M44
CREDIT: NOAO/AURA/NSF

Has Gemini gained another twin? No. It's just Mars south of Pollux.

Tonight, let's try a series of challenges designed to intrigue all SkyWatchers. For visual observers, your goal is just east of Saturn. Allow your eyes plenty of time to dark adapt and seek out a large hazy patch of barely visible stars. Congratulations! You've just spotted M44 and seen the light - light that left the cluster in the year 1480!

For binoculars, look a fist width west of bright Spica and you'll pick up M104. Its light came from 400 million years ago.

For the large telescope, your challenge lies five and a half degrees south of Beta Virginis and one half degree west. Classified as Arp 248, and more commonly known as "Wild's Triplet," these three very small interacting galaxies are a real treat! Best observed using higher magnifications, use wide aversion and try to keep the star just north of the trio at the edge of the field to cut glare. Best of luck!



M104
CREDIT: STEVE MANDEL

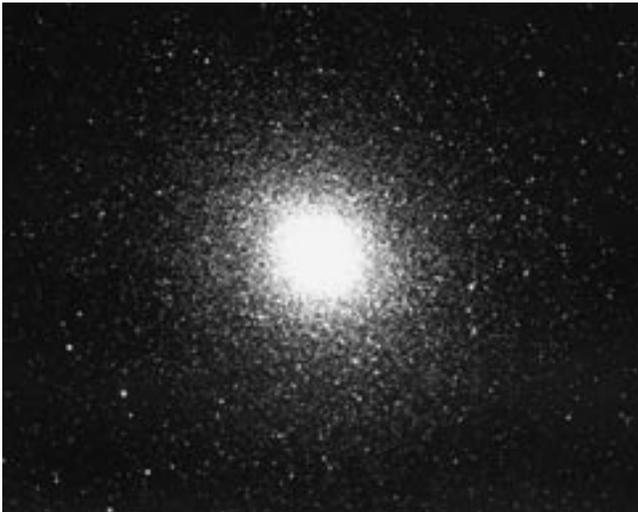
FRIDAY, MAY 26

This evening we're going to have a look at two of the finest globular clusters for the northern hemisphere. Entering the middle third of the sky to the northeast is everyone's favorite and champion of the overhead sky - the Great Hercules Cluster - M13. Just grazing the sky's middle third to the south-southeast is the equally spectacular M5 in Serpens.

At magnitude 5.8, M5 is only slightly brighter cumulatively than M13 and is also just slightly larger. With good reason...It's 600 light-years closer.

Now let's go locate each of them. M13 is easily found just one-third the way between Eta and Zeta Herculis along the western flank of the Keystone. To locate M5, you'll find it slightly northeast of 5 Serpens.

Which gives the better view? Well leave the decision to you!



M5

CREDIT: NOAO/AURA/NSF



M13

CREDIT: NOAO/AURA/NSF

SATURDAY, MAY 27

Tonight is New Moon Saturday and many observers will be packing their scopes up and heading for dark skies. Many will enjoy the camaraderie of other amateurs - plus opportunities to look through different equipment and discover entirely new night sky favorites. If you're on your own, keep this in mind: the



THE SKY AT
NIGHT STAR PARTY"
CREDIT: DAMIAN PEACH

best locations for observing will be far from city lights, at higher altitudes, and hampered by little foliage - especially to the south where studies sometimes only barely manage to clear the trees before they're gone again. Since most star parties are held at well-selected locations, a lot of the work has already been done for you!

For observers below 40 degrees north latitude, one study will be on everyone's list tonight - the incomparable Omega Centauri! To see it, you simply must have a clear view of the hori-

zontal to the south and begin looking for it well south of Spica as soon as it starts to get reasonably dark out. Don't expect much of a view from the northern hemisphere. Omega may look no better than a large unresolved misty glow. But you just have to look anyway!



OMEGA CENTAURI
CREDIT: NOAO/AURA/NSF

Even before that peek at Omega, Jupiter will dominate the sky to the south - so arrive early and set up just after sunset. Within a half hour you will see the planet culminating south. Once you've had that first look at Jupiter, you might want to look west toward Gemini and say goodbye to Mars and Saturn. If the seeing is really good, you will probably want to spend some quality time with Jupiter throughout the evening. One thing to watch for, the strikingly high contrast and well-defined shadow of a Galilean as it transits Jupiter's atmosphere.

After Omega Centauri and the planets, the sky's the limit!

SUNDAY, MAY 28

On this day in 1959, the first primates made it to space. Abel (a rhesus monkey) and Baker (a squirrel monkey) lifted off in the nose cone of an Army Jupiter missile and were carried aloft into sub-orbital flight. Recovered unharmed, Abel died just three days later from anesthesia during an electrode removal, but Baker lived on to the ripe old age of 27.



ABEL AND BAKER
CREDIT: NASA

Tonight let's monkey around with the stars as we climb into the canopy of the heavens towards 7.7 magnitude M101!

The sprawling nature of this face-on spiral means that the light of an 8th magnitude star has to be spread very thin to cover all that celestial terrain. Its 10th magnitude core region allowed Pierre Méchain to view it on March 27, 1781. This inclusion was the last published entry in Charles Messier's catalog. Meanwhile William Parsons (Lord Rosse), described M101 as "Large, spiral, faintish; several arms and knots. 14' diameter at least." - a description comparable to what is seen through the largest backyard telescopes used today.



At a distance of 27 million light-years, the true size of M101 is extraordinary - some 170,000 light-years in diameter. Its total luminosity is equivalent to over 30 billion suns. Even as large as this galaxy is, it merely approaches the size of the Milky Way!

M101
GEORGE JACOBY, BRUCE
BOHANNON AND MARK
HANNAH/NOAO/AURA/NSF

MONDAY, MAY 29

Today in 1919, a total eclipse of the Sun occurred and stellar measurements taken along the limb agreed with predictions based on Einstein's General Relativity theory - a first! Although we call it gravity, the space-time curve deflects the light of stars near the limb, causing their apparent position to differ slightly. Unlike today's astronomy, at that time you could only



M83
CREDIT: BILL SCHOENIG/
NOAO/AURA/NSF

observe stars near the Sun's limb (less than an arc second) during an eclipse. It's interesting to note that even Newton had his own theories on light and gravitation which also predicted deflection!

With tonight's thin moon setting early, let's have a look at the superb "Southern Pinwheel" galaxy - M83. You'll find it a little more than a fist width south-southeast of Gamma Hydrae.

Pictures of M83 are often used to show budding astronomers what our own galaxy would look like if it were "out there" rather

than "all around us." In astrophotos, M83 shows a luminous central core with two broad bars of almost equally intense light extending outward across from one another. These act as trunks for the gnarled growth of the galaxy's main spiral arms. Well away from the core, three spiral extensions are seen coiling outward to ultimately dissipate into space. But, that's where the comparison with our own galaxy ends. This 15 million light-year distant, 30,000 light-year diameter class SB spiral is but a miniature of our giant spiral!

As you observe M83 tonight take the time to look for the structure described above - the round central core region, lateral bars, and spiraling extensions. More aperture means more light, and more detail.

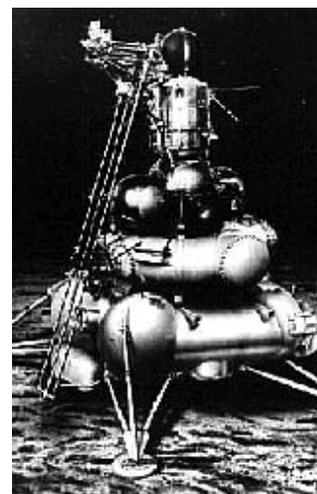
Something new? First re-locate M5 in Serpens then head 3 degrees west. There you will find the brightest galaxy (NGC 5846) of a half dozen or so clustered around 4.6 magnitude 110 Virginis. These include NGCs 5850, 5831, 5838, 5854, 5813, and NGC 5806. These seven galaxies range in magnitude from 10.2 to 11.8 - and all are within the range of a mid-size scope.

TUESDAY, MAY 30

Tonight we'll begin our studies by checking out the slender crescent of the Moon. To the north you will see the eastern edge of Mare Crisium beginning to emerge. The bright point on the shoreline is Promontorium Agarum with shallow crater Condorcet to its east. Look along the shore of the mare for a mountain to the south known as Mons Usov. Just to its north Luna 24 landed and directly to its west are the remains of Luna 15. Can you spot tiny crater Fahrenheit nearby?

Once the Moon has set, let's revisit a spectacular globular cluster well suited to all instruments - M5. To find M5 easily, head southeast of Arcturus and north of Beta Librae and identify 5 Serpentis. At low power, or in binoculars, you will see this handsome globular in the same field to the northwest.

First discovered while observing a comet by Gottfried Kirch and his wife in 1702, Charles Messier found it on his own on May 23, 1764. Although Messier said it was a round nebula that "doesn't contain any stars," even small scopes can resolve the curved patterns of stars that extend from M5's bright nucleus. Binoculars will reveal it with ease. For a real challenge, large telescopes can look for 11.8 magnitude globular Palomar 5 about 40' south of the star 4 Serpentis. Under very dark, clear skies, M5 can just be glimpsed unaided, but telescopes will enjoy the rose-petal like star arcs of this 13 billion year old city of stars.



LUNA 24
CREDIT: NASA



M5
CREDIT: HILLARY MATHIS/
REU PROGRAM/NOAO/
AURA/NSF

WEDNESDAY, MAY 31

Be very sure to check with IOTA for an awesome event on this Universal Time date. Why? Asteroid Vesta will be occulted by the Moon!

Tonight let's return to Mare Crisium and look for some challenging features. Beginning on the south shore of Crisium, start by identifying crater Shaply trapped on the edge of the mare's enclosure. To the southeast of Shaply you will see



MARE CRISIUM
CREDIT: SIMONE BOLZONI

two small grey ovals. The northernmost is crater Firmicus with crater Apollonius to its south. Further south you will see the smooth grey area of Sinus Successus. If you look at the paler peninsula on Successus' northern shore, you are seeing crater Ameghino and the landing area of the Luna 18 and Luna 20 missions.

If you'd like to take on another mission tonight, wait for the Moon to set and head towards Hercules for a high power view of a 9th magnitude planetary nebula - NGC 6210. This small disk won't be easy to separate?? from neighboring stars without magnification. To find NGC 6210, locate Beta and Gamma Herculis. Draw an imaginary line between them and extend it around the same distance to the northeast. Around 6500 light-years away, NGC 6510 is one of the most active planetary nebulae. Hubble Space Telescope (HST) images show powerful hot jets of turbulent gas burrowing through an outer shell of cool gas.

JUNE 2006



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THURSDAY, JUNE 1



M92
CREDIT: HILLARY MATHIS/
REU PROGRAM/NOAO/
AURA/NSF

Tonight let's look on the lunar surface at the junction of Mare Fecunditatis and the edge of Mare Tranquillitatis. Here stands ancient Taruntius. Like a lighthouse guarding the shores, it stands on a mountainous peninsula overlooking the mare. Tonight it appears as a bright ring, but watch in the days ahead as this "lighthouse" shoots its brilliant beams across the desolate landscape nearly 175 kilometers.

To see another brilliant lighthouse, let's head towards northern Hercules for a look at "the other Hercules Cluster" - M92. Discovered on December 27, 1777 by J. E. Bode, magnitude 6.5 M92 radiates with roughly half the brilliance of the Great Hercules Cluster - and this holds true intrinsically as well. About

900 light-years more distant than its famous neighbor, M13, the smaller M92 is still only 5,000 light-years away - "next door."

M92 gives a splendid, well-resolved view in even small scopes. It dissolves into dozens of fainter members arrayed around a nebulous core radiating the combined light of over 150,000 suns. Like all globulars, higher magnification must be used to add contrast and reveal some of its brighter stellar components - especially near the core where this celestial "lighthouse" really gathers them in!



TARUNTIS
CREDIT: DAMIAN PEACH

FRIDAY, JUNE 2

For SkyWatchers tonight, have a look as Regulus is quite near Luna.

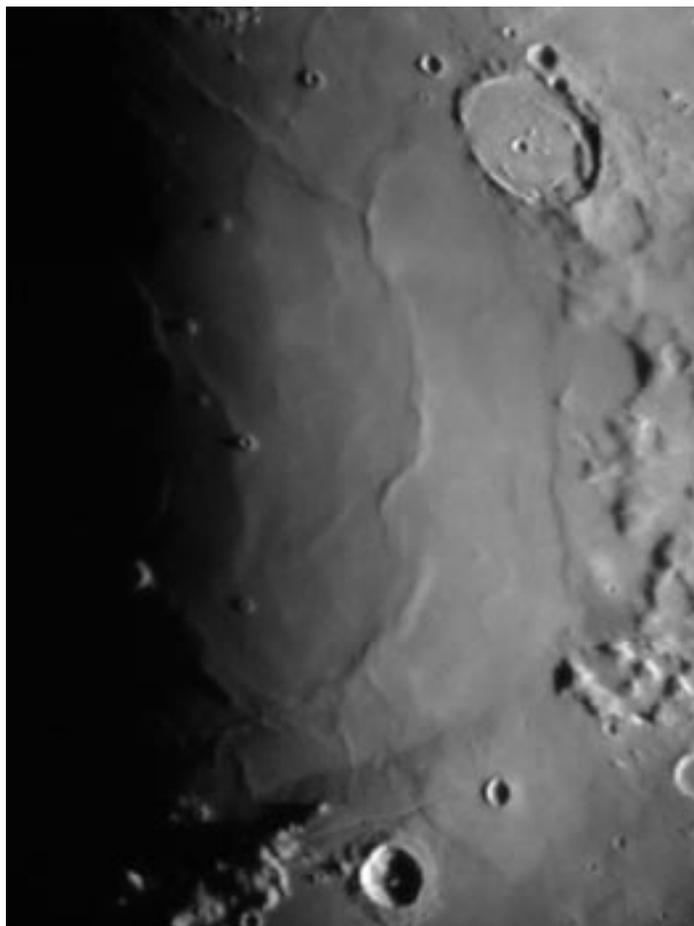
For telescope users, the Moon gives a wonderful opportunity to revisit ancient crater Posidonius. Its 84 kilometer by 98 kilometer expanse is easily seen in the most modest of optical instruments and it offers a wealth of details with its eroded walls and 1768 meter (5800 ft.) central peak. Look for a central crater attended by a fine curve of challenging mountain peaks to its east.

Continue southward from Posidonius along the edge of Mare Serenitatis to catch partially open crater Le Monnier. This ruined ring contains the remains of the Luna 21 mission - forever awaiting salvage in the grey sands along Le Monnier's southern edge.

Even though skies are fairly bright, we can still get an impression of a very distant third globular cluster in Hercules. This one is small and faint - but with reason. NGC 6229 is almost 100,000 light-years away! If it were transported to the distance of M13 or M92 it would shine as bright as the latter and eclipse both in apparent size!

Due to great distance, the brightest stars associated with NGC 6229 are only within reach of large telescopes. This may explain why William Herschel interpreted the faint and slightly condensed glow of NGC 6229 as a planetary nebula when he discovered it May 12, 1787. The surprise of three globulars within the confines of Hercules may also explain why the globular cluster was mistaken as a comet discovery in 1819! Its stellar nature was only first resolved in the mid 1800s by the discoverer of Neptune - Louis d'Arrest.

Despite the Moon, larger scopes can find NGC 6229 between the stars 52 and 42 Hercules, a fist width north of Eta - the northeastern star of the Hercules Keystone.



POSITONUS AND THE
SERPENTINE RIDGE
CREDIT: GREG KONKEL

SATURDAY, JUNE 3

If you're up early, why not keep watch for the peak of the Tau Herculids meteor shower? With a radiant near Corona Borealis, the Earth will encounter this stream for about a month. Sharp-eyed observers can expect about 15 faint

streaks per hour at its maximum.

Although it's furthest from the Earth right now, did you see Selene during daylight today? Spectacular, isn't it. Have you ever wondered if there was any place on the lunar surface that has never seen the light?

Directly in the center of the Moon is a dark floored area known as the Sinus Medii. South of that are two conspicuously large craters - Hipparchus to the north and ancient Albategnius to the south. Trace the terminator toward the south until you almost reach its point



VIEW TOWARDS
THE LUNAR SOUTH POLE
CREDIT: NASA

(cusp.) There you will see a black oval. This normal looking crater with brilliant west wall is ancient crater Curtius. Because of its high latitude, we never see its interior - and neither does the Sun! It is believed that the inner walls are quite steep. Because of this, Curtius' deep interior hasn't seen the light of day since its formation billions of years ago! Locked in perpetual darkness, scientists speculate there may be "lunar ice" inside its many cracks and crevices.

Because our Moon has no atmosphere, the entire surface is exposed to the vacuum of space. When sunlit, the surface reaches up to 385 K. Any exposed ice would immediately evaporate and be lost because the Moon's weak gravity cannot hold it. Frozen matter can only exist on the moon within permanently shadowed areas. Curtius lies near the Moon's south pole. Imaging has shown some 15,000 square kilometers where similar conditions could exist. But where does the "ice" come from? The lunar surface never ceases to be pelted by meteorites - most of which contain water. Many craters are formed by just such impacts. Hidden from sunlight, this frozen material can exist for millions of years!



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SUNDAY, JUNE 4

How about a little lunar “prospecting?” Then let’s explore the northern equivalent to Curtius. Start by locating previous study crater Plato. North of Plato lies a long horizontal area of gray floor - Mare Frigoris. North of Frigoris you will see a “double crater.” This is the elongated diamond shape of Goldschmidt. Cutting across its western border is Anaxagoras. The lunar north pole isn’t far from Goldschmidt, and since Anaxagoras lies about one degree outside of the Moon’s theoretical “arctic” area, the lunar sun will never go high enough to clear the southernmost rim. Such “permanent darkness” must mean there’s ice! And for that very reason, NASA’s Lunar Prospector probe was sent to explore. Did it find what it was looking for? The answer is yes.

The probe discovered vast quantities of cometary ice secreted inside the crater’s depths. What’s the significance? Water is essential to life and its presence influences any plans to establish a base on the lunar surface. Will the sun ever shine on such a base? Quite probably. But down below, in the crater’s depths it never has, and never will...

Tonight let’s look at another distant world as we take another look at Jupiter. You don’t have to wait for the sky to actually get dark to view Jupiter. At magnitude -2.4, Jupiter can easily be found a half-hour after sunset. It won’t be long before it’s gone so enjoy those “Bands on the Run” while they last!



THE LUNAR NORTH POLE
CREDIT: NASA

MONDAY, JUNE 5

- Tonight let's journey to the lunar surface and look at an area just south of crater Eratosthenes known as Sinus Aestuum. Its very smooth floor is curiously riddled to the north and east by dark stains. At one time Sinus Aestuum may have been completely submerged in lava. Later the molten rock sank to the Moon's interior before it could do much more than melt away outer layers and older surface features.



JUPITER
CREDIT: WES HIGGINS

Let's continue to follow Jupiter. One thing you'll notice is this gas giant doesn't stand still. Even 10 minutes of observation reveals a definite drift of features across its globe. This wouldn't be obvious if the entire planet was seen just as a series of light and dark bands running parallel to one another. There must be features on the planet that give observers reason to describe it as presenting "a wealth of detail."

Although the Great Red Spot (GRS) has not been quite so red over the last few decades, it still remains "Great" in size. Almost three Earths could fit inside its length and two along its width! This vast anticyclone of upper atmospheric activity resides along the southern frontier of the South Equatorial Belt (SEB) but is largely embedded within it. Careful observation at higher magnifications shows that the GRS precedes a vast system of turbulence trailing it across the globe.



ERATOSTHENES AND
SINUS AESTUUM
CREDIT: GREG KONKEL

Since Jupiter's day is two-fifths the length of our own, observers will be amazed to see the GRS come and go as the planet alternately presents its various faces. But, the GRS is not the only such spot in Jupiter's turbulent cloud tops. Often great dark masses of far less longevity can be seen to come and go - particularly along, and embedded within, Jupiter's NEB. Along with such dark "barge" formations, various semi-persistent white spots - or ovals - can also be detected. Many of these are seen south of the SEB and some can be detected in the planet's polar region through large aperture scopes.

If you are out late, be sure to keep watch after the Moon sets for the Scorpoid meteor shower. Its radiant is near the constellation of Ophiuchus, and the average fall rate is about 20 per hour - with some fireballs!

TUESDAY, JUNE 6

This evening on the lunar surface, look along the south shore of Mare Nubium. The thin, light ring you encounter will be crater Pitatus. Further south you will discover two mountain-walled plains whose exposed floors will show bright western and dark eastern walls. These twins are Wurzelbauer to the west and Gauricus to the east.

Wouldn't it be nice if a telescope could actually "zoom" you towards anything as though you actually traveled that far? At 200x, Jupiter would hang suspended in space as though it were a little more than 4 million kilometers away. At this distance, the human eye could easily be overwhelmed with the many fine features visible in Jupiter's dynamic cloud tops - especially when you consider that the planet would appear almost 5 times larger than the disk of the full moon!

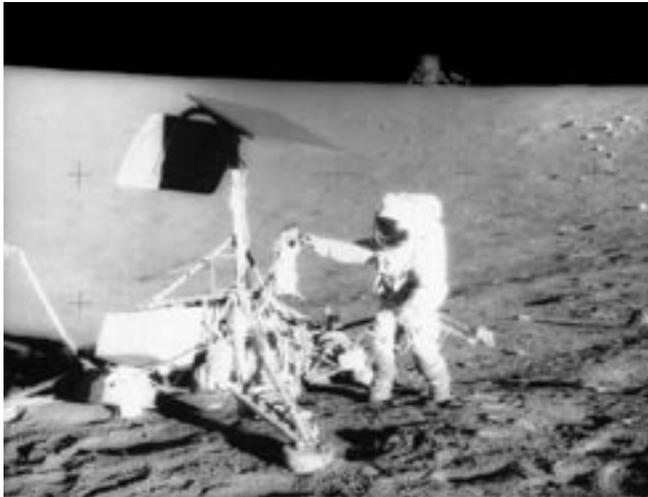
Unfortunately, telescopes don't quite work that way. The Earth's atmosphere rules everything - even aperture - when it comes to what you can see in the night time sky. So observe every night possible and eventually you will get that "once in a lifetime" view of Jupiter!



PITATUS
CREDIT: DAMIAN PEACH

WEDNESDAY, JUNE 7

For late night or early morning SkyWatchers, be alert for the peak of the June Arietid meteor shower during the early morning hours. The radiant is in the constellation Aries and the fall rate is about 30 per hour.



APOLLO 12 MISSION
VISITS SURVEYOR 3
CREDIT: NASA

Most are slow moving with some fireballs.

Begin tonight by looking for bright Spica very close to the Moon. It will be so close that it will be occulted for some observers! Be sure to check with IOTA for more details.

Tonight's lunar feature can be spotted in binoculars, but requires a telescope for detailed study. The Rhiphaeus Mountains can be found southwest of Copernicus. Highlighted by the bright ring of Euclides, the Montes Rhiphaeus show a variety of isolated hills and sharp

peaks which may have been the original crater walls of Mare Cognitum before lava flow filled its floor. Northeast of the range is another smooth floored area on the border of Oceanus Procellarum. It is here that Surveyor 3 landed on April 19, 1967. After bouncing three times, the probe came to rest on a smooth

slope in a sub-telescopic crater. As its on-board television monitors watched, Surveyor 3 deployed a "first of its kind" miniature shovel and dug to a depth of 18 inches. The view of sub-soil material and its clean-cut lines allowed scientists to conclude that the loose lunar soil could compact. Watching Surveyor 3 pound its shovel against the surface, the resulting tiny "dents" answered the crucial question. The surface of a mare would support the landing of a spacecraft and exploration by astronauts.



MONTES RIPHAEUS-
CREDIT: GREG KONKEL

With Jupiter and the Moon so close tonight, why not try some comparison views? Observe Jupiter's details through the telescope and compare what you see visually with the Moon. It gives you new respect for the wonders of lunar observation doesn't it?

THURSDAY, JUNE 8

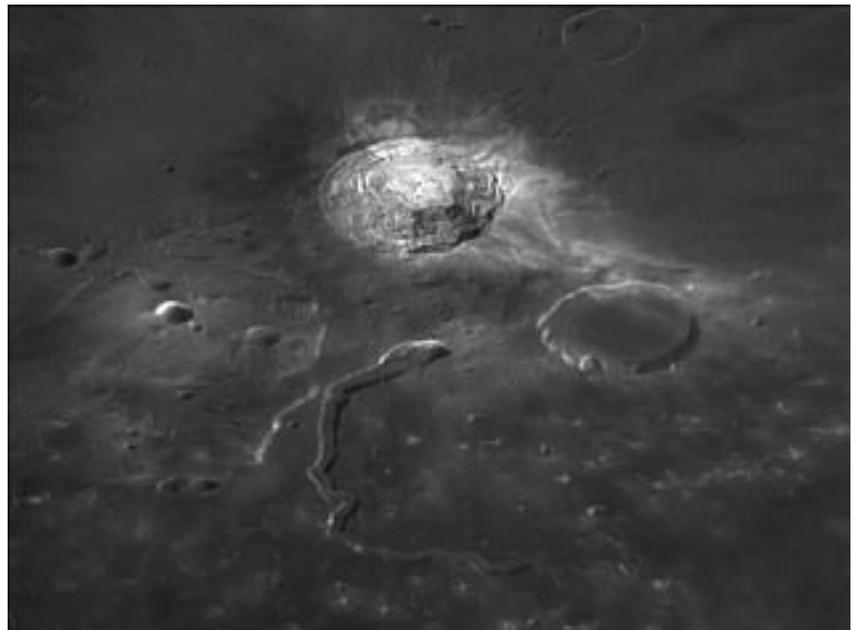
Born on this date in 1625 was the most notable observer after Galileo - Giovanni Cassini. Many of Cassini's discoveries are easily reproduced by amateurs today. He was the first to see belts and spots on Jupiter - allowing him to accurately determine the planet's rapid rotation. Cassini saw features on Mars clearly enough that he could determine its more Earth-like rotation as well. His observations of Saturn led to the discovery of its four brightest satellites. Cassini's accurate records of Galilean transits across Jupiter allowed him to note discrepancies based on variations in the planet's distance from Earth. In fact, Cassini came to think light might travel at a fixed speed! Astronomers particularly remember Cassini for his namesake division in Saturn's ring system. Do you suppose we should name a spacecraft after him? And if so, where should we send it?

The three planets Cassini is most widely noted for observing are still visible in the evening sky. Look southwest for a rapidly setting Mars and Saturn, while Jupiter stands high the south at skydark.

Tonight's lunar feature will be bright Aristarchus. Located on the terminator north of Kepler, this dazzling feature can sometimes be seen unaided and is easily noted in binoculars. For telescopic viewers, Aristarchus offers a splendid challenge - look for a thin, bright thread curling away from it. Named Schroter's Valley, it is a sinuous rille and largest of its kind. It may have once been a lava tube, similar to our own terrestrial volcanic features.



GIOVANNI CASSINI
(WIDELY USED
PUBLIC IMAGE)



VALLES SCHROTERI:
"SCHROTER'S VALLEY"
CREDIT: WES HIGGINS

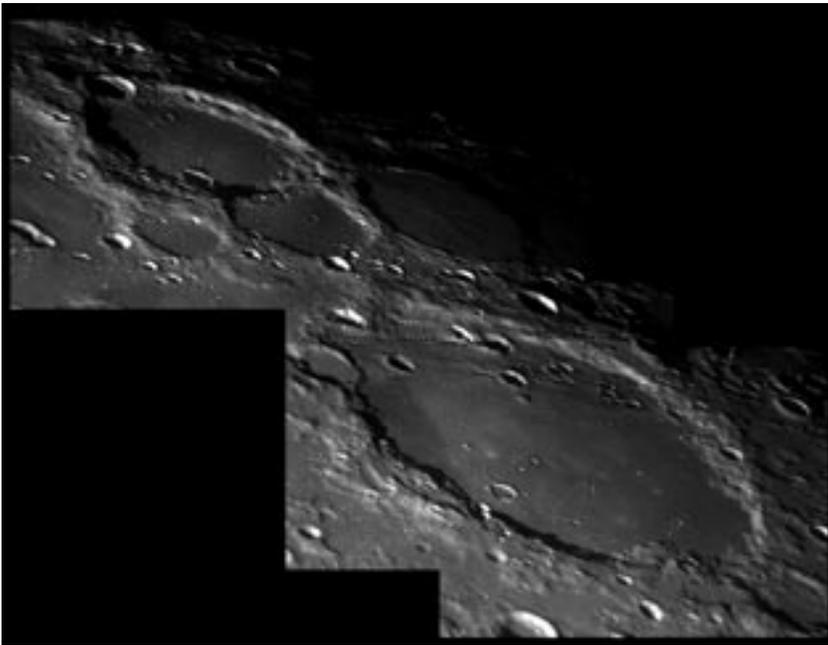
FRIDAY, JUNE 9



JOHANN GALLE
CREDIT: DEUSCHES
MUSEUM

Today is the birthday of Johann Gottfried Galle. Born in Germany in 1812, Galle, along with d'Arrest, shared the distinction of discovering Neptune. This was based on calculations by Le Verrier predicting its expected position. Galle was Encke's assistant at the Wilhelm Foerster Observatory in Berlin and became the first to see the faint "dusky ring" (Ring C) of Saturn. Galle was also one of the few astronomers ever to have seen Halley's Comet twice. He died two months after the comet passed perihelion in 1910, at a ripe old age of 98.

Want to practice some astronomy during the day? Then grab an FM radio and enjoy the "static" as we enter a cometary debris trail and some of the strongest daytime radio meteor showers of the year. To listen to the action, all you need is an external antenna. Tune the receiver to the lowest frequency not producing a clear signal. Each time a meteor passes through our atmosphere, it leaves an ion trail that bounces back distant radio signals to you - even in



SCHICKARD, NASMYTH,
WARGENTIN AND PHOCYLES
CREDIT: DAMIAN PEACH

a stationary car! Listen to the static for a quick rise in volume or a snatch of a distant station that lasts a second or two then fades back to static.

Tonight's highlighted lunar feature can be seen in binoculars but is best viewed telescopically. Located in the southwest quadrant on the terminator just south of Shickard, crater Wargentín is most unique. Once upon a time, it was a very normal crater and remained that way for hundreds of millions of years - then it happened: either an interior fissure opened up, or the impact that originally formed it caused molten lava to seep slowly upward. Oddly enough, Wargentín's walls lacked large enough breaks to allow the lava to escape and it eventually filled the crater to the rim. Often referred to as "the Cheese," enjoy Wargentín tonight for its unusual appearance.



UNIVERSE TODAY

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SATURDAY, JUNE 10

Begin your observations this evening by noting how close Antares is to the Moon. For some very lucky viewers, this means an occultation. Be sure to check IOTA for times and details in your area. You won't want to miss this event...

Meanwhile on the surface, tonight's lunar feature will be crater Galileo. It is a supreme challenge for binoculars to spot, but telescopes of any size at higher magnifications will easily reveal it perched on the terminator in the west-northwest section of the Moon. Set in the smooth sands of Oceanus Procellarum, Galileo is a very tiny, eye-shaped crater with a soft rille accompanying it. Of course, this crater was named for the man who first contemplated the Moon through a telescope. No matter what lunar resource you choose to follow, all agree that giving such an insignificant crater a great name like Galileo is like saying a Stradivarius is a stringed instrument! For those familiar with some of the outstanding lunar features, read any account of Galileo's life and just look at how many spectacular craters were named for people he supported. We cannot change the names of lunar cartography, but we can remember Galileo's many accomplishments each time we view this crater.

As the father of telescopic astronomy, Galileo blazed a trail across the night sky - one any amateur of the day can easily follow. Among his most well known discoveries were the four bright satellites of Jupiter - the Galilean moons. Of the four, Ganymede is now known to be the largest satellite in the solar system. At 5262 kilometers, Ganymede is significantly more than twice the diameter of Pluto and almost 10 percent larger than Mercury. Of all the satellites in our system other than the Earth's moon, it is the only one capable of displaying a true disk in a moderate sized telescope. Tonight, at some 1.6 arc seconds in apparent size, Ganymede could reveal its disk to a mid-sized scope. Take the time to observe Galileo's "solar system within a solar system." Get a sense of the relative colors, brightness and size. If one of them is missing, Galileo didn't miscount. Look for a transit shadow cast against the planet's disk or watch for it to emerge from around behind.



JUPITER AND MOONS
CREDIT: WES HIGGINS



GIBBOUS MOON
CREDIT: GREG KONKEL



<http://www.universetoday.com>

SUNDAY, JUNE 11

Tonight is the Full Moon. Often referred to as the Full Strawberry Moon, this name was a constant to every Algonquin tribe in North America. Our friends



in Europe referred to it as the Rose Moon. The North American version came about because the comparatively short season for harvesting strawberries arrives each year during the month of June.

As its rises, we'll voyage to something "strawberry" red - the brightest "carbon star" in the night skies. Aim scopes or binoculars about a fist width northeast of Beta Canes Venatici and behold "La Superba."

Y Canes Venatici is a variable star which ranges between magnitudes 4.8 to 6.3 over a period of about half a year. When "Y" is at minimum it is around 4 times dimmer than at its peak. But, there is something very good about catching this star on a night when it is faint - its distinctive

reddish hue. See if you agree with mid-18th century astronomer Father Angelo Secchi, in naming it "La Superba."

"FULL MOONY"
CREDIT: T.A. RECTOR,
I.P. DELL'ANTONIO/NOAO/
AURA/NSF

MONDAY, JUNE 12

Before the Moon rises tonight, let's visit Cor Caroli and "La Superba" and split the distance between them to find the spiral galaxy M94. At magnitude 8.2, this expansive galaxy's core region is very prominent, yet smaller scopes will have difficulty making out much structure due to low surface brightness. Mid-to-large aperture will pick up on a tightly wound spiral structure with hints of obstruction by dark dust at the galaxy's edges.

M94 was discovered by Pierre Méchain on March 22, 1781. Two nights later it was re-observed and catalogued by Charles Messier. Current distance estimates vary, but 15 million light-years is a given value. Like M81 in Ursa Major, and M83 in Hydra, M94 is a small spiral - well-formed, but far less massive than our own.



M94
CREDIT: HILLARY MATHIS
AND N.A. SHARP/NOAO/
AURA/NSF

TUESDAY, JUNE 13

Today in 1983, Pioneer 10 became the first manmade object to leave the solar system. Sailing in the general direction of Aldebaran for 68 light-years, what wonders will it see?

As Pioneer 10 approaches Aldebaran it might look back on a faint 6th magnitude yellow star - our Sun - poised against the backdrop of a constellation now visible after skydark - Ophiuchus. Within just a few degrees north of our Sun would appear a "ball of stars" - M107. Let's get our own Pioneer 10 view tonight...



ARTIST CONCEPT
OF PIONEER 10
PASSING JUPITER
CREDIT: NASA

Center your scope or binoculars on Antares (Alpha Scorpii) and move north past a jagged line of four fainter stars - Rho, Psi, Chi, and Phi Ophiuchi. Just two degrees north of Phi is 5.8 magnitude SAO 159948. Imagine this star replaced by our own Sun in the night sky. Using binoculars, finderscope, or low power telescope - frame this "Sun" in the same field with 8.1 magnitude globular cluster M107. That's what Pioneer 10 will view from Aldebaran - 2 million years from tonight!

Although the Moon will soon be along, keep watch for the peak of the Ophiuchid meteor shower with the radiant near the rising Scorpio. The fall rate is poor - with only 3 per hour - but fast moving bolides are common. The duration of this stream is 25 days.

WEDNESDAY, JUNE 14

Tonight we have plenty of time for exploration. Let's begin by locating a globular cluster in the southern constellation Lupus - "The Wolf." You'll find NGC 5986 around three finger-widths south of Psi 1 and 2 in the same field with SAO 206887.

At 34,000 light-years away, this globular cluster is a Class VII, and bright enough to be seen with binoculars. Despite being some 16,000 light-years from the galactic core, NGC 5986 is already beginning to feel the powerful pull of gravity tugging away a stream of stars and distorting its globular shape.

For large scopes, let's go galaxy hunting. Locate Arcturus and Spica and split the distance between them to roughly locate a pair of galaxies in the same low-power field. NGC 5363 is a small, and relatively bright, elliptical galaxy - which will appear as a pale oval. To its south is NGC 5364, which is a larger, but fainter, slightly-tilted spiral. Look for an intense stellar core. Photographically, NGC 5364 is one of the loveliest galaxies in the Coma-Virgo cluster.

THURSDAY, JUNE 15

With early evening dark skies, let's go after a cluster of galaxies southwest of Iota Draconis. To locate the field begin at a visible star (SAO 29407) about half a fist width away. Centering on it, shift a little more than a degree due north to turn up the brightest galaxy in this group - NGC 5866 - otherwise known as M102. For those working on their Astronomical League Messier list,

NGC 5866 is the accepted designation for a "messy mistake."

Tenth magnitude "M102" is both bright and large enough to have been seen by Méchain and Messier, but we know there are dozens of such galaxies throughout the spring sky. Despite the mistake, it's clear this 40 million light-year distant spiral is a superb example of an edge-on - even in modest-sized scopes. At mid-size, look for a faint halo surrounding a bright core region and dark lane bisecting the galaxy to the southeast. Large instruments will detect faint spiral arms extending visibly outward - considerably further than expected from a spindle-shaped edge-on.

Continuing north another 2 degrees and slightly east in a low power field, will reveal

11.5 magnitude NGC 5879. This is a slightly tilted spiral galaxy with wispy, curved extensions. A little more than 1 degree east of NGC 5879 is a very thin, but brighter, 10.4 magnitude edge-on: NGC 5907. Sometimes called the "Splinter" galaxy, it's the second brightest member of the NGC 5866 group.

Less than a degree due south of the Splinter Galaxy is a faint pair - NGC 5905 and NGC 5908 - which are barely visible in modest telescopes. At magnitude 11.9, NGC 5908 resembles a smaller, dimmer version of NGC 5866. Around 12 arc minutes due west is 12.0 magnitude NGC 5905. It might appear as a faint, edge-on spiral, but it's an illusion caused by a barred spiral.



M102
CREDIT: NOAO/AURA/NSF

FRIDAY, JUNE 16

Well before dawn, the June Lyrid meteor shower peaks. The Moon is closest to the Earth right now, but even if it were not, it would still dim the view. Look for the radiant near bright Vega where you may see up to 15 faint blue meteors per hour from this branch of the May Lyrid meteor stream.

Today in 1963, Valentina Tereshkova, aboard Soviet Vostok 6, became the first woman in space. Her solo flight remains unique to this day. Twenty years later, on the 18th, Sally Ride became the first American woman in orbit - aboard Space Shuttle Challenger.

Tonight let's take a "flight through space" and visit the night sky. All it takes is a little imagination and the ability to keep looking up!

Let's revisit magnificent globular cluster M5. This fifth brightest globular cluster in the sky is considered one of the most ancient at 13 billion years old. Located further away from the dusty galactic center, resolution explodes as we move up in aperture. Easily seen as a round ball of unresolved stars in binoculars, small scopes begin to pick up individual stellar points at higher magnifications. Careful attention shows that M5 is not perfectly round. Its brightest 11th and 12th magnitude stars actually are randomly distributed but seem to array themselves in great arcs.



VALENTINA TERESHKOVA
CREDIT: NASA



SALLY RIDE
CREDIT: NASA

SATURDAY, JUNE 17

Celestial scenery alert! Head outside just after sunset and look west. Saturn and Mars are now slightly more than a half degree apart. Don't wait too late to view, for the pair will soon set!

Take the time to really enjoy the "Great Cluster" in Hercules tonight - M13. Only rivaled by M5 as the grandest globular cluster in the northern hemisphere night sky, even modest scopes will see M13 is "stellar" in nature. Mid-aperture will reveal dozens of 12th magnitude stars taking up positions in great arcs surrounding an intensely condensed core - giving this immaculate cluster the look of a scarab beetle with hooked mandibles. For large scopes, something extraordinary occurs - up to five low star density zones appear - giving the cluster a visibly mottled look.

Now head north-northwest just off M13's edge to find 11.6 magnitude galaxy NGC 6207. Visible through mid-sized scopes, this tilted spiral can be a challenge. For something even more difficult, try 12th magnitude IC 4615 - one degree southwest of M13.



M13 - CREDIT
N.A. SHARP/REU
PROGRAM/NOAO/AURA/NSF

SUNDAY, JUNE 18

Thinking of donuts? Then here's your chance to observe their celestial equivalent. Look between the southern-most pair of stars in Lyra, Beta and Gamma, for the "Ring Nebula!"

First discovered by astronomer Antoine Darquier in 1779, the "Ring" was cataloged later that year by Charles Messier as M57. The accepted distance to this unusual structure is around 1,400 light-years. In binoculars it appears slightly larger than a star, yet it cannot be focused to a sharp point. Through a modest telescope and even at low power, M57 turns into a glowing elongated donut against a wonderful stellar backdrop. How you see the "King of the Rings" on any given night is highly subject to conditions. As aperture and power increase, so do details. It is not impossible to see braiding in the nebula structure with scopes as small as 8" on a fine night, or to pick up the faint 13th magnitude star caught on the edge in even smaller apertures.

Like many planetary nebula, seeing the central illuminating star is considered the ultimate in celestial viewing. This "shy friend" is a peculiar blue dwarf which gives off a continuous spectrum and might be variable. At times, this near 15th magnitude star can be seen with ease through a 12.5" telescope, yet remain elusive to 31" in aperture a few weeks later. No matter what details you see, capture "the Ring" tonight. You'll be glad you did.



M57 WIDE FIELD
CREDIT: ROGER WARNER

MONDAY, JUNE 19

The galaxies of spring have now progressed to the west. Rich in variety and prodigious in number, they are now giving way to the star clusters and intragalactic nebulae of summer. Doesn't it make sense to bid adieu to what could be the last of them before turning binoculars and telescopes elsewhere? If you could revisit one galaxy in particular which would it be?

Tonight, before that vast assembly of "island universes" rides off into the sunset, head out with scope on mount and charts in hand. Make an evening of parting company with those great whirling vortices of light others may call "home"...millions of light-years away!



A SMALL AREA OF
THE COMA BERENICES
GALAXY CLUSTER
CREDIT: NOAO/AURA/NSF

TUESDAY, JUNE 20

With very little Moon in pre-dawn hours, we welcome the “shooting stars” as we pass through another portion of the Ophiuchid meteor stream. The radiant for this pass lies nearer Sagittarius and the fall rate varies from 8 to 20 per hour, but the Ophiuchids can sometimes produce more than expected!

Ready for a new direction in observing? Then look no further than the tail of the Scorpion and get ready to head south - then north. - The Summer Milky Way is upon us!

Let's start with a “bright star and globular cluster” view. Some of the most easily found studies in the night sky are ones residing in the same field with bright, recognizable stars. And, some the most difficult things to observe in the night sky are - you guessed it - faint studies lying near overwhelmingly bright stars! But there are compromises...

Less than 3 arc minutes east of 3.3 magnitude G Scorpii (the tail star of the Scorpion) is 7.4 magnitude globular cluster NGC 6441. No challenge here. This 38,000 light-year distant compact cluster is around 13 thousand light-years from the galactic core. It was first noted by James Dunlop from southeastern Australia in 1826.

Around two and a half degrees northeast of G Scorpii (and NGC 6441) is another interesting deep sky twosome - bright open cluster

M7 and faint globular NGC 6453. M7 was first recorded as a glowing region of faint stars by Ptolemy circa 130 CE. Located 800 light-years away, the cluster includes more than half a dozen 6th magnitude stars easily resolved with the least amount of optical aid. Through telescopes, as many as 80 various stars can be seen.

Now head northeast and the faint haze of 31,000 light-year distant globular cluster NGC 6453 will reveal itself to mid- and large-sized scopes. Like NGC 6441, this globular was discovered from the southern hemisphere, in this case by John Herschel on June 8, 1837 while observing from the Cape of Good Hope, South Africa.



M7
CREDIT: N.A. SHARP/REU
PROGRAM/NOAO/AURA/NSF

 **UNIVERSE TODAY**
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WEDNESDAY, JUNE 21

Dark skies continue tonight and we'll continue following the great expanse of the Summer Milky Way.

Our first stop will be the "Butterfly Cluster" - M6. About the size of the full moon, this scattering of 7 to 12th magnitude stars looks like its namesake. The "wings" are easily seen as two lobes east and west of the cluster's main body. Around 75 blue and blue-white stars are visible at low power.

Want more? Head northeast a little more than one degree to reveal the expansive, 5.5 magnitude open cluster NGC 6383. Continue to sweep west at low power to find what might be expected as a very faint sheen of stars - 9th magnitude NGC 6374. What's that? You can't find it? Then you've just learned an invaluable lesson - some things in J. L. E. Dreyer's catalogue simply don't exist!



M6
CREDIT: NOAO/AURA/NSF

THURSDAY, JUNE 22

Celestial Scenery Alert! Although no one likes to get up early, the morning skies will be quite worth it. The Moon, loaded with earthshine, and brilliant Venus will be dancing just ahead of sunrise.

Today celebrates the founding of the Royal Greenwich Observatory in 1675 - 331 years of astronomy in a single location! Home to Flamsteed and Halley, the observatory was established by King Charles II to study human and sidereal time. We know it as the landmark for the Prime Meridian of the Earth and the Universal Time (UT) standard. Also on this date in history (1978), James Christy of the US Naval Observatory in Flagstaff, Arizona discovered Pluto's satellite Charon.

Originally discovered in Gemini, Pluto is now about a full moon's width southeast of 55 Serpentis. At magnitude 13.9, the planet can just be detected in a mid-size scope, but recognizing the "God of the Underworld" is another matter. It takes very careful chartwork.

Tonight let's resume our trip north from Scorpio's "tail." Starting with Antares, head east-northeast less than a fist width to put yourself in the general location of M19. With a visual magnitude of 6.8, this bright globular cluster can be seen with small binoculars, but requires a telescope to take on form. Discovered by Messier in 1764, M19

is the most oblate globular known. Harlow Shaply, who studied globular clusters and cataloged their shapes, estimated that M19 has about twice as many stars along the major axis as the minor. This "stretch" is due to its proximity to the Galactic Center - a distance of only about 5,200 light-years. Very rich and dense, even small telescopes can pick up the cluster's faint blue tinge.

For the adventurous, there are two more. Magnitude 8.2 NGC 6293 is less than a finger-width east-southeast of M19 and far brighter than you might expect. Note how much more round and concentrated the core appears to be. About the same distance north-northeast of M19 is fainter NGC 6284 - similar apparent size, but more loosely constructed.



M19
CREDIT:
DOUG WILLIAMS/REU
PROGRAM/NOAO/AURA/NSF



<http://www.universetoday.com>

FRIDAY, JUNE 23

This evening, we'll return to Scorpio from Ophiuchus and locate three globular clusters at the head of the Scorpion - Antares.

M4, located one degree west of Alpha (Antares) is one the most easily located of all globular clusters and provides a fine view with binoculars or scopes. First noted by Philippe Loys de Chéseaux in 1746, M4 is one of the nearest globulars - at some 7200 light-years. At magnitude 5.9, it approaches unaided visibility. This misty looking globular improves with both aperture and magnification, revealing a chain of 11th and 12th magnitude stars across the cluster's core.

Less than one degree east-northeast of M4 is large and faint NGC 6144. Because of its position in the same low power field with Antares, it's a 9.1 magnitude, low surface brightness challenge!

A challenge of a different type is M80 - one of the most densely packed globular clusters in the Milky Way. Located about halfway between Antares and Beta Scorpii, this 33,000 light-year distant cluster defies resolu-tion. An original discovery of Charles Messier, in 1781, William Herschel was the first to resolve it into individual stars - and with the right scope and condi-tions, so can you!



SATURDAY, JUNE 24

On this day in 1881, Sir William Huggins made the first photographic spectrum of a comet (1881 III) and detected cyanogen (CN) emissions at violet wavelengths. This discovery caused near mass hysteria some 29 years later when Earth passed through the tail of Halley's Comet.

Tonight is a near New Moon and a good time to pack the scope (and family) for a late night out among the stars. Before you head out to your favorite star party locale consider this: It's summer and the richest part of the Milky Way is going to softly illuminate the sky from Corona Australis in the south to Cepheus in the north. That means bring everything you can - from small hand held binoculars, to a big dob!

If you will be attending with other amateurs, here are some star party hints: Cover your dome and trunk lights with translucent red filter paper. Try to arrive just after sunset, but if you get there late, stop for a moment on the side of the road. Turn off your bright lights, allow your eyes to dark adapt, then drive into the parking area using parking lights only. If you don't have a scope to set up, park well away from where others are stationed. Before opening car doors, turn off any music or news, then allow your eyes to further dark adapt so you can find your way around safely.

Amateur astronomers are some of the friendliest folks you'll ever meet!



"STAR PARTY"
CREDIT: VICTOR DECRISTORFORO



SIR WILLIAM HUGGINS
CREDIT: MARY LEA
SHANE ARCHIVES/LICK
OBSERVATORY

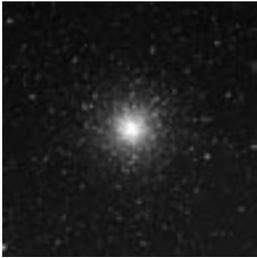
SUNDAY, JUNE 25



HERMANN OBERTH
(WIDELY USED
PUBLIC IMAGE)

Today celebrates the birth of Hermann Oberth. Born in 1894, Oberth is the father of modern rocketry and space travel. But you won't need a rocket to travel skyward as we celebrate tonight's New Moon.

The constellation Ophiuchus is the unrecognized "thirteenth sign of the Zodiac" - the Snake Charmer. Flanking Ophiuchus on both sides is a serpent (Serpens). West is the head (Serpens Cauda), and east the tail (Serpens Caput). The premiere study of Serpens Cauda is M5. In the less recognizable Serpens Caput is even less recognizable open cluster - M16. Between M5 and M16 are four fine globular clusters - M10, M12, M14, and NGC 6539. Let's learn more about this mysterious region of the sky by visiting with them all...



M12
CREDIT: N.A. SHARP AND
VANESSA HARVEY/REU
PROGRAM/NOAO/AURA/NSF

The brightest star in Serpens Cauda is Alpha - then southeast Epsilon. Use them to point you southeast to Yed Prior (Delta Ophiuchi) Yed Posterior (Epsilon Ophiuchi). A fist width east of Epsilon, is condensed 6.6 magnitude globular cluster M10. First resolved by William Herschel, Messier described this cluster as a nebula without stars on discovery May 29, 1764. It might appear that way in binoculars, but even small scopes pick stellar members out of M10 and neighboring M12 about two finger-widths northwest.



M12
CREDIT: REU PROGRAM/
NOAO/AURA/NSF

At first glance through binoculars or a modest telescope, they much alike. Both have similar magnitudes and apparent sizes, but there are differences. It's difficult to resolve M12 at lower magnifications, while M10 appears more blue. For those with large aperture, note difference in class structures. M12 is class IX and M10 is class VII.

Now head west-northwest about a fist width. M14 is roughly twice the distance away and even hard to resolve. Like M10 and M12, M14 was discovered by Messier during one of his comet sweeps in late spring 1764. Its brightest stars are 14th magnitude - revealing the quality of William Herschel's hand-made reflector which resolved it in 1783. Smaller than the previous pair, M14 is right in the middle at Class VIII. Feeling adventurous? Head southeast and visit NGC 6539 northeast of Tau. If this faint globular weren't so obscured by dust it would be 7 times brighter than M14!



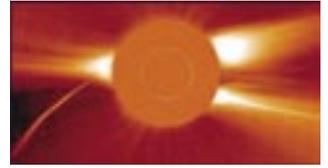
M14
CREDIT: NOAO/AURA/NSF

MONDAY, JUNE 26

On this day in 1949, sun-grazing asteroid Icarus was discovered on a photographic plate. It was made using the 48-inch Schmidt nine months after that telescope went into operation, and just prior to the multi-year National Geographic - Palomar Sky Survey. The asteroid was found to have a highly eccentric orbit and a perihelion distance of just 17 million miles (closer to the Sun than Mercury), giving it its unusual name. Icarus was just four million miles from Earth at the time of discovery, and the peculiarities of its orbit have been used to determine Mercury's mass and test Einstein's theory of general relativity.

But, today is even more special. It is the birthday of none other than Charles Messier - the famed French comet hunter. Born in 1730, Messier cataloged the 100 or so bright nebulae and star clusters we now refer to as the Messier objects - a list intended to keep observers from confusing fixed objects in space with possible new comets. Despite his discovery of over a dozen such comets, he is best remembered for the nebulae that didn't stray, but stayed right where he and his associate Pierre Méchain found them!

Look after skydark for two of the most easily recognizable constellations in the night sky. Scorpius looks much like its namesake, "the Scorpion," while Sagittarius resembles a "teapot." The brightest star in this constellation is Kaus Australis (Epsilon). Kaus - and two other eastern stars of Sagittarius, Al Nasl ("the nose") and Kaus Media form the "spout." Rising upwards is the "steam" of the Milky Way. If you follow the "steam" north from Al Nasl you will arrive at M8 - the "Lagoon" nebula!



SUN GRAZING COMET
CREDIT: NASA



CHARLES MESSIER
(WIDELY USED
PUBLIC IMAGE)



M8:
"THE LAGOON NEBULA"
CREDIT: NOAO/AURA/NSF



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TUESDAY, JUNE 27

While the Moon is still so close to new and tender, it won't hamper studies as we follow the Milky Way north. Tonight we'll take a more detailed look at seven studies all within half a fist width north of Al Nasl (Gamma.)

Begin with Gamma and look less than one degree north-northwest for a pair, 9.5 magnitude NGC 6528 and 8.6 magnitude NGC 6522, Class V and VI respectively. From NGC 6522, continue a little more than 2 degrees north to capture a view of the 8.0 magnitude open cluster NGC 6520. While looking at this fairly large cluster of two dozen 9th to 12th magnitude stars, walk back the magnification and see if you can also include the "C"-shaped obscuration nebula Barnard 86 northeast.

Two and a half degrees further north leads you to 8.0 magnitude globular cluster NGC 6553. This bright, Class IX study was discovered by William Herschel and initially mis-identified as a planetary nebula in 1784. Despite its relative brightness, this 20,000 light-year distant globular requires a larger scope and higher magnifications to resolve. Continuing north another degree we encounter the 8.3 magnitude, mid-sized globular cluster NGC 6544. Another Herschel discovery, this Irregular Class study is far more likely to show some resolution than NGC 6553, but still needs a mid-sized scope to make out individual stars. Another degree further north leads us to open cluster NGC 6530 - "the Strawberry Cluster." At magnitude 4.6, this cluster is part of the "Lagoon Nebula."

Dark skies later tonight also mean great success at spotting a handful of meteors originating near the constellation of Corvus. The Corvid meteor shower is not well documented, but you might spot as many as ten per hour.

WEDNESDAY, JUNE 28

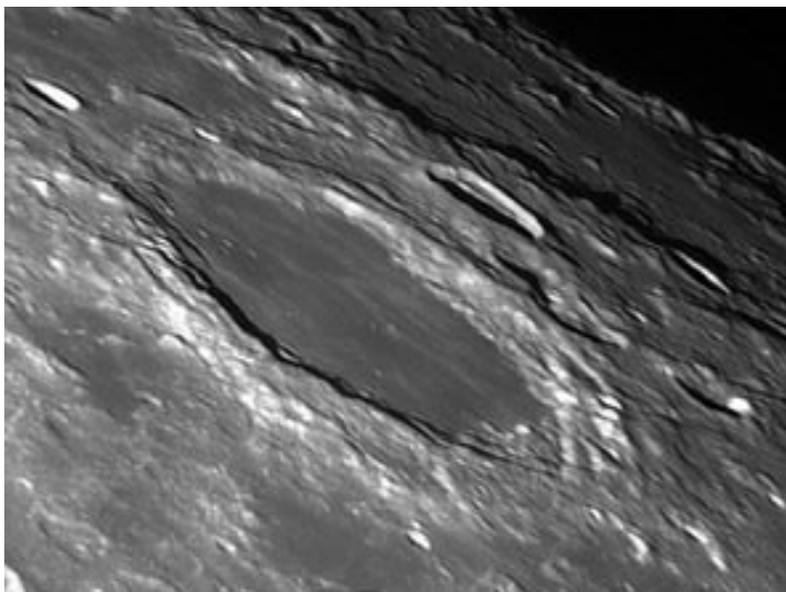
Tonight the Moon is a slender crescent low to the western horizon. Have a look at the northern edge for the smooth grey sands of Mare Humboldtianum and crater Endymion to its west. Once it sets, let's head out once again to venture along the Milky Way!

Tonight, we'll begin again with M8 and its attendant open cluster NGC 6530, which was first noted by Flamsteed in the late 17th century. Charles Messier emphasized this cluster's appearance in his notes: "A cluster which appears like a nebula in an ordinary telescope of 3 feet [focal length] but with an excellent instrument, one perceives nothing but a large number of small stars." The Lagoon Nebula - M8 - was first reported by Le Gentil in 1747, who also made reference to the star cluster.

To the northeast a little more than a degree is 8.0 magnitude open cluster NGC 6546. Unrecognizable as a cluster in small scopes, several dozen faint stars can be resolved in modest instruments at higher magnifications. Another degree north and slightly west leads to open cluster M21. An original

discovery of Messier on June 5, 1764, it is estimated to be around 5 million years old - rather young for a cluster with around 50 members.

Moving less than a degree southwest of M21 is the faint nebulosity of M20 - the Trifid Nebula. Located some 5,000 light-years away, this object is spectacular in photos and gives a recognizable view in larger scopes. Two 8th magnitude stars dominate the cluster - one of which is a superb triple system.



ENDYMION
CREDIT: DAMIAN PEACH

THURSDAY, JUNE 29

If you're lucky enough to catch the very beginnings of the tender crescent Moon just after sunset, be sure to look for Regulus nearby!

Today we celebrate the birthday of George Ellery Hale. Born in 1868, Hale was the founding father of the Mt. Wilson Observatory. Although he had no education beyond a baccalaureate in physics, he became the leading astronomer of his day. He invented the spectroheliograph, coined the word astrophysics, and founded the *Astrophysical Journal* as well as Yerkes Observatory. At the time, Mt. Wilson dominated the world of astronomy, confirming the nature of galaxies as "island universes" and verifying an expanding universe cosmology. Later Hale went on to found Palomar Observatory and the 5-meter (200") telescope (named for him) was dedicated on June 3, 1948. It continues to be the largest telescope in the continental United States.



"THE LAGOON AND TRIFID"
CREDIT: STEVE MANDEL

Although Mt Palomar Observatory's largest instrument was dedicated to exploring the extragalactic realm, the smaller 48-inch Samuel Oschin Telescope was one of the first telescopes to survey the entire northern hemisphere sky. This fine instrument captured six degree wide

fields of the sky. Tonight, let's explore an area just that size.

Start three finger-widths northeast of the "teapot's lid," Lambda, for open cluster M25. Added to Messier's catalog on June 20, 1764, it was first noted by Philippe Loys de Chéseaux in the mid 1740s. In modest telescopes, this 2,000 light-year distant cluster shows around four dozen various magnitude stars and larger aperture reveals many finer stars across the field. Two and a half degrees further north-northeast reveals challenging open cluster NGC 6645. Somewhat small, this 8.5 magnitude cluster is condensed enough to distinguish itself among the rich star fields of the Milky Way. Appearing like a nebulous patch to smaller scopes, mid-apertures reveal two dozen faint members.

Around three degrees northwest of M25 is much brighter open cluster M18. Its members begin at about magnitude 8.5 and perhaps two dozen stars are visible to magnitude 12. Messier discovered and catalogued this cluster June 3, 1764. One degree north-northeast of M18 is the evening's most spectacular study: the graceful and beautiful "Swan Nebula" - M17. Even through a small scope, this one is quite impressive. Just the amount of gas in this 6,000 light-year distant area could condense to form as many as 800 suns!

A short hop north will bring us to M16 - the "Eagle Nebula." Unlike the "Swan" the "Eagle" is not easily seen. Although detectable through most telescopes, it is low surface brightness and requires a nebula filter to really stand out.

FRIDAY, JUNE 30

Let's return to the Moon and look toward the southern shore of Mare Fecunditatis and previous study crater Petavius. Just to the southwest you will see a smaller, but very prominent pair - Snellius and Stevinus. So close to the terminator, this duo of Class I craters show their sharp, younger outlines very well.

When the Moon has begun to set, find a comfortable seat, relax, and enjoy the June Draconid meteor shower. The radiant from this shower is near the handle of the Big Dipper. The fall rate varies from 10 to 100 per hour, but tonight's darker skies will offer a better than usual chance to spot what are now known to be the offspring of comet Pons-Winnecke. On a curious note, today in 1908 the great Tunguska impact happened in Siberia. A fragment of the comet, perhaps?



GEORGE ELLERY HALE
(WIDELY USED
PUBLIC IMAGE)



M25
CREDIT: HILLARY MATHIS
AND VANESSA HARVEY/REU
PROGRAM/NOAO/AURA/NSF



M18
CREDIT: HILLARY MATHIS/
REU PROGRAM/NOAO/
AURA/NSF



M16
CREDIT: BILL SCHOENIG/
NOAO/AURA/NSF

JULY 2006



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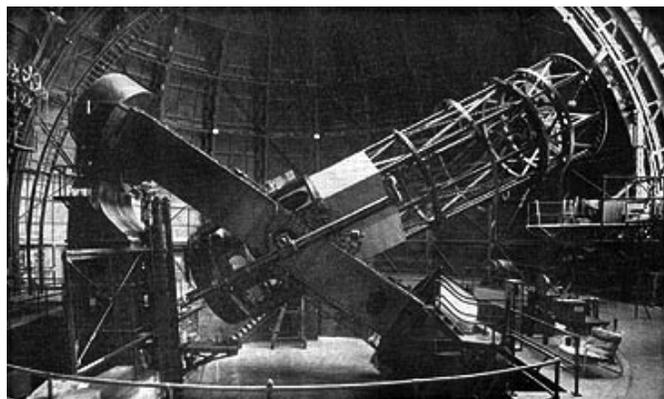
SATURDAY, JULY 1

Today in 1917, astronomers at Mt. Wilson celebrated the arrival of the 100" primary mirror for the Hooker Telescope. The mirror was cast by the Saint Gobrain Glassworks of France using the same type of glass as wine bottles. Funds for casting, shaping, and silvering the mirror were provided by Los Angeles businessman John D. Hooker. The 100 inch telescope ultimately proved to usher in a new age of astrophysical investigation and expanded human thinking to include a Universe of innumerable galaxies beyond our own.

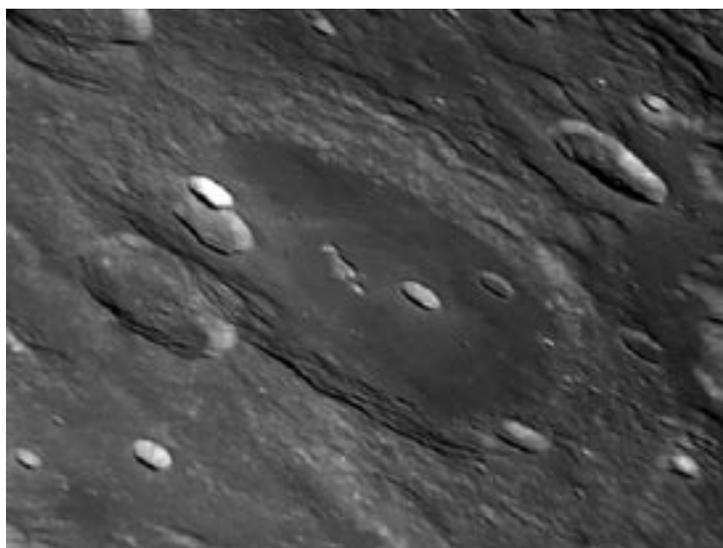
Although the Moon is furthest from the Earth tonight, it most definitely won't stop us from exploring. Let's have another look at a previous study crater on the lunar surface tonight as we locate shallow crater Cleomides just north of Mare Crisium. With binoculars, or a telescope at low power, follow the rings to the north as you encounter Burckhardt, Geminus, and the faded old Messala. For a telescopic challenge, look for crater Delmotte at the eastern edge of Cleomides' rim. Shift to the northwest for Trailes and Debes on its western edge.

Since the distant Moon is not overpowering, wait for it to wester, then head off to explore a trio of star clusters. Just a little more than a fist width south of Antares is large open cluster NGC 6124. At magnitude 5.8, this mixed variety of bright stars resides almost precisely between Zeta Scorpii and Eta Lupi. NGC 6124 is easily recognized and contains a visibly condensed core region.

Now head a little more than 5 degrees due east between Zeta and Mu Scorpii to have a look at 6.4 magnitude NGC 6242. With an expanse one-third the size of the previous cluster, this 4,000 light-year distant, compact gathering of more than two dozen stars was first noted (along with earlier study NGC 6124) by Abbe Lacaille during his mid-eighteenth century trip to South Africa. Now return to Zeta and look less than one degree north for brilliant NGC 6231. This magnitude 2.6 study is around 6000 light-years away. Binocular users can collect these trophies!

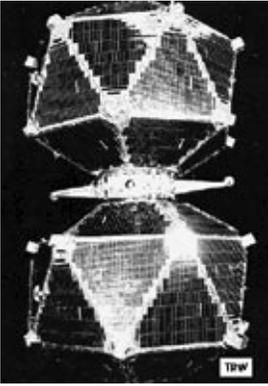


THE HOOKER TELESCOPE
CREDIT: MT. WILSON
OBSERVATORY



CLEOMIDES
CREDIT: DAMIAN PEACH

SATURDAY, JULY 2



THE VELA GAMMA
RAY SATELLITE
CREDIT: NASA

On this day in 1967, the Vela gamma-ray satellite was launched. Originally designed to detect nuclear explosions, Vela made a much more important contribution by detecting gamma-ray bursts in space. These very short-lived, highly energetic explosions can happen from almost any direction and are caused by events as cataclysmic as the collapse of two neutron stars to form a black hole.

Tonight we're going to look on the lunar surface for a crater so old that it's almost extinct. Start by identifying the three rings of Theophilus, Cyrillus and Catherina. To the south you will see the broad, bright wall of the Altai Scarp and further south a huge shallow crater on the terminator. This crater can only be seen during this particular phase of lunar sunrise and has become so dilapidated it is unnamed. Younger craters, Lindenau and Rothman invade its northern wall and you will see a small collection of craters to the south that resemble a "paw print." Enjoy it tonight, for it will be gone tomorrow.

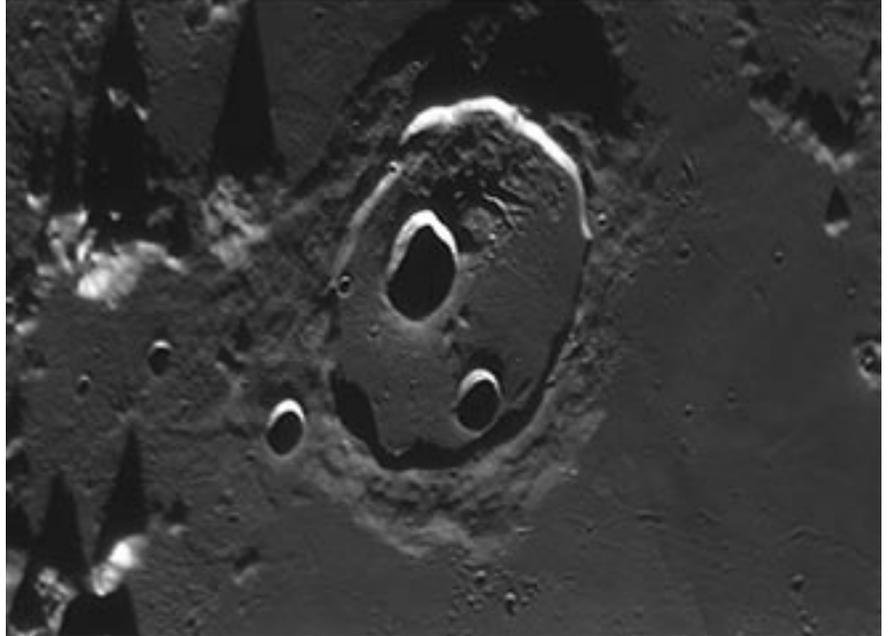
Wait until the Moon begins to set and return to Mu Scorpii. About a finger-width east you will find large open cluster NGC 6281. At magnitude 5.4, you'll find this sky gem punctuated by a wide pair of 6th magnitude stars. This brightly scattered cluster of three dozen members shows no real nucleus but is easily recognized at low magnifications.

MONDAY, JULY 3

It might be hard to believe, but right now the Sun is furthest from the Earth.

Tonight, let's take a quiet journey on the lunar surface as we view an area highlighted by sunrise - the Caucasus Mountains. Easily spotted in both binoculars and small telescopes, this range towers some 5182 meters above the surrounding plains - making its peaks as high as Mount Ararat. As the shadows throw the rugged terrain into bold relief, take the time to enjoy watching the terminator move along the lunar surface. As time passes you can follow the mountain's shadows shortening and details emerging in Crater Cassini. It's a very peaceful experience...

Despite bright skies, let's observe 6.6 magnitude M62. Located roughly halfway between Alpha and Lambda Scorpii, this ordinarily bright cluster deserves a fine, dark night, but it's fun to locate. Distorted by its proximity to the galactic core, M62 is 22,000 light-years away. This globular cluster is intrinsically twice as bright as M10 and M12, and much more centrally condensed at Class IV.



CASSINI
CREDIT: WES HIGGINS

TUESDAY, JULY 4



M19
CREDIT: NOAO/AURA/NSF

Today is the suspected date when Chinese astronomers first noted the bright supernova event that corresponds with the Crab Nebula - M1. Well, it might not be a supernova, but something cool will happen tonight...the Moon will occult Spica! Such a bright star is quite fun to watch disappear behind the lunar limb and requires no special equipment to enjoy - just the right location. Be sure to check IOTA for times and areas.

If you explore the lunar surface this evening, you will find a very curious feature we've studied before known as the Alpine Valley. Located near the terminator in the north, look for a long, narrow scar creasing the foothills between Mare Frigoris and Mare Imbrium. Running a distance of 177 kilometers and ranging between 1.6 to 21 kilometers wide, this gash through the Montes Alpes includes tiny crater Trouvelot to its south. Stable conditions at high power will also reveal a narrow fissure on its floor.

If you'd like more, then let's revisit M19 through the less welcoming skies of moonlight. Many amateurs like to make a study of how seeing affects views in the night sky. Relocate other studies as well and see the difference!



VALLES ALPES:
"THE ALPINE VALLEY"
CREDIT: DAMIAN PEACH

WEDNESDAY, JULY 5

For SkyWatchers, have a look at the Moon tonight... Jupiter is very nearby.

Tonight at first glance, the most prominent features on the Moon will be the descending series of “rings” - Ptolemaeus, Alphonsus, and Arzachel. Between, and west, of Alphonsus and Arzachel you will discover a selenographer’s delight! Power up to have a close look at Alpetragius. At 25 miles in diameter and 9800 feet deep, the sharp young crater has a massive central mountain peak precisely at its center. This huge, symmetrical dome towers 6200 feet above the crater floor and rivals neighbor Arzachel’s central peak. While part of the crater may still be dark, be sure to look at the dazzling west wall and the summit of Alpetragius’ fantastic mountain.



Ready to climb to greater heights? Then look north... Tonight one of the finest, bright planetary nebulae - NGC 6543 - calls for attention. At magnitude 8.1, the “Cat’s Eye Nebula” is small and intense. On a still night - with or without the Moon - this feline beauty simply absorbs all the magnification you can send its way. About the only thing “wrong” with this planetary is how difficult it can be to find! High magnification is needed to distinguish it from a star - but the greatest challenge is the navigation skills needed to track it down. Start at Gamma Draconis and extend a line past Xi twice the distance between them. This leaves you about one degree south of NGC 6543. Now sweep the sky north-northeast until you make out that bright, but fuzzy star. Power up. As you observe this 3600 light-year distant planetary, think about how the “Cat’s Eye” looks almost directly down from the north pole of the solar system. A view very similar to the “circles within circles” used by Ptolemy to explain the layout of planetary orbits!

ALPATRENIUS
CREDIT: ROGER WARNER



NGC 6543:
“THE CAT’S EYE NEBULA”
CREDIT: HST/NASA

THURSDAY, JULY 6

Today in 1687, Isaac Newton's *Principia* was first published with the help of the Astronomer Royal of England - Edmund Halley.

Tonight on the lunar surface, previous study Copernicus will draw attention to itself, but let's head to the north and look for prominent little Class I Pytheas.

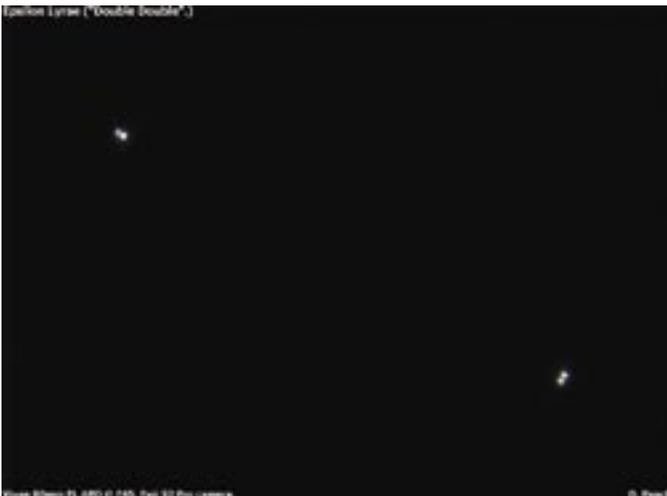


ERATOSTHENES
AND TIMOCHARIS
CREDIT: GREG KONKEL

Like a bright little ring standing alone in the southern half of dark Mare Imbrium, this high contrast feature will catch the eye. Just a bit more to the north is Lambert. Although it is marginally larger, notice how much darker it appears. Lambert stands on a great lunar ridge winding its way up from grand Eratosthenes, 250 miles southeast, and continues on for another 150 miles. As you observe, you may notice the ridge is just slightly lighter than the background. While Lambert is not as grand

as its neighbor to the east - Timocharis, you might catch the sunlight reflecting off the hollowed-out remains of its central peak. It is believed that this is a collapsed area of a "rebound dome." A formation created when the crater formed during a particularly nasty impact.

Even though skies are bright, we can still study double stars - and we have



EPSILON LYRAE:
"THE DOUBLE DOUBLE"
CREDIT: DAMIAN PEACH

a "double-double" in mind. Along with Orion's "Trapezium," Epsilon Lyrae is probably the most well-known multiple star system in the night sky. Just about any magnification, even binoculars, will resolve the main pair - but don't stop there. Drop in the power and look carefully as each of the wider members splits again. Any telescope capable of modest magnification will do the trick - but as in most things celestial - sky conditions rule. Note in particular the matched pair Epsilon-2 to the south and the disparate pair (Epsilon-1) to the north. On marginal nights of seeing, the pair of

mismatched brightness (magnitudes 4.6 and 6.3) can be a tough split while the twins (magnitudes 4.9 and 5.2) may require little effort. Look for the "Double-Double" less than 2 degrees northeast of brilliant blue Vega.



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FRIDAY, JULY 7

Tonight we'll observe a lunar feature near the southern terminator often overlooked for its grander neighbor - Clavius. Just take one step northwest and let's power up to study Longomontanus.

Named for Danish astronomer and assistant to Tycho Brahe, Christian S. Longomontanus, this splendid mountain-walled plain shows a broken border on its north and an off-center mountain peak. Notice how its smooth sands have eroded its edges over time. Just outside its eastern wall, look for the remains of a much older crater destroyed when Longomontanus formed. Just to its north are the remains of Montanari, and the double strike of crater Brown to the northeast.

Before we call it a night, let's have a look at disparate double star Delta Herculis. A tough resolve for a small scope, this one promises to be a challenging double for mid-sized instruments. Bright Delta A glows at magnitude 3.0, while dim Delta B is at 8.1. The separation on this pair is 11 arc-seconds. We'll bring you back to this double later, along with other pairs to be observed over the next few nights. What a difference a dark sky will make...



LONGOMONTANUS
CREDIT: DAMIAN PEACH

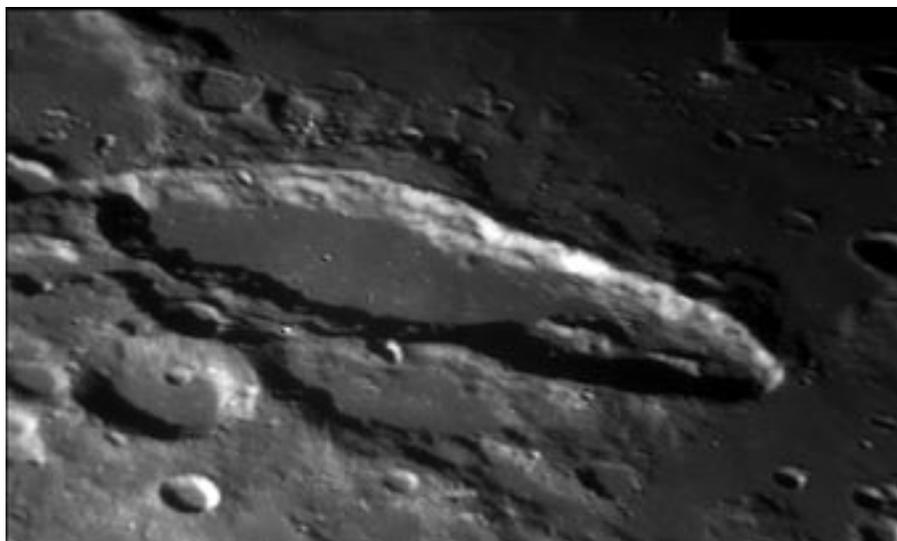


<http://www.universetoday.com>

SATURDAY, JULY 8

While the gibbous Moon dominates the night sky, why fight it? Let's study it instead, as we head toward some challenging craters.

Start by identifying the long narrow ellipse of crater Schiller on the terminator to the south. Head further south along the terminator and look for a line of four prominent craters. Their interiors may be black, but the southwest walls will be brilliantly illuminated. The most striking of this quartet is Zucchius and



SCHILLER
CREDIT: DAMIAN PEACH

depending on libration may be very shadowed. To its east is Bettinus, and at power you will see central peaks in both craters. Further south-east is Kirchner and to its east is the very old Wilson.

Just north of Bettinus and - at an angle to Zucchius - you will see a strange, walled, V-shaped area curving back to Schiller. This odd area is one of the Moon's older surface features. An aeon or two ago, this

was part of a much larger structure which can be traced here and there amidst later forming craters. Since all that is now left is some hills and ridges, no one is certain if the area formed geologically or was caused by an impact.

But this isn't the only mystery in the universe. Why are so many stars in the night sky doubles? Do double stars form together? Are they created separately then later are gravitationally attracted? Or are doubles and multiple stars all that's left of an open cluster after the Milky Way pulls them apart through tidal forces? Who needs theory when these twosomes and threesomes make for such fine views!

Let's have a look at another "Herculean pair" - 3.5 magnitude Mu Herculis. Keep a sharp eye and use only enough power to darken the bright moonlit sky. Look for a dim 9.8 magnitude companion some 30 arc-seconds west-southwest of a golden 3.4 magnitude primary. During the current bright lunar phase, very small telescopes will have difficulty with this one, but we'll be back.

SUNDAY, JULY 9

On this day in 1979, Voyager 2 approached within 721,670 kilometers of Jupiter's cloudtops for its very closest pass. To see Jupiter tonight as Voyager II did, you'll need 207X magnification! As the sky darkens enough to locate this -2.3 magnitude "star," turn your scope on Jupiter - for what could be your last best look at the giant planet.

Using 207X on the Moon gets you a lot closer than 721,670 kilometers. That magnification puts you within 1800 kilometers of the regolith. Now let's power up and have a close look at what is known to be one of the most transitory features on the lunar surface. To find it, begin by revisiting bright Aristarchus and note Promontorium Heraclides on Sinus Iridum's western tip. Just to the west and near the terminator you will see a small bump on the surface. This particular feature may not appear particularly striking in itself, but note how much brighter it is on its eastern slope. You are looking at Rumker - an object that cannot be seen at any power unless it lies near the terminator. Yet tonight it can be detected with binoculars! Rumker is an example of a lunar dome - a feature thought to be the remains of an ancient shield volcano.

Ready for another challenge? Then let's take on one of the toughest, and most beautiful, doubles in the night sky - Antares. This splendid, first magnitude red giant - "Rival of Mars" - is now high enough in the early evening to try to spot its 5.4 magnitude green companion. Like winter's Sirius, the Antares pair needs especially still - but not necessarily dark - skies. It also requires a well-chosen magnification - one high enough to separate the two close stars (2.9 arc seconds), but low enough to concentrate the fainter star's (magnitude 5.4) light.



LUNAR DOME
CREDIT: WES HIGGINS



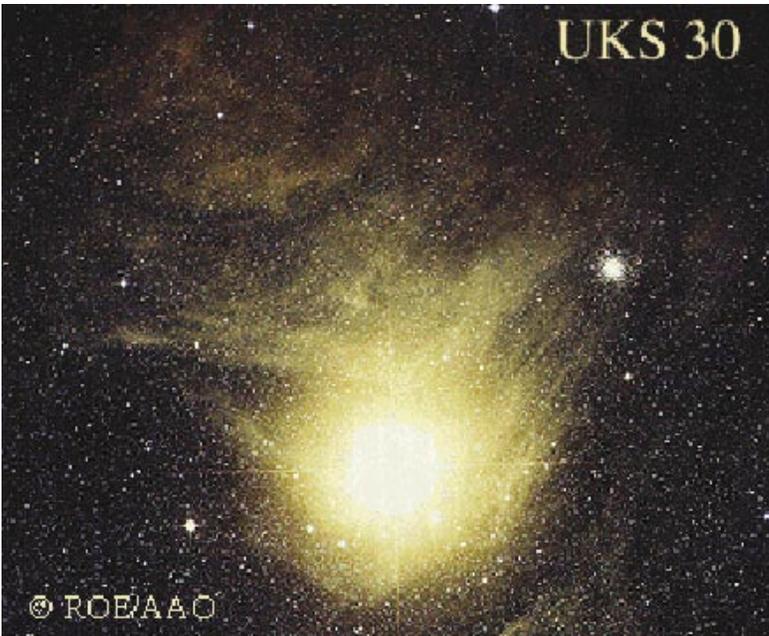
VOYAGER 2
IMAGE OF JUPITER
CREDIT: NASA

MONDAY, JULY 10

Yes. It is big. Yes. It is bright. And yes...it's officially the Universal date of the Full Moon. Are you ready to risk a little night blindness to see something new? Then let's head towards the great Grimaldi and turn south. Close to the terminator west of Mare Humorum you will see the very bright Class III crater Byrgius. On its northeast wall is another impact named Byrgius A and it is the center of a prominent ray system splashed over the older crater. The ejecta

brightens the whole area and makes it difficult to resolve Byrgius. Look just to the west along the terminator for Darwin - an ancient multi-crater complex.

Now, let's go really look again at Antares. Like many red giants, 520 light-year distant Antares A is variable with around a 5.8 year-cycle. Such a cycle occurs as Antares' photosphere alternately swells and cools, then shrinks and warms. Driving this cycle are events deep within the star itself. As Antares' nuclear fuel waxes and wanes - delivering more, then less food to feed its enlarged form - a tug-of-war occurs between radiation and gravity within it.



ANTARES
CREDIT: DAVID MALIN

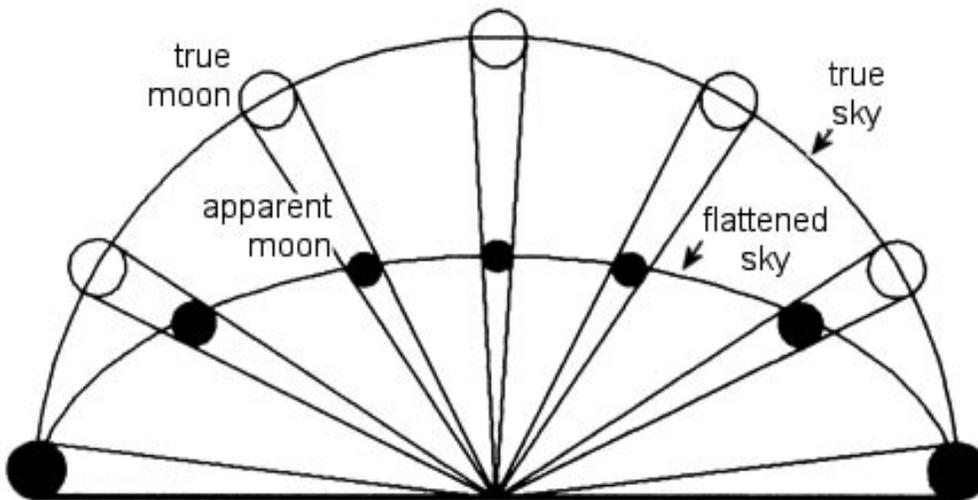
Think of red giants as a "star within a star." Antares' massive core and mantle is actually a fiercely radiant blue-white star surrounded by an expansive shroud of diffuse hydrogen and helium gas. This shroud is so large that it would engulf all our solar system's inner planets plus the asteroid belt.

TUESDAY, JULY 11

During July, something strange is happening in the woods...deer sprout antlers. Due to this natural phenomenon, tonight's Full Moon is sometimes referred to as the "Buck Moon." For some of us, however, the month of July also brings fearsome storms and Luna is also referred to as the "Thunder Moon." In more agricultural regions it's the "Hay Moon." Among coast dwellers, this is the "Sturgeon Moon" - a name given by ancient fishermen whose best catches occurred during this month. Elsewhere it has been called the "Red Moon" because hazy-heat rising from the Earth's surface at low angles gives the Moon color as it rises. This month's moon is also the "Grain Moon," or for scholars, the "Green Corn Moon."

No matter what it's called, we can watch it rise and enjoy the "Moon Illusion." Everyone knows the Moon looks larger on the horizon, but did you know this is a psychological phenomenon and not a physical one? Prove it to yourself by looking at the rising Moon upright...it looks larger, doesn't it? Now stand on your head, or find a comfortable way to view it upside down...now how big is it?

Take a look at the stars overhead. For northern observers, you can't miss the "Summer Triangle" now entering the middle third of the sky at dark. Look to Vega, Deneb, and Altair - three stars of the first magnitude and make note of the constellations within their bounds - within a few days the Moon will rise later and the subtle beauty of the shimmering summer Milky Way will reveal itself!



SKY MODEL FOR
MOON ILLUSION
CREDIT: NASA

WEDNESDAY, JULY 12

Haven't found Neptune yet? Try looking north of the Moon tonight...

Tonight as Selene forecasts its brilliant rise to the south-southeast, let's have a look at 400 light-year distant Rasalgethi - Alpha Herculis. Known as the "Head of the Kneeling One," it's an easily resolved (4.8 arc second spaced) double noted for its fine color contrast. At magnitude 3.5, the variable bright primary is one of the largest known stars - with a diameter four times the Earth-Sun distance. Its photospheric temperature is so low at 3000 degrees Kelvin that it barely glows a warm "red-orange." Meanwhile, its 5.4 magnitude companion is a yellow giant with a temperature twice the primary. The two together make Rasalgethi A seem a deeper red while Rasalgethi B takes on a lovely yellow/green hue.

Tonight let's use a bright feature to help us locate something very cool on the lunar surface. Start by identifying unmistakable Tycho to the south. Northeast of Tycho you will see a bright ray running towards Mare Serenitatis and the equally bright spot of Cassini. If you trace the great double ray northwest, you will see the fainter branch extend all the way to Bullialdus and its central peak.



TYCHO AND RAYS
CREDIT: ROGER WARNER

THURSDAY, JULY 13

Tonight the Moon is not only closest to Earth, but rises just as the sky gets dark. We'll only have time for two deep sky studies, so let's make them galaxies! The constellation Draco is filled with them...

First revisit "the Cat's Eye" planetary - NGC 6543, and enjoy a high-power view through improved skies. Move north at low power less than four degrees and breathe west. This is 10.1 magnitude, near edge-on, spiral NGC 6503. Through scopes, this fine, evenly-balanced spiral displays the kind of patterned mottling associated with pinwheel galaxies when viewed face on. If you have trouble locating it, try dropping about a finger-width southeast of faint Psi Draconis.

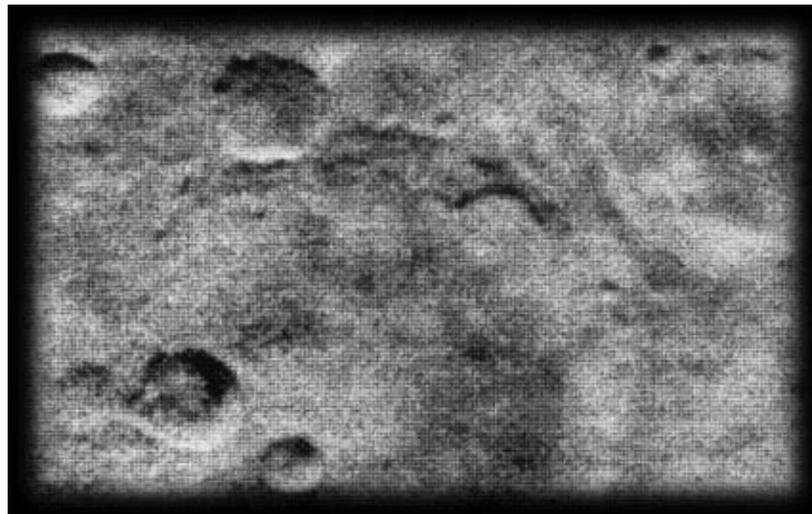
Northeast of Psi is brighter southeast Phi and northwest Chi. Mark the distance between them and continue that same distance northwest beyond Chi for small scope challenge - 11.1 magnitude NGC 6643.

FRIDAY, JULY 14

Today in 1965, Mariner 4 became the first spacecraft to perform a flyby of Mars. Tonight Mars is “flying by” Regulus in Leo. Look for it in binoculars about a hand span above the western horizon just after sunset.

Although the “Red Planet” is around 2.0 magnitude, it’s less than 4 arc seconds in size - making it barely larger than Uranus in a telescope. Meanwhile 5.8 magnitude Uranus follows magnitude 7.8 Neptune above the horizon. Look for them around midnight dancing with the gibbous Moon roughly between them. You can recognize Neptune by its telescopic blue disc, around two finger-widths northwest of Gamma Capricorni and Uranus further east between Lambda and Phi Aquarii. Be sure to check IOTA for information, because the Moon and Uranus will be having a close encounter of the occultation kind on this Universal “date!”

Tonight while waiting for Uranus and Neptune, why not take a binocular sweep of the sky due south of Epsilon Scorpii all the way to the horizon. Although we’ve already made a bit of a study of this region, get a sense of just how rich it is in terms of faint stars and open clusters - a part of the night sky leading southwest into Ara and the exotic constellations of the southern hemisphere Milky Way - Norma, Centaurus, and Crux...



MARINER
4 IMAGE OF MARS
CREDIT: NASA

SATURDAY, JULY 15

With the Moon now well east, let's search out "the God of the Underworld" - Pluto. Right now the solar system's ninth planet lies near a pair of bright stars that should make it easy to track down and follow its motion over the next several days. But before you start, make sure you have access to a telescope able to reveal stars down to magnitude 14.0. Ready to discover Pluto?

Start by drawing a circle on a clean white sheet of paper. Make it large enough to represent the field stop in an eyepiece. Then go out and aim your telescope directly at 3.6 magnitude Xi Ophiuchi. Shift Xi to the north of the eyepiece field and position 10 arc minute distant 5.9 magnitude SAO 160700 in the center of the field. Now shift SAO 160700 to where Xi was located in the eyepiece. Tonight, Pluto should lie somewhere near the center of the eyepiece field and to the east. Make a sketch of all the stars in the field - including SAO 160700. Be sure to come back several nights later and compare your original sketch. The "star" that has moved is Pluto!

SUNDAY, JULY 16

Today in 1850 at Harvard University, the first photograph of a star was made (other than the Sun). The honors went to Vega. In 1994, an impact loomed as nearly two dozen fragments of Comet Shoemaker-Levy 9 sped toward the cloud-tops of Jupiter. The results were spectacular. As fragment after fragment struck Jupiter, parts of the Gas Giant shone as bright as the Sun. Meanwhile very dark footprints were left behind - holes punched through the planet's atmosphere. Although such footprints are no longer visible, take the time to look at Jupiter again. No matter where you observe from, this dynamic planet offers a wealth of things to see - be it the appearance of the "Great Red Spot," or just the ever changing waltz of the Galilean moons.

Just after skydark this evening, three fine globular clusters (M10, M12, and M14) are well placed in the south. Revisit all three with binoculars, then track them down through the scope. Start at Delta Ophiuchi and sweep east a hand span to catch all three. Each globular cluster will look like a round haze condensing toward their centers.



SHOEMAKER LEVY 9 IMPACT AREA
CREDIT: HUBBLE SPACE TELESCOPE

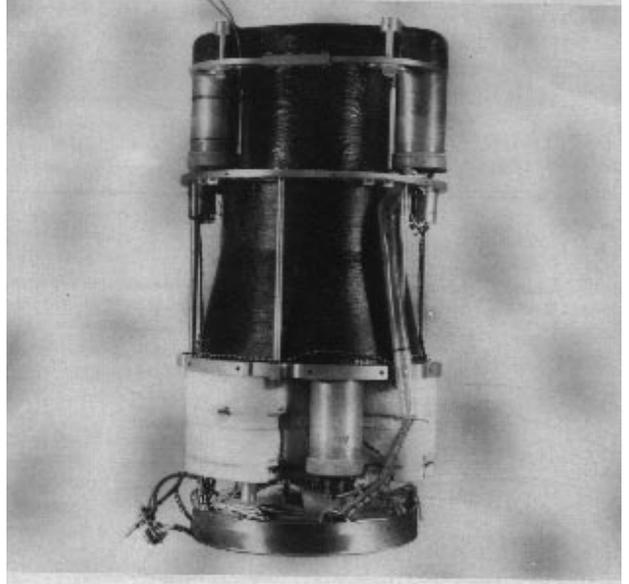
MONDAY, JULY 17

Today in 1963, the Nuclear Test Ban Treaty was signed. The treaty prohibited the detonation of nuclear devices in our atmosphere. To be sure all countries were in compliance, the United States later launched the first gamma ray detectors into orbit. In 1967 these detectors picked up a new discovery - the first of many cosmic gamma ray sources.

As we know most stars begin life in stellar nurseries and end life either alone or in very small groups as doubles or multiple stars. Tonight we can have a look at a group of young stars beginning their stellar evolution and end with an old solitary elder preparing to move on to an even "higher realm." Open cluster IC 4665 is easily detected with just about any optical aid about a finger-width north-northeast of Beta Ophiuchi. Discovered by Philippe Loys de Chéseaux in the mid-1700s, this 1400 light-year distant cluster consists of about 30 mixed magnitude stars all less than 40 million years of age. Despite

its early discovery, the cluster did not achieve broad enough recognition for Dreyer to include it in the late 19th century New General Catalog and it was later added as a supplement to the NGC in the Index Catalog of 1908. Be sure to use low power to so see all of this large group.

About three finger-widths east-northeast of IC 4665 is a study that did make Dreyer's catalogue - NGC 5672. This 9th magnitude planetary is very small - but intense. Like the "Cat's Eye" in Draco, and NGC 6210 in Hercules, this planetary can take a lot of magnification. Those with large scopes should look for a small, round, blue inner core encased in a faint shell. A challenge to find? You bet. Worth the work? Sometimes working for something makes it all the more fun!



THE EXPLORER 11
GAMMA RAY DETECTOR
CREDIT: NASA

TUESDAY, JULY 18



ROHINI 1
(CAN'T FIND
A CREDIT LINE...
PUBLIC IMAGE?)

26 years ago today, India launched its first satellite - Rohini 1 - from the Satish Dhawan Space Center (SDSC), located on Sriharikota Island in the Bay of Bengal. Tonight we'll launch our imaginations as we revisit a lineup of globular clusters now well placed in southern Ophiuchus.

Let's begin with Antares and head around a fist width southeast to locate the first. Viewable in binoculars, M62 is known to be one of a small group of globular clusters having undergone a core collapse. Possibly caused by a central black hole, this mysterious process means that the center of the cluster is far more densely populated than it should be. Look for this influence as you note the peculiar way this irregular Class IV globular brightens toward the core.

Now head about two finger-widths north. Also viewable in binoculars, M19 is intensely blue and displays an extremely elongated core. Like many of its nearby globulars, this Class VIII flattens to the west as a result of tidal actions from the galactic core. This cluster is known to have a large number of "blue stragglers" - bright stars that should have become red giants in the 12 billion since the cluster formed. Although these stars appear to live in perpetual youth they remain blue as a result of a "cosmic face lift" - their outer red atmospheres have been stripped away through gravitational interactions with other nearby stars!

To complete our tour, head 1.5 degrees north to Class IX globular NGC 6284 - then 2 degrees further north for Class VII NGC 6287. Only larger scopes will resolve any stars in this pair, but the faint "mounding" of their glow is quite enchanting to the eye.



M62
CREDIT: SEDS

WEDNESDAY, JULY 19

Today in 1846, Edward Pickering was born. Although his name is not well known, he became a pioneer in the field of spectroscopy. Pickering was the Harvard College Observatory's Director from 1876 to 1919, and it was during his time there that photography and astronomy began to merge. The archive known as the Harvard Plate Collection still remains a valuable source of data.

Tonight let's look at a faint study in Cygnus, part of which was first recognized in 1904 by Willamina Fleming of Harvard College and named for Edmond Pickering. Possessed of three main components - NGC 6960, NGC 6979, and NGC 6992 - these regions are also called the Eastern, Northern, and Western Veil Nebulae. Of the three, the Northern Veil is also distinguished by the name "Pickering's Wedge." At one time these components of the "Cygnus Loop" looked a lot like M1 - the Crab Nebula - but due to greater antiquity have expanded and separated to encompass three degrees of the night sky. Like the Crab, the Cygnus Loop came out of a supernova explosion. This one was located around 1,500 light-years away, and occurred about 20,000 years ago. Such an explosion would have emitted as much light as all the stars in our galaxy!

To study the Cygnus Loop is a serious challenge. Very dark skies, or filters, are essential. Through moonless rural skies, binoculars and small scopes can detect the brighter regions of all three Veils - including the faint Pickering's Wedge. Start at 52 Cygni - located about two finger-widths south of the star marking the eastern wing tip of Cygnus. Look for a broad thread of nebulosity running north of 52 - this is the handle of the "Witches Broom" (NGC 6960). To locate Pickering's Wedge look north-northwest. Look for a faintly glowing triangle of light. Continue east to the brightest portion of the Loop - NGC 6992. At low power, larger scopes will see numerous filaments and projections in this expansive crescent-shaped nebula.



EDWARD PICKERING
CREDIT: MARY LEA
SHANE ARCHIVES/LICK
OBSERVATORY



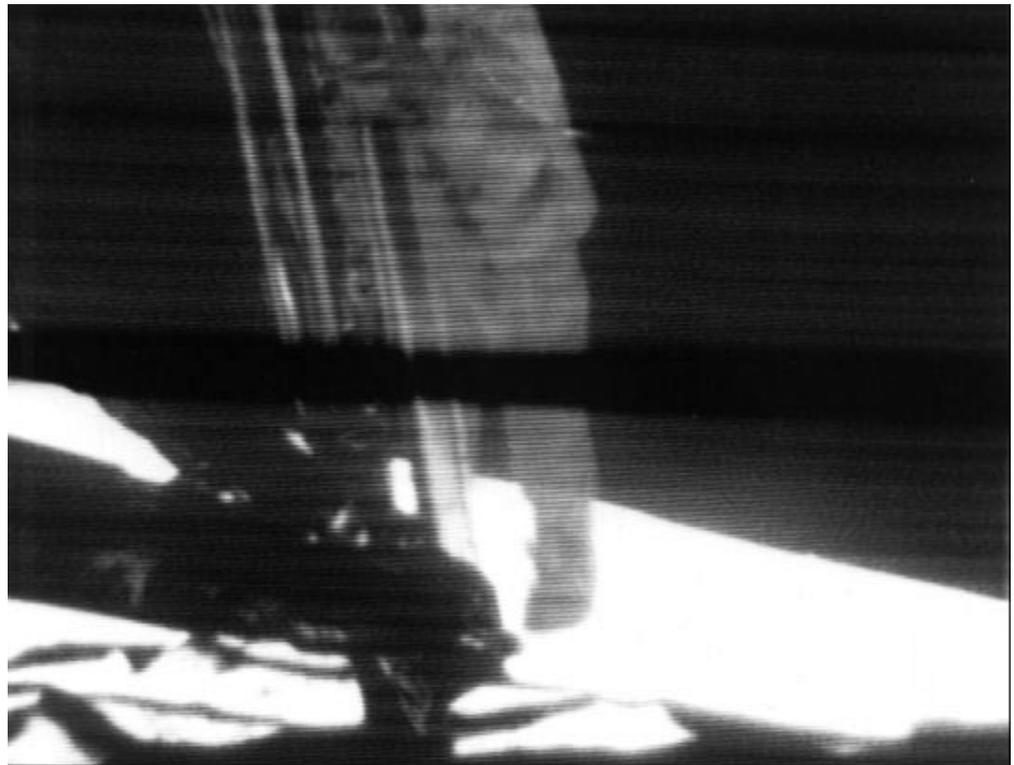
THE "VEIL" NEBULA
CREDIT: STEVE MANDEL

THURSDAY, JULY 20

In the early morning hours, the Moon and the Pleiades are going to be very close. This means a possible grazing event, so be sure to check IOTA for details.

Today was a busy day in astronomical history. In 1969, the world held its breath as Apollo 11's Eagle landed and Neil Armstrong became the first human to leave a footprint on the Moon. In celebration of our very humanity, Armstrong was so moved that he momentarily forgot his speech. The famous words were meant to be "One small step for a man. One giant leap for mankind." That's nothing more than one small error for a man, and a huge success for mankind! Seven years later in 1976, Viking 1 landed on Mars - sending back the first images ever taken from that planet's surface.

While we can't walk on the Moon or land on Mars, we can journey to the furthest planet. Tonight is your last chance to place 13.9 magnitude Pluto in the same field with 5.9 magnitude SAO 160701. So grab your field sketch and check to see which 14th magnitude "star" is no longer visible south-southeast of our marker. Pluto moves surprisingly quick for a 4.7 million kilometer distant world, doesn't it?!



ARMSTRONG'S FIRST
STEP ON THE MOON
CREDIT: NASA

FRIDAY, JULY 21

Tonight's late moon means that we have a chance to revisit the Cygnus Loop then track down the less elusive but equally expansive region of neighboring nebulosity - the North American Nebula.

Under superb conditions, even unaided vision can detect NGC 7000 as a glowing patch in the Milky Way around two finger-widths east-southeast of Deneb. Turn binoculars its way and the true shape of this huge region of luminous gas and dust begins to reveal itself. To fully explore the North American Nebula requires no more than a very small scope... but very dark skies.



NGC 7000: "THE
NORTH AMERICAN NEBULA"
CREDIT: STEVE MANDEL

SATURDAY, JULY 22



FRIEDRICH BESSELL
(WIDELY USED
PUBLIC IMAGE)

Celestial Scenery Alert! Get up early on a weekend? When you see bright Venus so near to a waning Moon... It's worth it!

Tonight we honor the work of Friedrich Bessel, born on this day in 1784. Bessel was a German astronomer and mathematician whose mathematical functions still carry his name. But put away your calculator, because Bessel was also the first person to measure a star's parallax. In 1837, he chose 61 Cygni and the resulting measurement proved to be no more than a third of an arc second. His work ended a debate that stretched back two millennia to Aristotle's time and Greek theories concerning stellar distances.

Named the "Flying Star" in 1792 by Giuseppe Piazzi, 61 Cygni is actually a binary star of magnitudes 5.3 and 6.0 separated by 30 arc seconds. Located roughly between Deneb and eastern wingtip Zeta, look for bright Tau and 61 is a finger-width northwest. Of the visible stars in the night sky, 61 is fourth closest to Earth, with only Alpha Centauri, Sirius, and Epsilon Eridani closer. Just how close is it? Right around 11 light-years. As you observe this double star, keep in mind that Bessel had to somehow detect a shift of 1/100th the pair's separation as the Earth moved from one side of the solar system to another!

SUNDAY, JULY 23

With continuing dark skies ahead, now is a good time to do some serious study in Scorpius. Starting at Theta, move one finger-width south to pick out bright, 6.9 magnitude, 32,000 light-year distant globular cluster NGC 6388. Like many globulars in this region, it's within 10,400 light-years of the galactic core. Easily seen in binoculars, a telescope shows Class III NGC 6388 to be similar to Class II M80. This one is a jewel in the crown of the southern sky!

Return to Theta and head two finger-widths west for the small, but bright, open cluster NGC 6322. Through a small scope or binoculars, this mixed magnitude cluster appears loose, and consists of a triangle of bright stars plus a smattering of dim ones. Larger scopes can resolve several dozen members.

Now for a challenge. Start at Lambda Scorpii and head due east toward 3.3 magnitude G Scorpii. See anything unusual? NGC 6441 is a faint, but intense Class III globular...one that accompanies a bright star!



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MONDAY, JULY 24

Tonight let's go to the other extreme - from the Tail of the Scorpion to the Handle of the Little Dipper. We're going to start answering the question - What's up there anyway?

As we have already explored, our northern Pole Star is not alone. It is mildly variable and the brightest component of a complex multiple star system. Now, aim your binoculars that way for they will reveal a wonderful little nearby asterism that turns this 2nd magnitude star into a "diamond ring." Look for a full-moon sized circlet of 7th and 8th magnitude stars just south of Polaris.

What's the most commonly accessible deep sky study near Polaris? Let's say the long-lived open cluster NGC 188 in Cepheus. Due to its smaller size, and low cumulative brightness (magnitude 8.1), this more than 10 billion year-old "Methuselah Cluster," requires dark skies and at least a mid-sized scope to detect. Look for a faint sheen of light punctuated by a half dozen 12th and 13th magnitude stars some 4 degrees from Polaris in the direction of Alpha Cassiopeia.

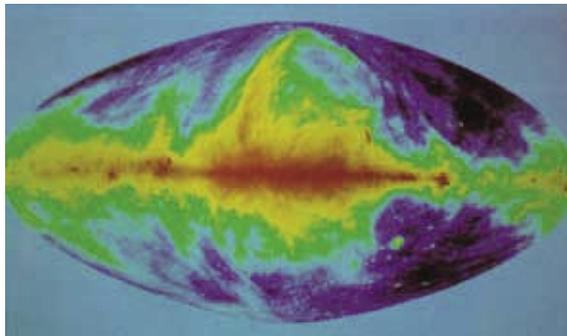


NGC 188
CREDIT: NOAO/AURA/NSF

TUESDAY, JULY 25

It's New Moon and dark skies are ours to explore the summer Milky Way. Tonight would be a good time to find a dark site and just look! Aptly described as "milky," our view of the great galactic pinwheel we call home is based on a location some 26,000 light-years from its very heart. Our solar system is one tiny light within the Orion Spur between the Centaurus and Perseus Spiral arms. When we look toward our galaxy's core, we peer through a great disk at its bulging core region. The center of that expanse is now known to lie about one degree due south of 4.6 magnitude X Sagittarii. Hidden inside is a black hole with the combined mass of some 3.6 million suns - acting as the pivot around which all things galactic turn. To locate X Sagittarii visually, use the tip star of the Sagittarian "teapot" spout (Gamma) and look for it around three finger-widths northwest. Not sure? Try placing the little finger of your right hand on Antares. X is just about a hand span away towards your thumb to the east.

Does "X" mark the spot of anything visible? Two finger-widths south-southwest is 7.2 magnitude open cluster NGC 6425. Large binoculars reveal the cluster as a slightly condensed arc of stars, while scopes resolve a dozen members. Even closer to the galactic core is 8.0 magnitude NGC 6451 between our last study and X. This small open cluster is more densely populated but its brightest members are fainter. Capturable in a small scope, it will require aperture to begin resolution. As you observe this cluster tonight, remember you are looking within 17,000 light-years of the very center of the Milky Way galaxy!



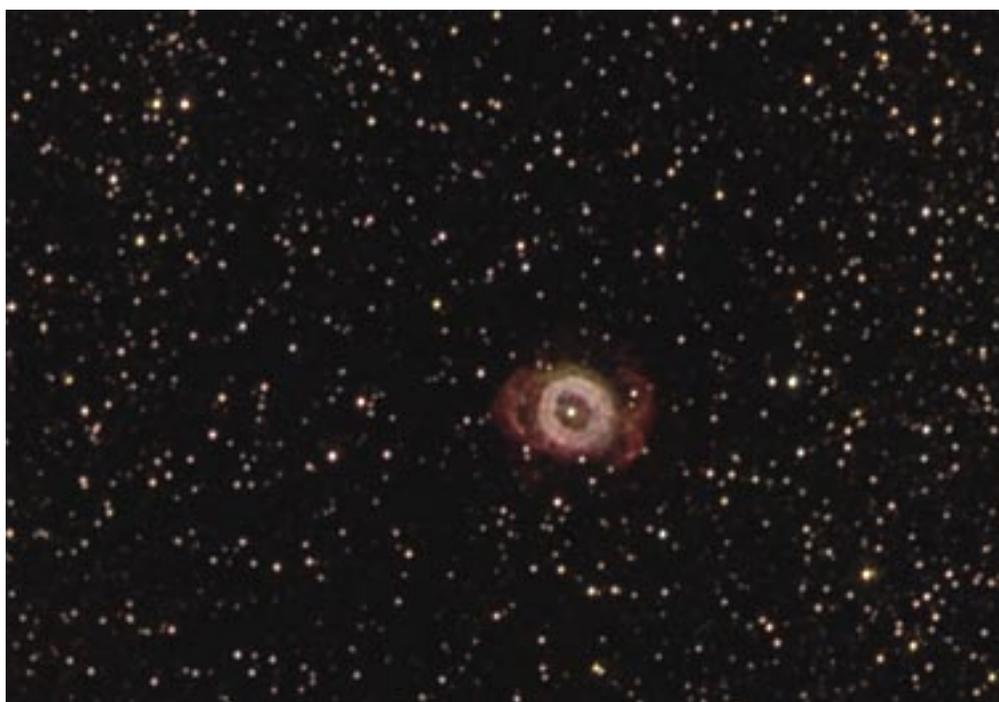
RADIO FREQUENCY VIEW
OF THE MILKY WAY
CREDIT: NASA

WEDNESDAY, JULY 26

While we still have dark skies, let's resume our tour of studies near the galactic core. Return to X and head slightly more than two finger-widths north-northwest for 34,000 light-year distant globular cluster NGC 6401. First seen by William Herschel on May 21, 1784, this "Uncertain Class" globular proved unresolvable and was thought by him to be gaseous - rather than starry - in nature.

A finger-width due west is tonight's challenge - 12th magnitude planetary nebula NGC 6369. Its pinkish color is due to the red filtering of its light by gas and dust in the direction of the galactic core. Visible in small scopes, it will take careful inspection of stars around it to detect this faint annular "Little Ghost Planetary."

Now locate Theta Ophiuchi and head south-southeast less than a finger-width. There you will find small, 9.5 magnitude globular NGC 6355. Discovered by Herschel three days after NGC 6401, this Uncertain Class globular lies within 6,000 light-years of the galactic core and 31,000 light-years from Earth.



NGC 6369:
"THE GHOST NEBULA"
CREDIT: R. JAY GABANY

THURSDAY, JULY 27

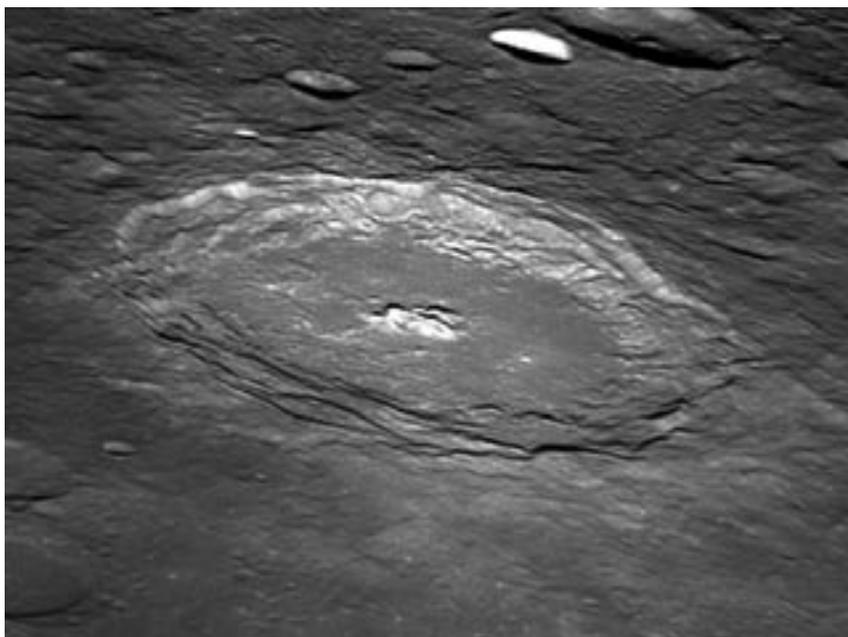
Tonight the tender crescent of the Moon will join the western horizon quickly. Let's take this opportunity to enjoy a warm summer evening and have a look at the lunar edge near the center and see what we can identify. Do you see the beginnings of Langrenus? If so, power up and continue east to look for three rings that get progressively larger as you move toward the limb. These are tiny Barkla, larger Kapteyn with central peak, and La Pérouse. If lunar libration is in our favor, you might even spot diminutive Elmer on the edge!

Now let's head off once more toward the galactic core and continue our tour where "X" marks the spot.

Two globular clusters are found 4 degrees southeast of X Sagittarii but there's a far simpler way to find them. Both are less than a finger-width north-northwest of Gamma Sagittarii - Al Nasl. Do you recognize this pair? The brightest and largest is NGC 6522. Located

25,000 light-years away, this globular is within 2,000 light-years of the center of our galaxy. Its companion - NGC 6528 - is slightly less than 26,000 light-years distant - but is equally close to our galaxy's black hole. This pair was discovered simultaneously by William Herschel on the night of June 24, 1784.

To finish our "X" tour of studies, locate diminutive, but densely packed open cluster NGC 6520. You'll find it less than two finger-widths north of Al Nasl. At 6300 light-years distant, this 8th magnitude open cluster is far closer to us than any globular of comparable magnitude. Look for NGC 6520 and the accompanying dark nebula - Barnard 86. Déjà vu?



LANGRENUS
CREDIT: DAMIAN PEACH

FRIDAY, JULY 28

Tonight the young Moon sets early, so we'll hustle off to revisit a single small globular - M80. Found about two finger-widths northwest of Antares, this little globular cluster is a powerpunch at Class II. Located in a region heavily obscured by dark dust, M80 shines like an unresolvable star in small binoculars



M80
(IN ARCHIVE AS LISTED
AS PUBLIC IMAGE)

and reveals itself to be among the most heavily concentrated globulars through the telescope. Discovered within days of each other by Messier and Méchain in 1781, this intense cluster is around 36,000 light-years distant.

In 1860, M80 became the first globular cluster to contain a nova. As surprised astronomers watched, a centrally located star brightened to magnitude 7 over a period of days to become known as T Scorpii. The event then dimmed more rapidly than expected, making observers wonder exactly what they had seen. Since most globular clusters contain stars of about the same age, the hypothesis was put forward that perhaps they had witnessed an actual collision of stellar members. Given that the cluster contains more than a mil-

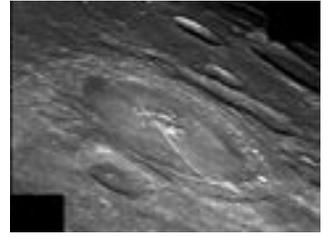
lion stars, the probability remains that some 2700 collisions of this type may have occurred over M80's lifetime.

Now grab a comfortable seat because the Delta Aquarid meteor shower reaches its peak tonight. Not considered especially prolific, the average fall rate is about 25 per hour - but who wouldn't want to catch a meteor every 4 to 5 minutes? These travelers are considered to be quite slow, with speeds around 24 kilometers per second, and they leave yellow trails. One of the most endearing qualities of this annual shower is its broad stream of around 20 days before and 20 days after peak. This allows it to overlap with the beginning stages of the famous Perseids.

SATURDAY, JULY 29

Tonight the Moon will be high enough for us to have a great look at the area just a little southwest of Petavius to identify a small pair of Class I craters, known as Snellius and Stevinus. Power up and notice how these younger craters display much sharper and well defined outlines. If skies are steady, you may spy an odd looking series of confluent craters between the pair and the limb. Showing itself as an odd looking black streak, take pleasure in the fact that you have just identified Class II Hase!

After the Moon sets, revisit the Great Hercules Cluster - M13 - while it remains well placed. Those with very small scopes should avert their vision to detect a dozen or so of the cluster's brightest outlying members well away from its luminous core region. For large aperture, take a very careful look at M13's edge for a dark obscuration known as the "Propeller." Rather than actually being part of this pure population II cluster, it is believed that this dark nebula is between us and the cluster.



PETAVIUS
CREDIT: DAMIAN PEACH



M13: "THE GREAT
HERCULES CLUSTER"
CREDIT: R. JAY GABANY



<http://www.universetoday.com>

SUNDAY, JULY 30

If you are exploring the lunar surface tonight, be sure to look closely along the eastern boundary of Mare Nectaris. The bright cliffs seen there are the Pyrenees Mountains which hold crater Gutenberg in their grasp. Gutenberg has been filled with lava and terribly eroded over its lifetime. Its northeast wall was broken before the lava flow by an impact known as Gutenberg E. The southern edge contains a very unusual mountain-walled enclosure.

Now, relax and enjoy the peak of the Capricornid meteor shower. Although it is hard for the casual observer to distinguish these meteors from the Delta Aquarids, no one minds. Again, face the general direction of southeast and enjoy! The fall rate for this shower is around 10 to 35 per hour, but unlike the Aquarids, this stream produces those great “fireballs” known as bolides. Enjoy...



GUTENBURG
CREDIT: GREG KONKEL

MONDAY, JULY 31

Be sure to check IOTA information for this Universal date...the Moon occults Spica!

Tonight the three rings of Theophilus, Cyrillus and Catherina will be well highlighted as will a previous study - the Altai Scarp. Also to the far south along the terminator you will see Mutus, a small crater with black interior and bright, thin west wall crest. Angling further southwest from Mutus, look for a “bite” taken out of the terminator. This is crater Manzinus.

Once the Moon sets revisit the “King of the Rings” in Lyra! Nicely situated between Gamma and Beta Lyrae, those with larger scopes should look for visible brightening in the interior of the annularity. Power up. It might be your night to catch the central star. Observers with small scopes should to pay attention to an asterism of a half dozen stars that have been christened “The Chalice of the Ring” preceding it across the sky.



M57: “THE RING NEBULA”
CREDIT: R. JAY GABANY



THEOPHILUS, CYRILLUS,
CATHARINA AND
THE ALTAI SCARP
CREDIT: GREG KONKEL

AUGUST 2006



<http://www.universetoday.com>

TUESDAY, AUGUST 1

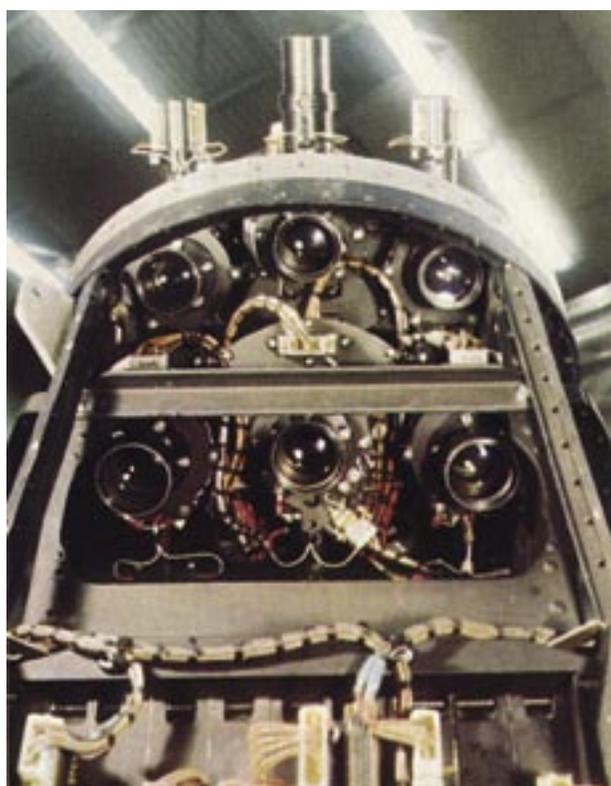
Today is the birth date of Maria Mitchell. Born in 1818, Mitchell became the first woman to be elected as an astronomer to the American Academy of Arts and Sciences. She later gained worldwide fame when she discovered a bright comet in 1847.

Tonight on the lunar surface Mare Tranquillitatis (to the south) and Mare Serenitatis (north) are almost fully disclosed. Look where they meet for the curving arm of Archerusia Promontorium. On the Promontorium's southern tip you'll see the bright ring of crater Pliny. To Pliny's southwest lay the scattered remains of Ranger 6, where it crashed blindly on February 2, 1964. Further southwest and toward the shore of Tranquillitatis is the final resting place of the successful Ranger 8 mission, which took 7137 pictures in its last 23 minutes of flight. Also in the area is the soft-landing site of Surveyor 5 - the first lunar probe to use an alpha particle spectrograph on the soil. So what's the soil made of? Very similar to our own Earth's basalt - a mixture of oxygen, silicon, aluminum and magnesium, with a bit of iron, nickel, calcium, carbon and sodium as well.

Now let's move upward to go "star counting." Turn your attention to Lyra. Can you see all four stars in the Lyre's parallelogram? The sky overhead - despite the waxing Moon - allows you to see stars as faint as magnitude 4.5. Take a look inside the Hercules "Keystone" and see if you can make out any stars. If so, you'd be seeing stars as faint as magnitude 5.4 - but that would be quite an accomplishment under the circumstances. Now locate Corona Borealis between Hercules' "Keystone" and Arcturus. How many stars can you see that are definitely a part of the circlet? You can see 2.3 magnitude Alphecca (Alpha), but how about 3.7 magnitude Nusakan (Beta) or 3.9 magnitude Gamma? Great! Try 4.2 magnitude Theta and Epsilon, but it's getting harder. That's five stars down to magnitude 4.2. Can you see six without aversion? Try holding them all in your direct vision. If you can, you will be seeing stars down to magnitude 4.7. But, if you can see seven stars in the circlet, that would include magnitude 4.9 Iota and be a very decent night with such a Moon. You have now learned how to assess limiting magnitudes!



MARIA MITCHELL
CREDIT: NASA



RANGER 8 VIDICON
TELEVISION CAMERAS
CREDIT: NASA

WEDNESDAY, AUGUST 2



Surveyor 6 took photos and scooped up the Moon's soil for analysis.

SURVEYOR 6
CREDIT: NASA

With the Moon now ending first quarter, this would be an excellent time to look for it in late afternoon skies. This evening, why not take the opportunity to explore the lunar surface with binoculars and look at four very cool features.

Central on the terminator tonight will be Sinus Medii - the adopted “center” of the lunar disc and the point from which latitude and longitude are measured. This smooth plain may look small, but it covers about as much area as the states of Massachusetts and Connecticut combined. On a curious note, in 1930 Sinus Medii was chosen by Edison Pettit and Seth Nicholson for a surface temperature measurement at full Moon. Experiments of this type were started by Lord Rosse as early as 1868, but on this occasion Pettit and Nicholson found the surface to be slightly warmer than boiling water. Around a

hundred years after Rosse’s attempt, Surveyor 6 successfully landed in Sinus Medii on November 9, 1967, and became the very first probe to “lift off” from the lunar surface.

Keep those binoculars handy as we look toward the Northern Cross - otherwise known as Cygnus the Swan. Start at the Swan’s beak - Alberio - and hold the binoculars very steady. Can you make out two stars where you thought there was one? If so, then you are seeing 3.2 magnitude Alberio’s distant companion, but don’t stop with binoculars. Bring out the scope and have another look. The



SINUS MEDII
CREDIT: GREG KONKEL

brighter star is a warm golden yellow and the fainter is a pristine aqua blue. Many astronomers agree this is the premier pair of colors in the heavens!

THURSDAY, AUGUST 3

Tonight let's explore the lunar surface in hopes of catching an unusual event. On the southern edge of Mare Nubium is the old walled plain Pitatus. Power up. On the western edge you will see smaller and equally old Hesiodus. Almost central along their shared wall there is a break to watch for when the terminator is close. For a brief moment, sunrise on the Moon will pass through this break creating a beam of light across the crater floor known as the Hesiodus Sunrise Ray. If the terminator has moved beyond it at your observing time, look to the south for small Hesiodus A. This is an example of an extremely rare double concentric crater. This formation is caused by one impact followed by another, slightly smaller impact, at exactly the same location.

Now that we've seen a double crater, let's have a look at a double star. Center on Delta Cygni - the westernmost star of the "Northern Cross." This particular double is the ultimate resolution challenge for scopes of all sizes. This close, disparate pair pushes the limits. Be sure to power up and hope for a very steady sky.



PITATUS AND HESIODUS
CREDIT: WES HIGGINS

FRIDAY, AUGUST 4

For Skywatchers, be sure to check out Antares and the Moon. A close event for some...an occultation for others! IOTA has the facts for your area.

Tonight let's return to Pitatus and note how the view has changed in just 24 hours. Now barely visible, you can see where this once grand crater's walls vary greatly in height. To Pitatus' south are two twin mountain-walled plains. Let's start by looking at Wurzelbauer to the west. Only when it's near the terminator can you truly see where time has distorted and warped this once grand crater. Its slightly younger neighbor - Gauricus, to the east - will show many marks in its walls from smaller meteor strikes at high power.

Keep that power as we take a look at double star Pi Aquilae. Need help finding it? Start at Altair (Alpha Aquilae) and shift a little more than a finger-width north to Tarazed (Gamma). From Tarazed head a little less than finger-width northeast to find Pi. "Starsplitters" will find two tiny 6th magnitude specks whose centers are separated by a mere 1.4 arc seconds!



WURZELBAUER AND
GARCIOUS NORTH OF TYCHO
CREDIT: ROGER WARNER

SATURDAY, AUGUST 5

Today we celebrate the 76th birthday of Neil Armstrong, the first human to walk on the moon. Congratulations! Also on this date in 1864, Giovanni Donati made the very first spectroscopic observations of comet Tempel (1864 II). The three absorption lines he noticed led to what we now know as the Swan bands, arising from a form of molecular carbon (C₂).

Tonight let's head toward the lunar south as we take a close look at the dark, heart-shaped region Palus Epidemiarum. Caught on its southern edge is the largely eroded Campanus with well defined Cichus to the east and Ramsden to the west. Power up and look carefully at its smooth floors. If conditions are favorable, you will catch Rima Hesiodus cutting across its northern boundary and the crisscross pattern of Rima Ramsden in the western lobe. Can you make out a small, deep puncture mark to the northeast? It might be small, but it has a name - Marth.

Alpha Lyrae is now directly overhead at skydark. Brilliant blue Vega is the fifth brightest star in the night sky. Celebrated in Hollywood's depiction of the Carl Sagan book Contact, most folks know that Vega lies some 26 light-years away. Due to its proximity to Earth, Vega isn't

as brilliant as it appears. Its absolute magnitude (0.5) is slightly fainter than its apparent magnitude (0.03). But, Vega is significantly brighter than our own Sun. If Sol were as distant, it would appear as a star of the 4th magnitude - some 58 times fainter. As a marker star, Vega has two other very significant roles - it is within a few degrees of the apex of the Sun's Way as we move through the Milky Way galaxy and in 12,000 years it will be found within a few degrees of the celestial North Pole! For those with telescopes, look for a faint 10th magnitude companion within 1 arc minute south of Vega.



NEIL ARMSTRONG
CREDIT: NASA



CAMPAUNUS AND MERCATOR
(CENTER IMAGE)
CREDIT: GREG KONKEL

SUNDAY, AUGUST 6

Although the great Gassendi will appear to be the most fascinating crater on the Moon tonight, let's head north for something you ordinarily wouldn't explore. Using Sinus Iridum as a marker, follow the bright moonscape westward



MONS GRUITHUISEN
DELTA AND GAMMA
CREDIT: RICARDO BORBA

to where it reaches into Sinus Roris to the north, Oceanus Procellarum to the west and Mare Imbrium to the south. Our guide feature in this bright, pockmarked area is prominent Mairan. On the very southern tip of this peninsula-like feature, look for two very unusual "domes." Mons Gruithuisen Gamma stands on the eastern edge and a small stretch of grey sand separates it from Mons Gruithuisen Delta to its east.

Tonight let's have a look at the second brightest star of the Summer Triangle - Altair. 16 light-year distant Alpha Aquilae, like Vega, is a - Sirius-type star which is several times the size and mass of our Sun. Such stars

burn hotter at the surface (approaching 10,000 degrees Kelvin) and appear much whiter to the eye as a result. An unusual feature of Altair is its exceedingly high speed of rotation - requiring just six hours to complete an "Altairian day" at the equator. Because of this, its girth is significantly greater than its height as gases on the equator move along at the surprising rate of 150 kilometers per second! As you observe Altair telescopically, look for a 10th magnitude companion roughly three arc minutes to the northwest.

MONDAY, AUGUST 7

Today in 1959, Explorer 6 became the first satellite to return photos of the Earth from orbit.

Tonight let's explore the Earth's natural satellite with binoculars as we view the areas of all the historic Apollo missions. Starting with Apollo 11, you will find its landing site on the southwest corner of Mare Tranquillitatis where it meets with Mare Nectaris. Apollo 12 was near the terminator to the west and just north of the small, bright punctuation of Euclid. Apollo 14 landed due east on the border of Mare Cognitum. Look to the north for shallow Archimedes and the Apennine Mountain range where you will find Apollo 15's site in Palus Putredinus. Look southeast of Apollo 11's site in the rugged terrain west of Theophilus for Apollo 16, and Apollo 17 ends our tour on the southeastern shore of Mare Serenitatis where it joins Mare Nectaris.

This evening, let's round out our exploration of the Summer Triangle with a look at Deneb. Seemingly the faintest of the three bright stars of summer, this one star puts out more light than some globular clusters. With an absolute magnitude of -7.1, Deneb would be among the very first stars resolved out of the combined

light of the entire Milky Way by astronomers living in the Great Andromeda Galaxy. Among earthly astronomers, it is widely believed Deneb is the source of the bulk of the light illuminating the neighboring North American Nebula (NGC 7000). But, Deneb won't last long. With a mass 25 times that of our Sun, its voracious nuclear engine will burn through most of its available hydrogen and helium within 50,000 years, while the intense heat of its core will cause the star's outer shroud to expand hundreds of millions of kilometers into the surrounding space. When this one eventually goes supernova, even 1600 light-years may not be an absolutely safe distance. Afterwards, a second truly superb supernova remnant will join the Veil Complex in Cygnus and future generations of astronomers will contemplate it in great wonder!



EXPLORER 6
CREDIT: NASA



NGC 7000: THE
"CALIFORNIA NEBULA"
CREDIT: STEVE MANDELL

TUESDAY, AUGUST 8

Although the Moon will be very nearly full tonight, we can still look for a lunar feature. On the south limb near the terminator, look for a well defined black ellipse with a highlighted southwest wall. This is Inghirami, and its northeastern section will be quite dark. This high wall will cast a shadow across the grey crater floor towards the terminator.

Now let's revisit 52 Cygni. Located due south of Epsilon, this foreground star to the Western Veil Nebula is also a pretty double whose 8.7 magnitude disparate companion lies some 6 arc seconds east-northeast of the 4.2 magnitude primary. As a challenge for small scopes during the lunacy, try different eyepieces to strike a balance between darkening the sky, and condensing the light of the faint companion.



INGHIRAMI ON
THE TERMINATOR
BELOW SCHILLER
CREDIT : GREG KONKEL

WEDNESDAY, AUGUST 9

Tonight is the Full Moon. During years when the Harvest Moon occurs late in September, this was often referred to as the “Fruit” or “Barley” Moon - a time when both are ripe. While we can trace its bright rays and features tonight, why not try to look for something a bit different?

We often overlook the simple beauty of practicing astronomy without a telescope. This evening as the Sun sets and the Moon rises opposite it, take advantage of some quiet time and really stop to look at the eastern horizon. If you are lucky enough to have clear skies, you will see the Earth’s shadow rising - like a dark, sometimes blue band - that stretches 90 degrees north and south. Look just above the horizon for a Rayleigh scattering effect known by some as the “Belt of Venus.” This beautiful pinkish glow is caused by backscattering of sunlight. As the Sun continues to move west, the boundary between Earth’s shadow and the Venus’ Belt rises higher in the sky and gently blends into the coming night. What you are seeing is the shadow of the Earth’s translucent atmosphere, casting a shadow back on itself.



“BELT OF VENUS”
CREDIT: STEVE MANDEL

THURSDAY, AUGUST 10

Tonight the sky remains bright all evening - but that won't keep us from challenging ourselves on a fine double now high to the south in Sagittarius at sky-dark. Tight, disparate double 21 Sagittarii is less than five degrees due north of Kaus Borealis - Lambda Sagittarii. Because of bright skies, it will take a finderscope to track this 5th magnitude star down. To help single it out, look for Mu Sagittarii 3 degrees to 21's west. Resolution of this 1.9 arc second pair is possible in just about any size instrument, but like other pairs we've visited, this one is disparate. Look for the 5.1 magnitude blue A star's 7.6 magnitude orange companion leading it across the sky.

How about another? Simply swing 3 degrees west to a very challenging multiple star system - Mu Sagittarii! Under the circumstances, this four-star group will need a bit of aperture to see all three faint companions. Ranging in magnitude from 9.3 to 13.5, all members are easily resolved at low magnifications.

If you choose to look at the lunar surface tonight, look for several bright rays extending away from crater Copernicus. Traveling hundreds of kilometers across the surface, each ray is unique.



COPERNICUS RAYS
CREDIT: STEVE MANDELL

FRIDAY, AUGUST 11

On this date 129 years ago, Asaph Hall of the U.S. Naval Observatory unwittingly prepared for an evening of planetary discovery. That night in 1877 would prove to be the first time anyone saw a satellite of Mars! Six nights later, Asaph went on to observe Deimos' partner, Phobos, as well. Since then, we humans have added a few "satellites" to Mars' skies, but Phobos ("Fear") and Deimos ("Terror") are the Red Planet's only two known natural moons. When Hall discovered these two small, irregularly shaped satellites, Mars was riding high in Aquarius less than one month before opposition. However tonight you can only catch Mars trailing the Sun to the west less than an hour after sunset. Look for it as a much diminished 1.8 magnitude "star" in Leo just above the western horizon.

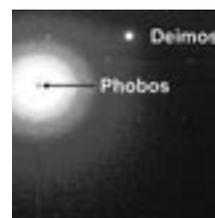
Tonight is the peak of the Perseid meteor shower, but observations will be hampered by the Moon. Despite this, you can improve your chances by putting a tree or building between yourself and the Moon. Let's sit back and talk about the Perseids while we watch...

The Perseids are the most famous of all meteor showers and never fail to provide an impressive display. Records of Perseid activity go back to 36 AD. In 1839, Eduard Heis was the first observer to take a meteor count and discovered the Perseids had a maximum rate of around 160 per hour. Other observers have since continued these studies to find the fall rate varies considerably.

Astronomer Giovanni Schiaparelli was the first to relate the orbit of the Perseids to periodic comet Swift-Tuttle (1862 III). We now know there are four individual streams from the comet's 120 year orbital period. Their peaks occur on different nights around this time - but tonight's stream is the heaviest. This debris enters the Earth's atmosphere at 60 km/sec from the border of Perseus and Cassiopeia. Watch as the radiant swings an arc around Polaris northeast to northwest. The Perseids will be around for a few more days yet, so keep up the watch and make some counts of your own!



ASAPH HALL
(PUBLIC IMAGE)



DEIMOS AND
PHOBOS
CREDIT: NASA

SATURDAY, AUGUST 12

Tonight the Moon rises just as the sky gets dark, but that doesn't mean we can't take scope to sky. Returning to Gamma Sagittarii, use low power to look for 9.2 magnitude globular cluster NGC 6638 to the east-southeast. Like all 9th magnitude globulars, there is little hope of resolving more than a few of the brighter members without using a large telescope.

How about another? If you shift Gamma almost a degree in the direction of NGC 6638 and look north in the low power field you will see something a bit more impressive - mid-sized 6.9 magnitude globular M28. Discovered by Messier on July 27, 1764, this 19,000 light-year distant globular cluster is 60 light-years in diameter. First resolved as a "star cloud" by William Herschel, tonight you might be able to pick out a few of its brightest members.



SUNDAY, AUGUST 13

Don't forget to keep watch for more of the Perseids!

Tonight we'll have about a half an hour of no Moon to use to real advantage. Let's return to Gamma Sagittarii and head less than 3 degrees east-northeast to the spectacular 5.1 magnitude globular cluster M22.

At 10,400 light-years distance, M22 is one of the closest globular clusters to Earth and glows with the combined light of 100,000 suns. Its 100 light-year diameter globe spreads across a full moon's size in professional telescopes. Like most globular clusters, only about half its true apparent size is visible through common equipment, but the view is as expansive as the true apparent size of many other clusters - including the Great Hercules Cluster - M13!

Consisting of numerous stars bright as 11th magnitude, M22 is easily resolved through dark skies into dozens of stars even through the smallest scopes. Like M13, this superb globular appears to have regions where stellar density varies within its form - a mottling effect that can be seen through modest telescopes. Among globulars, M22 is the third brightest in the sky - following Omega Centauri and 47 Tucanae and trailed distantly by nearly sixth magnitude M13 and M5. Southern observers will have little trouble seeing M22 unaided.

After viewing M22 head one degree northwest to visit 8.8 magnitude globular cluster NGC 6642. NGC 6642 is about three times more distant than M22 and lies some 5500 light-years from the galactic core. Intrinsically, NGC 6642 is every bit as luminous as M22!

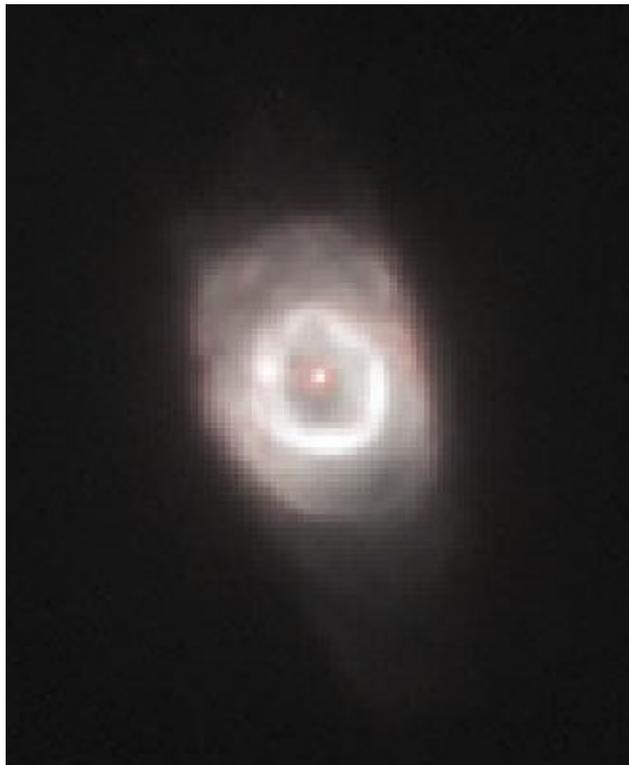


M22
CREDIT: N.A. SHARP/REU
PROGRAM/NOAO/AURA/NSF

MONDAY, AUGUST 14

Are you ready for a real challenge? Then look no further than planetary nebula NGC 6790 in Aquila. Hope for a really still sky, because this tiny planetary will need it to catch your observing eye. Try using a nebula filter in a mid-power eyepiece for a “before and after” approach to distinguish this 10th magnitude planetary from neighboring 10th magnitude stars. To find it, center on Delta Aquilae, and drop almost two degrees south, then a bit west. If you’re on the planetary it will be near the middle of the 100X field. Install the filter and note which star doesn’t lose its luster.

No filter? Then try again on a fine night of excellent sky stability and inspect every star closely at twice the magnification. Once you find this tiny sky gem, don’t forget to congratulate the navigation and subtle study skills you have acquired in your observing!



NGC 6790
CREDIT: HOWARD BOND
(ST SCL) NASA

TUESDAY, AUGUST 15

With early dark skies, let's take a look at a bright star cluster equally fine in binoculars and telescope - M39.

Located about a fist-width northeast of Deneb, you will easily catch a couple dozen members in a triangular pattern through binoculars. M39 is particularly beautiful because its brightest components seem almost three dimensional against a backdrop of fainter members. Younger than the Coma Berenices cluster, and older than the Pleiades, this loose, bright galactic cluster is some 800 light-years away. Its members are all main sequence stars, the brightest of which are beginning to mature into red giants.

For more of a challenge, look no further than Sadr - the 2.3 magnitude crux star in the middle of the Northern Cross. Once centered at low power, shift Sadr half a degree north to get a view of the two dozen fainter stars of smallish NGC 6910. Notice the Y-shaped pattern of its brighter members!



M39
CREDIT: HEIDI SCHWEIKER
/NOAO/AURA/NSF

 **UNIVERSE TODAY**
<http://www.universetoday.com>

WEDNESDAY, AUGUST 16

Tonight we have over an hour of dark before moonrise, so let's head south to study a pair of fainter globular clusters in Sagittarius. At low power, locate Delta - the northeastern star of the "spout." Going southeast a little less than a degree will reveal 8.3 magnitude, highly condensed NGC 6624.

To locate our next study, use Delta and Gamma (Al Nasl) to form the base of an equilateral triangle with the point to the south. At low power you will see slightly fainter NGC 6569. To complete our tour of the region, be sure to revisit NGC 6522 and NGC 6528 within a degree northwest of Al Nasl.

All these globular clusters were discovered by William Herschel in June 1784. Of the four, NGC 6522 and NGC 6528 are within 2000 light-years of our galactic core.

Now watch as the Moon and the Pleiades rise together...



NGC 6522 AND NGC 6528
CREDIT: NOAO/AURA/NSF

THURSDAY, AUGUST 17

Tonight at skydark, look for the constellation of Telescopium. Its three main stars were named by Abbé Nicolas Louis de Lacaille during a trip to the Cape of Good Hope during the years 1750-1754. Let's have a look at the brightest star of a constellation that commemorates all telescopes. To find Alpha Telescopium, start at Epsilon Sagittarii and look about a fist-width south. Once you've found Alpha, look a little less than a degree east in binoculars for visual double Delta 1 and 2.

Now hop 4 degrees northeast to revisit globular cluster NGC 6541. This splendid southern sky study will appear as a large faint globular with a bright star to the northeast.



NGC 6541
CREDIT: IPAC/2MASS
IMAGE

FRIDAY, AUGUST 18



NORMAN LOCKYER
(PUBLIC DOMAIN IMAGE)

On this day in 1868, Norman Lockyer became the first astro-chemist to see helium absorption lines in the Sun's spectrum. The element helium is the second most abundant in space and we can see a helium rich star tonight by revisiting Alpha Telescopii - an example of a helium diffusion star. Located some 250 light-years from Earth, it shines with the luminosity of nearly 900 suns - but unlike our Sun, a significant proportion of its light is emitted by excited helium in the star's 18,400 degree Kelvin photosphere!

Now let's look west-northwest from Alpha Telescopii a little more than 5 degrees to locate the very faint glow of 9.2 magnitude globular cluster NGC 6496. Look for 5th magnitude star SAO 228562 that accompanies it.



CONTINUOUS SPECTRUM
CREDIT: NASA

SATURDAY, AUGUST 19

Born today in 1646 was the self-educated English astronomer John Flamsteed. Despite a rather difficult childhood, Flamsteed's passion for observing led him to become First Observer at the Royal Observatory where his catalog of 3000 stars became the most accurate of the time. Flamsteed numbered stars in accordance with their right ascension location in the sky - rather than by relative brightness (Bayer's method). Flamsteed numbers are still in use today and capture stars down to the 6th magnitude. If you're up early this morning, you can see the lunar crater named for Flamsteed as a large, faint ring east of crater Grimaldi in the Oceanus Procellarum.

Also born on this day, but in 1891, was Milton Humason. A colleague of Edwin Hubble at Mts. Wilson and Palomar, Humason was instrumental in measuring the faint spectra of galaxies, which in turn provided evidence for the expansion of the universe.

Tonight let's honor Flamsteed and Humason while challenging ourselves by having a look at an 11.1 magnitude galaxy - NGC 6951. This superb face-on barred spiral will show nothing more than a bright fuzzy core in small scopes. Mid-sized instruments will reveal two faint bars extending east-west, and larger scopes should look for faint spiral extensions winding outward from the two bars. To find NGC 6951, locate 4 Cephei, then head south-southwest less than a degree.



JOHN FLAMSTEED
(PUBLIC DOMAIN IMAGE)



SHARDA JOGEE (YALE)
WIYN/NOAO/AURA/
NSF - COPYRIGHT WIYN
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SUNDAY, AUGUST 20



COLLINDER 399:
"BROCCHI'S CLUSTER"
CREDIT: SEDS

Have you caught Mercury yet? Then try looking at Saturn this morning with binoculars. They'll be wonderfully close!

Tonight is the peak of the Kappa Cygnid meteor shower. With the Moon comfortably out of the way for most of the evening, keep an eye on the radiant near Deneb. The average fall rate is about 12 per hour and includes some fireballs. Be sure to continue the watch over the next several nights as this shower continues for next two weeks!

Normally, we'd go galaxy hunting on a dark night such as this, but how about if we explore the wonderful world of low power? Start by locating magnificent M13 and move 3 degrees northwest. What you will find is a splendid loose open cluster of stars known as Dolidze/Dzimselejsvili (DoDz) 5 - and it looks much like a miniature of the constellation Hercules. Just slightly more than 4 degrees to its east and just about a degree south of Eta Herculis is DoDz 6, which contains a perfect diamond pattern and an asterism of brighter stars resembling the constellation of Sagitta.

Now we're going to move across the constellation of Hercules towards Lyra. East of the "keystone" is a tight configuration of three stars - Omicron, Nu, and Xi. About the same distance separating these stars northeast you will find DoDz 9. At low power, you'll see a pretty open cluster of around two dozen mixed magnitude stars. Now look again at the "keystone" and identify Lambda and Delta to the south. About midway between them and slightly southeast you will discover the stellar field of DoDz 8. This last is easy - all you need to do is know the beautiful red/green double, Ras Algethi (Alpha). Move about 1 degree northwest to discover the star-studded open cluster DoDz 7. These great open clusters are very much off the beaten path and will add a new dimension to binocular and fast-telescope observing.

Now let's try two more open star cluster studies found easily with large binoculars or a low power scope. The first is a rich beauty lying in the constellation Vulpecula, but is easier found by moving around 3 degrees southeast of Beta Cygni. Known as Stock 1, this stellar swarm contains around 50 or so members of varying magnitudes and could become a real favorite. The next is an asterism known as the "Coat Hanger," (also known as Brocchi's Cluster, or Collinder 399). Let the colorful double star Alberio be your guide as you move about 4 degrees to its south-southwest. You will know this cluster when you see it, because it really does look like a coat hanger!

MONDAY, AUGUST 21

If you're up early, be sure to look for the Moon and Venus gracing the pre-dawn skies.

Have you seen any Kappa Cygnid meteors yet? Tonight the fall rate drops off, but be sure to follow the trails of any you do see with binoculars. Now let's head towards more unusual open clusters - this time in Cygnus. Starting with Gamma Cygni, locate a loose cluster involving Gamma, Do (Dolidze) 43. Now shift two degrees southwest to pick up Do 42 as well. Don't confuse Do 42 with nearby M29 though, for the two look very similar. For fans of the "Double Cluster" in Perseus, you'll like the next pairing! Shift another half degree southwest along the body of Cygnus to pick out Do 40 and Do 41. This pretty pair can be placed in the same low power field. By moving another half degree due west, you'll find highly populated Do 39 and that, too, is a double treat. The brighter clump of stars in the same low power field is IC 4996.

Now for two bright open clusters. The first, Ruprecht 173 is about a degree northwest of Epsilon Cygni. You'll truly appreciate this heavily populated star cluster! The next is as easy as identifying the constellation of Lyra. Just southeast of bright Vega is a wonderful double for binoculars, Delta 1 and 2 - the easternmost most two stars in the lyre. This bright pair is part of an open cluster known as Stephenson 1.



THE CONSTELLATION
OF CYGNUS
CREDIT: NASA

TUESDAY, AUGUST 22

Just before dawn, watch as the last sliver of the Moon slips past both Mercury and Saturn.

With very dark skies tonight, let's take this opportunity to visit a deepsky



M8
NOAO/AURA/NSF

study that's great in telescopes and binoculars. Are you ready for another swim in the "Lagoon?"

Easily located about three finger-widths above the tip of the teapot's spout (Al Nasl), M8 is one of Sagittarius' premier objects. This combination of emission/reflection and dark nebula only gets better as you add an open cluster. Spanning a half a degree of sky, this study is loaded with features. One of the most prominent is a curving dark channel dividing the area nearly in half. On its leading (western) side you will note two bright stars. The southernmost of this pair (9 Sagittarii) is thought to be the illuminating source of the

nebula. On the trailing (eastern) side, is brightly scattered cluster NGC 6530 containing 18 erratically changing variables known as "flare stars." For large scopes, and those with filters, look for small patches of dark nebulae called "globules." These are thought to be "protostar" regions - areas where new stars undergo rapid formation. Return again to 9 Sagittarii and look carefully at a concentrated portion of the nebula west-southwest. This is known as the "Hourglass" and is a source of strong radio emission.

WEDNESDAY, AUGUST 23

Tonight is New Moon and time for us to have a look at one of the summer's most curious galaxies - NGC 6822. This study is a telescopic challenge even for skilled observers. Set your sights roughly 2 degrees northeast of easy double 54 Sagittarii, and have a look at this distant dwarf galaxy bound to our own Milky Way by invisible gravitational attraction...

Named after its discoverer (E. E. Barnard - 1884), "Barnard's Galaxy" is a not-so-nearby member of our local galaxy group. Discovered with a 6" refractor, this 1.7 million light-year distant galaxy is not easily found, but can be seen with very dark sky conditions and at the lowest possible power. Due to large apparent size, and overall faintness (magnitude 9), low power is essential in larger telescopes to give a better sense of the galaxy's frontier. Observers using large scopes will see faint regions of glowing gas (HII regions) and unresolved concentrations of bright stars. To distinguish them, try a nebula filter to



NGC 6822:
"BARNARD'S GALAXY"
CREDIT: LOCAL GROUP
GALAXIES SURVEY
TEAM/NOAO/AURA/NSF

enhance the HII and downplay the star fields. Barnard's Galaxy appears like a very faint open cluster overlaid with a sheen of nebulosity, but the practiced eye using the above technique will clearly see that the "shine" behind the stars is extragalactic in nature.

Now look less than a degree north-northwest to turn up pale blue-green NGC 6818 - the "Little Gem" planetary. Easily found in any size scope, this bright and condensed nebula reveals its annular nature in larger scopes but hints at it in scopes as small as 6". Use a super wide field long-focus eyepiece to frame them both!

THURSDAY, AUGUST 24

With little or no Moon to interfere tonight, let's try for another quest - M20.

Located a finger-width above earlier study M8, the "Trifid" nebula appears initially as two widely spaced stars - one of which is a low power double



M20:
THE "TRIFID" NEBULA
CREDIT: NOAO/AURA/NSF

- each caught in its own faint lobe of nebulosity. Keen eyed observers will find that the double star - HN 40 - is actually a superb triple star system of striking colors! The 7.6 magnitude primary appears blue. Southwest is a reddish 10.7 magnitude secondary while a third companion of magnitude 8.7 is northwest of the primary.

Described as "trifid" by William Herschel in 1784, this tri-lobed pattern of faint luminosity broken by a dark nebula - Barnard 85 - is associated with the southern triple. This region is more brightly illuminated due to the presence

of the star cluster and is suffused with a brighter, redder reflection nebula of hydrogen gas. The northern part of the Trifid (surrounding the solitary star) is fainter and bluer. It shines by excitation and is composed primarily of doubly ionized oxygen gas. The entire area lies roughly 5000 light-years away.

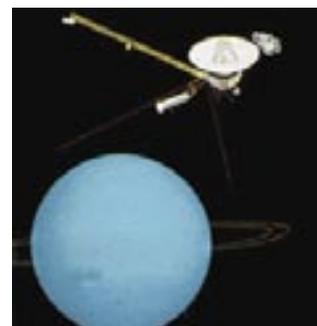
What makes M20 the "Trifid" nebula, are the series of dark, dissecting dust lanes meeting at the nebula's east and west edges, while the southernmost dust lane ends in the brightest portion of the nebula. With much larger scopes, M20 shows differences in concentration in each of the lobes along with other embedded stars. It requires a dark night, but the Trifid is worth the hunt. On excellent nights of seeing, larger scopes will show the Trifid much as it appears in black and white photographs!

FRIDAY, AUGUST 25

Somewhere out there, the Moon is furthest from Earth, but not so far away from Mars. Be sure to check IOTA for occultation events.

On this date in 1981, Voyager 2 made a fly-by of Saturn. Eight years later in 1989, Voyager 2 went on to fly by Neptune on this same date. Why don't we make a "date" tonight to have a look at this distant world? Tonight you'll find Neptune's 7.8 magnitude blue disk a little more than a degree northeast of Iota Capricorni.

With little Moon to interfere, let's have a look at a great binocular target and treasure trove for the telescope - M24. To locate M24, head about four finger-widths north of Lambda Sagittarii. Often referred to as the "Small Sagittarius Star Cloud," this vast region is easily seen unaided from dark sky sites and displays a profusion of faint stars in binoculars. Telescopes will find a dense, but unresolvable galactic cluster - NGC 6603 - embedded near its northeastern border. For those seeking a challenge, look for the Barnard Dark Nebula - B92 - just north of the central region.



VOYAGER PASSING NEPTUNE
CREDIT: WORLD BOOK
ILLUSTRATORS/NASA

SATURDAY, AUGUST 26

If you're up before dawn this morning, be sure to look for Venus and Saturn very close to one another.

Did you spot the slender crescent Moon tonight just after sunset? Then



M6
CREDIT: MARK HANNA
AND N.A. SHARP/REU
PROGRAM/NOAO/AURA/NSF

be glad it's gone early as we say farewell to the favorites of the southern Milky Way. Start at G Scorpii and neighboring 7.4 magnitude globular cluster NGC 6441. Head a little more than 2 degrees due north to large and brightly scattered open cluster M7. Shift slightly northwest and include neighboring 10th magnitude globular NGC 6453 in the same low power field. Be sure to visit less than four degrees northwest for the lovely arching loops of "Butterfly" cluster - M6!

Centering on Gamma Sagittarii, go north 6 degrees to find the billowing lobes of the Lagoon Nebula and the

"Strawberry Cluster" - NGC 6530. Less than 2 degrees north-northwest brings you to the subtle lobes of the Trifid Nebula - M20. From M20 shift a little less than 6 degrees north-northeast to enter the open magical window of the



M11
CREDIT: N.A. SHARP/REU
PROGRAM/NOAO/AURA/NSF

Small Sagittarian Star Cloud and be sure to catch the faint sheen of open cluster NGC 6602 within it. Less than three degrees north-northeast reveals the gentle "Swan Nebula" floating effortlessly on the ocean of deep space. Perhaps the "Swan" sees the subtle "Eagle" gliding overhead less than three degrees north. Look for its attendant open cluster of stars - M16.

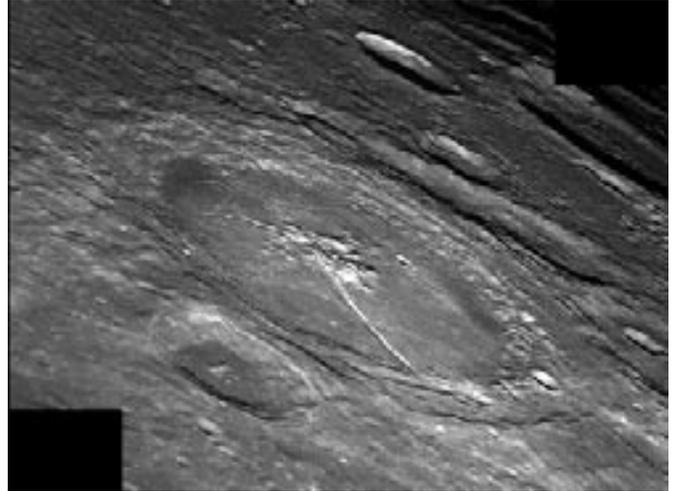
And for last, the densely populated open cluster M11. The "Wild Duck" cluster soars about a fist's width northeast of M16. Dominated by a single 8th magnitude star, this conically-shaped 3,000 member assembly of stardust easily resolves into innumerable stars with any significant amount of magnification. Through intermediate aperture, this 6000

light-year distant, 250 million year old cluster takes on a new form as several hundred 13th and 14th magnitude members begin to spill outside its V-shaped bounds! Discovered by Gottfried Kirch of Berlin observatory in 1681, the cluster was first noted as stellar by William Derham in the first third of the 18th century. Charles Messier added it to his catalog May 30, 1764.

SUNDAY, AUGUST 27

Tonight the Moon sets by skydark, but if you're looking for a lunar challenge, return to crater Petavius about one-third the way up from the southern cusp just after sunset. This ancient crater is a wonderland of detail when lying on the terminator. Look for its rugged walls interrupted by crater Wrottesley to the northwest and elongated Palitzsch southeast. If conditions are stable, power up to look for a massive, multi-peaked central mountain region, along with a deep scar - Rima Petavius - cutting diagonally across the wavelike floor.

When the Moon has set, look for the southern Crown - Corona Australis. Its hidden jewel is 7.3 magnitude, 28,000 light-year distant globular cluster NGC 6723. Discovered on June 3, 1826 by James Dunlop of New South Wales, Australia, NGC 6723 can be best found by heading less than 7 degrees due south of Zeta Sagittarii. This mid-sized cluster gives a surprising view, but if you're more north, best catch it at its highest.



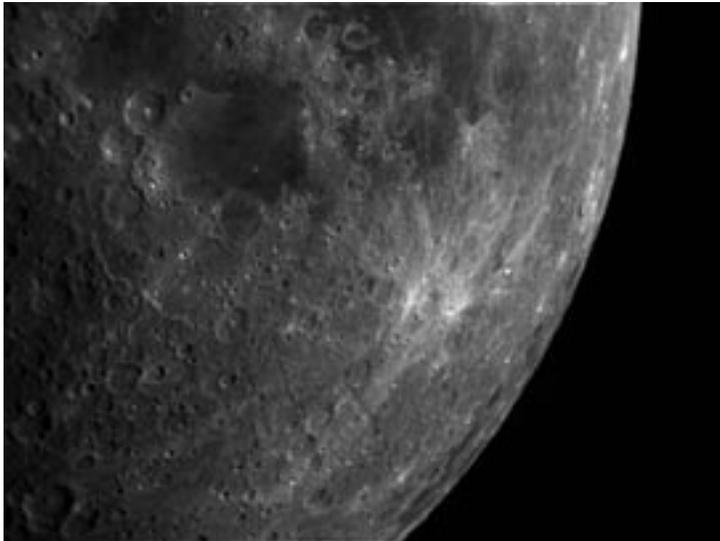
PETAVIUS
CREDIT: DAMIAN PEACH



NGC 6723
CREDIT: DAVID MALIN/
ANGLO-AUSTRALIAN
OBSERVATORY

MONDAY, AUGUST 28

On this day in 1789, William Herschel discovered Saturn's moon - Enceladus. The ringed planet is barely skimming the horizon to the east just before sunrise



FURNERIUS
CREDIT: ROGER WARNER

with brilliant Venus. Be sure to check IOTA as well, for the Moon and Spica will perform an occultation tonight.

Although we have traveled this road before, let's go further south than last night's lunar study and have another look at Furnerius. Shallower and less impressive than Petavius, Furnerius will fade to obscurity as the Moon waxes. This flooded old crater has no central peak, but a much younger crater has punched a hole in its lava-filled floor. Look for the long "crack" extending from Furnerius' north shore to crater rim.

Perhaps it was caused by the impact? Sharp-eyed observers with good conditions and high power will also spot a multitude of small craters within and along Furnerius' walls. For binocular viewers, try spotting crater Stevinus to the north and Fraunhofer to the south.



M26
CREDIT: HILLARY MATHIS
AND VANESSA HARVEY/REU
PROGRAM/NOAO/AURA/NSF

Tonight the Moon sets just as the sky gets dark and presents a fine opportunity to continue our ascent along the Milky Way. Let's start with a quick look at M11 almost precisely between 3.5 magnitude Lambda Aquilae and 4.1 magnitude Alpha Scutum. At low power it's possible to get the "Big Picture" of this fine example of a dense Milky Way cluster in northern hemisphere skies. Range through all your eyepieces to bring out more and more stars as the background sky darkens and resolution improves.

After you find the one eyepiece that gives M11 the best view, shift over to Alpha Scutum and check east-northeast for neighboring 7.8 magnitude open cluster NGC 6664. Compare the view to Scutum's other Messier open cluster - similar sized M26. As one of the faintest Messier clusters, it's surprising his scope was able to reveal it at all! To locate M26 shift a little less than 3 degrees south-southeast of Alpha. Those with larger scopes should look for a strange void in the middle of the cluster.

TUESDAY, AUGUST 29

Need some astronomical inspiration? Then just have a look at the Moon and Jupiter caught together tonight in the starry sky.

On the lunar surface, head to the eastern shore of Mare Nectaris to catch an easily noticed broken black line. This is the western flank of the Pyrenees Mountains which stretch close to 350 kilometers north to south. The black line you see is a good example of a lunar scarp, a feature more like a cliff than a true mountain range. This scarp ends to the north in crater Guttenberg. Just south of Guttenberg, you will find high contrast Santbech.

The Moon is now becoming the “highlight” of the night sky. Try using “higher power” to diminish some of its glare. While southwestern Sagittarius is also high, why not observe some of its other globular clusters?

Center the scope on Epsilon and sweep less than 3 degrees north-northeast to find small 7.7 magnitude globular M69. M69 gives an appearance similar to that of other compact clusters - such as M28 and M80. Small and moderately bright, it appears coarsely textured through smaller instruments and requires larger scopes to bring out its brightest 14th magnitude members. This cluster sits near a blue 7th magnitude star which complicates seeing M69 through binoculars and finderscopes.

Now head a little more than a degree southeast, then north of a pair of 6th magnitude stars to locate NGC 6652 - a very small 9th magnitude globular. Go less than 2 degrees northeast to find brighter (8.1 magnitude), larger M70. Notice how more of M70’s light is concentrated in its core than M69. Continuing a little more than 3 degrees in the direction of Zeta we encounter M54. Through a modest scope, this 7.7 magnitude globular is small, very blue, and intensely concentrated at the core. Larger amateur instruments will only bring out a few 15th magnitude members out of this globular’s faintly glowing form.

Charles Messier discovered M69 and M70 on August 31, 1780 from Paris while trying to confirm a discovery made by Lacaille using a half-inch spyglass in South Africa. These two globulars lie within 2,000 light-years of each other and less than 30,000 light-years from Earth. Due to unusual richness in metal content -for astronomers, “metals” are any elements other than hydrogen and helium- M69 may be a relatively young cluster. At some 90,000 light-years, M54 is the most distant Messier globular cluster - and may not be a globular at all - but the core of a dwarf galaxy beyond the bounds of the Milky Way! In fact M54 is intrinsically larger (300 light-years in diameter) and brighter (magnitude 10.1) than any other globular within the Milky Way itself.



M69
CREDIT: REU PROGRAM/
NOAO/AURA/NSF



M70
CREDIT: REU
PROGRAM/NOAO/AURA/NSF

WEDNESDAY, AUGUST 30

On the lunar surface tonight, we'll return to identify Metius, Fabricus and Jansen to the south. Southwest of this trio you will see a sharply defined small crater known as Vlacq. Power up to resolve its small central mountain peak.



M29
CREDIT: HILLARY MATHIS/
NOAO/AURA/NSF

Angling off to the west and extending westward is multiple crater Hommel. Look especially for Hommel A and Hommel C which fit nicely and precisely within the borders of the older crater. Note how many individual craters make up its borders. Just north of Hommel is Pitiscus and to its south is Nearch.

Tonight with the Moon in Libra and low to the southwest, deepsky studies will still continue to only be mildly hampered. The main study for tonight will definitely improve once the Moon sets - so while we're waiting, let's drop by open cluster M29 less than 2 degrees south-southeast of Gamma Cygni. At lower power, or through small scopes, its handful of brightest members makes this 6.6 magnitude open cluster look more like an asterism than a real group. Lacking any sense of a core, higher power and larger scopes will bring out another dozen or so stars. Those with binoculars will enjoy seeing a few of M29's brightest stars against a vague nebulosity.



M55
CREDIT: HILLARY MATHIS/
NOAO/AURA/NSF

Now let's see what the "I" can "C"... Less than 2 degrees southwest of M29 (just south of 5th magnitude P Cygni) lies another open cluster of similar brightness and size to M29 - IC 4996. How do these two compare? The less conspicuous IC 4996 lies in a richer Milky Way field and consists of fewer and more compact bright stars. Smaller scopes see this one as a patch of nebulosity.

Now for M55. Found in the far reaches of eastern Sagittarius, and west-southwest of Zeta, M55 is one of the coarsest globulars known. At magnitude 7.0, M55 can be seen as a large pale ghost of luminosity in binoculars or finderscopes. This is one very open globular cluster! A multitude of fine, easily resolved stars spread oblately over the mid-power field. Long exposure photos show this to be a true globular glowing with the combined light of almost 100,000 suns.

THURSDAY, AUGUST 31

Watch as the Moon and Antares slow dance together tonight. Be sure to check IOTA for an occultation...

Tonight's prominent lunar features are also Astronomical League challenges. Look southwest of previous study Theophilus for the huge form of Maurolycus. Its cratered floor may be either partially lit or fully disclosed depending on your observing time. Note especially Maurolycus' multiple central mountains. North of Maurolycus you will see the well-eroded remains of Gemma Frisius. Its broken walls will show well under current illumination. Finally look carefully for crater Goodacre which has destroyed Gemma Frisius' northern wall.

Tonight we begin entering the stream of the Andromedid meteor shower, which peaks off and on for the next couple of months. For those in the northern hemisphere, look for the lazy "W" of Cassiopeia to the northeast. This is the radiant - or relative point of origin - of the stream. At times, this shower has been known to

be spectacular, but let's stick with an accepted fall rate of around 20 per hour. These are the offspring of Beila's Comet, one that split apart leaving radically different streams. The Andromedids have a reputation for red fireballs with spectacular trains, so watch for them in the weeks ahead.

If you decide to take the scope out tonight, now would be an excellent opportunity to revisit your southern summer sky favorites!



MAUROYCUS
CREDIT: WES HIGGINS

SEPTEMBER 2006



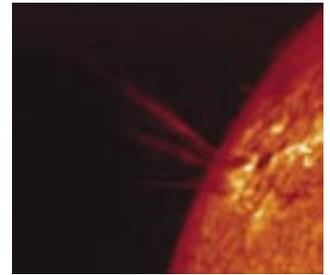
<http://www.universetoday.com>

FRIDAY, SEPTEMBER 1

In 1859, solar physicist Richard Carrington observed the first flare ever recorded. Naturally enough, an intense aurora followed the next day. 120 years later in 1979, Pioneer 11 made history as the first probe to fly by Saturn.

Tonight the waxing Moon will be above the Scorpion's tail. Its most notable features will be the vast area of craters dominating the south-central portion near and along the terminator. Now emerging is Ptolemaeus - just north-north-east of Albategnius. This large round crater is a mountain walled plain filled with lava flow. With the exception of interior crater Ptolemaeus A, binoculars will see it as very smooth. Telescopes however can reveal faint mottling in the surface of the crater's interior, along with a single elongated craterlet to the northeast. Despite its apparent uniformity, close inspection has revealed as many as 195 interior craterlets within Ptolemaeus! Look for a variety of interior ridges and shallow depressions.

With the moon low to the southwest, we have a chance to go northeast to Cepheus for a new study - NGC 7160. At magnitude 6.1, this small open cluster is easily identified in scopes and may be seen as a faint starfield in binoculars. You'll find it about a finger-width north of Nu Cephei.



SOLAR FLARE
CREDIT: NASA



PTOLEMAEUS, ALPHONSUS
AND ARZACHEL
CREDIT: ROGER WARNER



ARTIST CONCEPT
OF PIONEER 11
ENCOUNTERING SATURN
CREDIT: NASA



<http://www.universetoday.com>

SATURDAY, SEPTEMBER 2

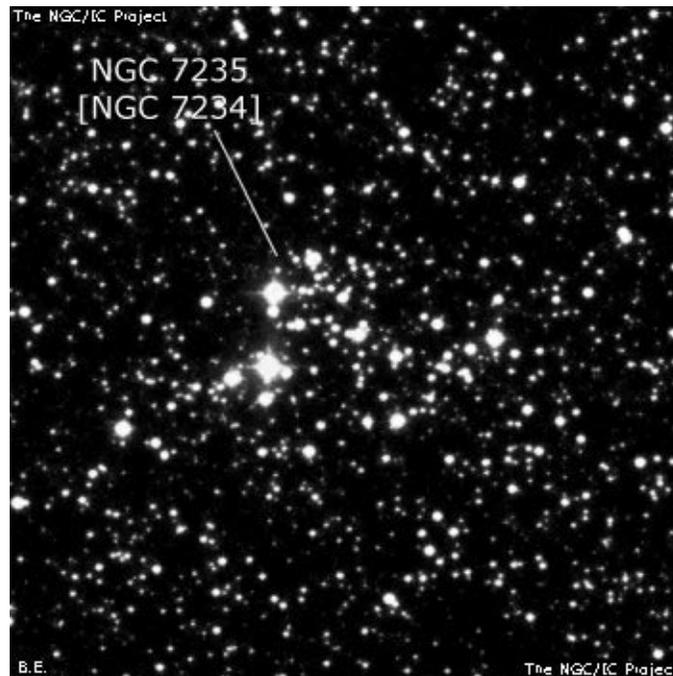


DESLANDRES AND HELL
CREDIT: TAMMY PLOTNER

On the lunar surface tonight, we'll start by following the southward descent of large crater rings Ptolemaeus, Alphonsus, and Arzachel to a smaller, bright one southwest named Thebit. We're going to have a look at Hell...

Just west of Thebit and its prominent A crater to the northwest, you see the Straight Wall - Rupes Recta - appearing as a thin, white line. Continue south until you see large, eroded crater Deslandres. On its western shore, is a bright ring that marks the boundary of Hell. While this might seem like an unusual name for a crater, it was named for an astronomer - and clergyman!

Once you've been to Hell, let's go to the heavens for NGC 7235. Locate the star crowded area of Epsilon Cephei which will also include this 7.7 magnitude open cluster in the same low power field. Give it a try. Look for a small, rectangular assortment of 10th magnitude and fainter stars west-northwest of Epsilon.



NGC 7235
NGC/IC PROJECT
(PERMISSION PENDING)



<http://www.universetoday.com>

SUNDAY, SEPTEMBER 3

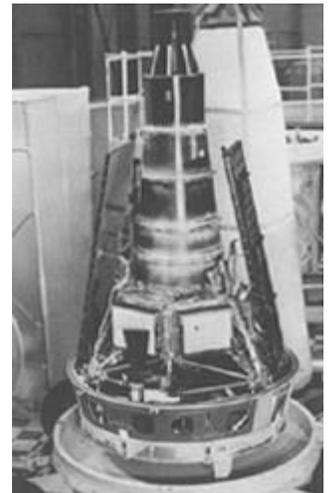
Today in 1976, the Viking 2 lander successfully touched down on Mars. By today's technological standards, the type of equipment aboard Viking 2 would be considered antiquated, so why don't we visit a couple of "antique" lunar features tonight?

Due south of mighty Copernicus on the eastern edge of Mare Cognitum, you will see a ruined pair of flattened craters. They are Bonpland and Parry - with Frau Mauro just above them. The smallest and brightest of these ancient twins is the eastern Parry. Have a look at its south wall where a huge section is entirely lost. It was near this location that Ranger 7 ended its successful flight in 1964. Just south of Parry is another example of a well-worn Class V crater. See if you can distinguish the ruins of Guericke. Not much is left save for a slight U-shape to its battered walls. These are some of the oldest visible features on the Moon!

If you'd like to head for something very young, have a look at 6.8 magnitude open cluster NGC 6811 in Cygnus. This mid-sized, unusually dense open cluster is found less than finger-width north-northwest of Delta - the westernmost star of the Northern Cross. Like most open clusters, the age of NGC 6811 is measured in millions, rather than billions, of years. Visible in binoculars on most nights, telescopes should show a half dozen or so broadly-spaced resolvable stars overlaying a fainter field. Be sure to return again on a moonless night, and have another look a disparate double Delta!



VIKING 2
CREDIT: NASA



RANGER 7
CREDIT: NASA



FRA MAURO -
CREDIT: WES HIGGINS



<http://www.universetoday.com>

MONDAY, SEPTEMBER 4

Tonight let's head towards the lunar north and take another look at the Juras Mountains surrounding the lovely and peaceful "Bay of Rainbows" - Sinus Iridum. This semi-circle of tall peaks could be the remains of a gigantic crater wall. It is speculated the area may have been caused by an impact from an enormous planetoid on a low angle of approach - with the material moving like a tidal wave across the surface. While exploring the Montes Juras, look for crater Bianchini in their midst.

Tonight let's view a double star, Eta Lyra. Just on the edge of unaided visibility, you will find it around three finger-widths due east of Vega. This wide, disparate pair of 4.5 and 8.0 magnitude stars should be resolvable in just about any scope, but is beyond the reach of binoculars.



SINUS IRIDUM
CREDIT: GREG KONKEL

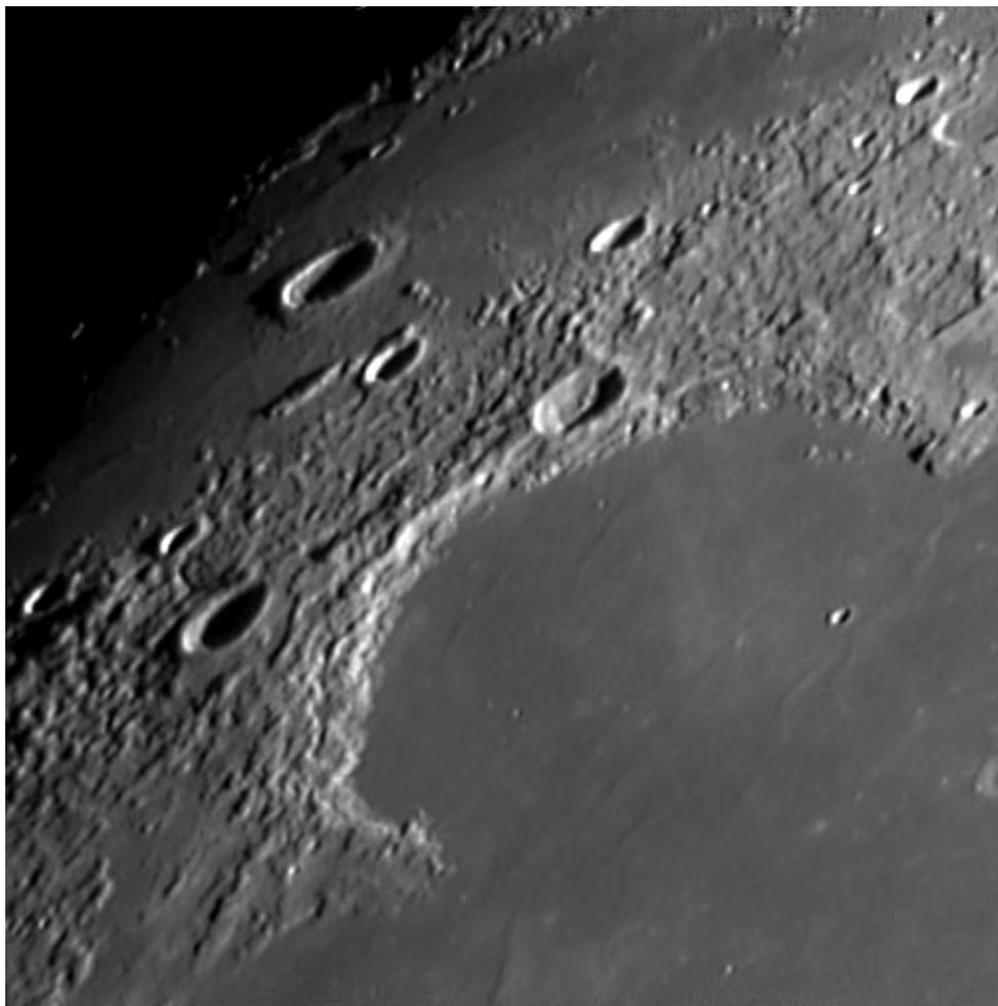
TUESDAY, SEPTEMBER 5

While the graceful Gassendi will try to steal the lunar show tonight, let's have a go at Foucault instead. To find it, head north to Sinus Iridum and locate Bianchini in the Juras Mountains. Just northeast, and near the shore of south-eastern Mare Frigoris, look for a bright little ring.

Physicist Jean Foucault played an instrumental role in the creation of today's parabolic mirrors. His "Foucault knife edge test" made it possible for opticians to test mirror curves for optical excellence during the final phases of shaping before metallization. Thanks to Foucault's insight, we can turn our telescopes on such difficult double stars as Beta Delphini and resolve its 0.6 arc-second distant 5.0 magnitude companion. A challenge for smaller scopes is MU Cygni. This 4.5 and 6.0 magnitude pair should be resolvable in any scope that passed Foucault's test!



JEAN LEON FOUCAULT
(WIDELY USED
PUBLIC IMAGE)



CRATER FOUCAULT
CREDIT: RICARDO BORBA



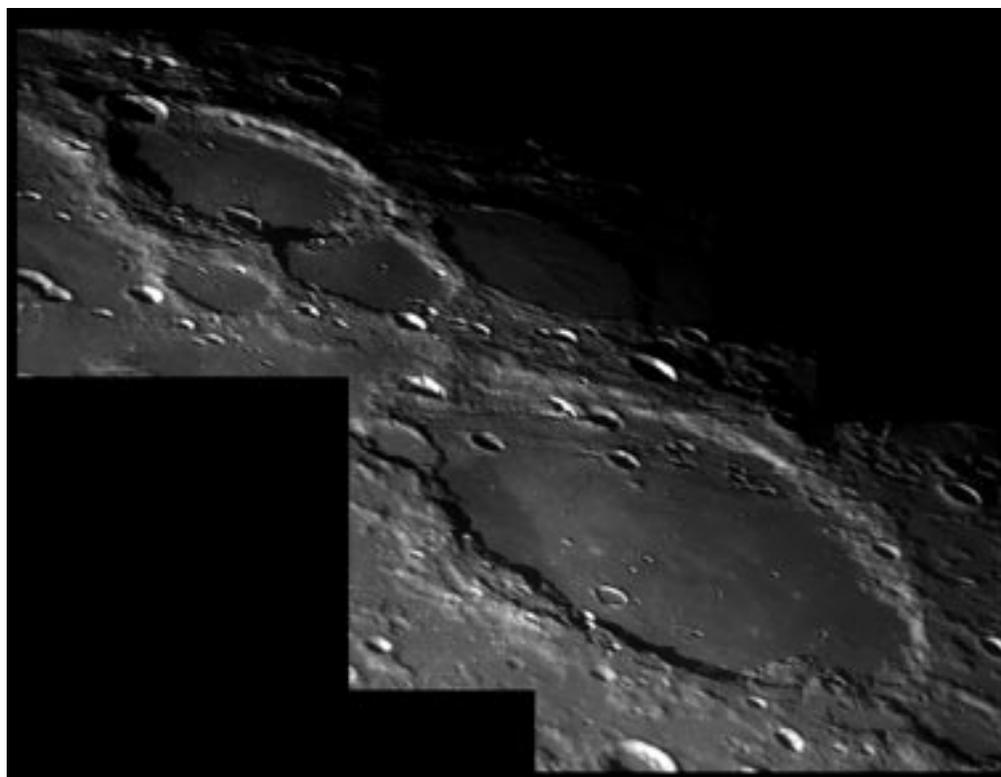
<http://www.universetoday.com>

WEDNESDAY, SEPTEMBER 6

Today celebrates the founding of the Astronomical and Astrophysical Society of America. Started in 1899, it is now known as the American Astronomical Society.

Tonight's lunar journey is on the south shore of Mare Humorum where we encounter the grand crater Shickard. Truly this is one huge mountain-walled plain! Shickard's deeply stained floor is so convex that if you were to stand in the center, you could not see the crater walls.

This evening we bid farewell to the "Rival of Mars" - Antares. We know that it is a red giant and we know that it is not alone, but did you know that Antares' true rival is brighter Betelgeuse? Photometric measurements show that more massive Betelgeuse is slightly redder than Antares. Fortunately, the "Rival" does reside along the ecliptic plane allowing us many opportunities to see it accompany other solar system objects.



SCHICKARD
CREDIT: DAMIAN PEACH

THURSDAY, SEPTEMBER 7

It's Full Moon. Many cultures refer to this one in particular as the "Corn Moon" because this time of year most corn crops are ready for harvest.

Tonight let's harvest some bright lunar features as we trace the ray system of Tycho in the lunar south. Look for the bright points of Kepler and Aristarchus to the northwest quadrant. In the east, dazzling crater Proclus will light up the western shore of Mare Crisium. Just north of central, look for the two bright rings of Manlius and Menelaus.

For viewers in Australia, Asia, Europe and Africa, you will also have a partial lunar eclipse. Only the edge of the Moon will actually enter the umbral shadow, but even the penumbral event is very worthwhile to watch. Be sure to check the pages of "Mr. Eclipse" - Fred Espenak - for detailed times and information. Wishing you clear skies!



LUNAR RAYS
FROM PROCULUS
CREDIT: ROGER WARNER

FRIDAY, SEPTEMBER 8

Today in 1966, a legend was born as the television program *Star Trek* premiered. Created by Gene Roddenberry, its enduring legacy inspired several generations to an interest in space, astronomy, and technology. Its five-year mission still airs - along with numerous movie and series sequels. May *Star Trek* continue to “live long and prosper!”

While the Moon essentially appears to be full throughout the night, take the time to compare the western and eastern limbs. To the west, you will see the smooth arc no longer displays high contrast features. To the east you should see a broken edge now in sunset. Watch in the days ahead as many of your favorite craters begin to reveal themselves in a “different light.”

Tonight let’s visit Alya. One of the fainter stars to receive a proper name, Theta Serpens Caput is located around a hand span due east of Beta Ophiuchi. Thankfully, resolving this wide, matched magnitude pair is easier than finding it. If you have high power, self-stabilizing binoculars, this one could be real fun!

See a shooting star while out? It could belong to the Piscid meteor stream reaching a peak of around 5 meteors per hour. This branch of the Piscids is a rather unstudied, unusual, and diffuse stream that is active all month and favors southern hemisphere observers.



SATURDAY, SEPTEMBER 9

It won't be long until the Moon lights the skies, so let's have a look at disparate double Kappa Pegasi. It's the westernmost star of northern Pegasus and is around a hand span southeast of Sadr - the central star of the Northern Cross. At magnitude 4.3, look for a faint companion leading the orange-yellow primary across the sky. This one could be tough for small scopes - so make a challenge of it!

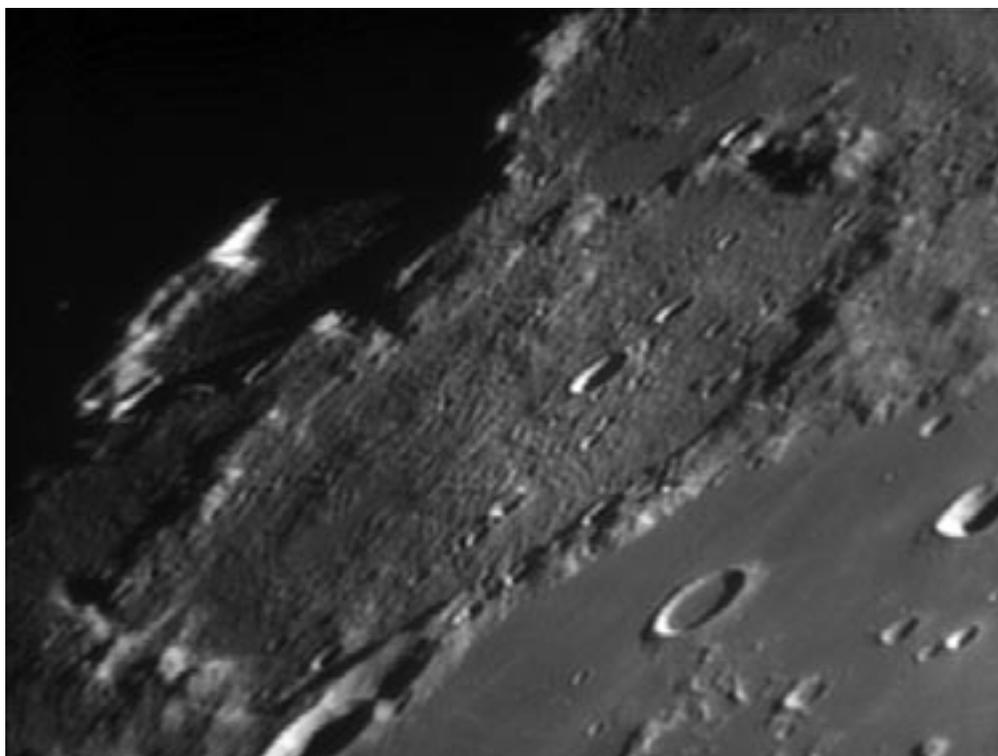
On this day in 1839, John Herschel froze time by making the very first glass plate photograph - and we're glad he did. His photo was of his father William's famous 40-foot telescope in Slough, England. The scope had not been used in decades and was disassembled shortly after the photograph was taken. Later in 1892, on this same day, Edward Emerson Barnard was busy at Lick Observatory discovering Jupiter's innermost moon - Amalthea.

If you're out tonight after the Moon rises, you can spot crater J. Herschel north of Sinus Iridum on the south shore of Mare Frigoris. Look for a large, shallow crater with small Horrebow caught along its southwestern edge.

For those who like "space oddities," be sure to check out Jupiter tonight. There will be a very curious alignment of its moons!



JOHN HERSCHEL'S
FIRST PICTURE
CREDIT: SCIENCE MUSEUM
OF LONDON



CRATER J. HERSCHEL
CREDIT: DAMIAN PEACH

SUNDAY, SEPTEMBER 10



JAMES E. KEELER
(WIDELY USED
PUBLIC IMAGE)

Today is the birthday of James E. Keeler. Born in 1857, Keeler was a pioneer in the field of spectroscopy and astrophysics. In 1895, he noted different areas of Saturn's rings revolve at different velocities. This proved the rings were not solid, but rather a collection of smaller particles traveling in independent orbits.

Tonight there's only a short time before moonrise, so let's have a look at Beta and Gamma Lyrae - the lower two stars in the "Harp." Beta is actually a quick change variable dropping to less than half the brightness of Gamma every 12 days, but for a few days the two stars appear to be of near equal brightness. Beta is a very unusual eclipsing spectroscopic binary. Its unseen companion may be a "collapsar."

Now head a finger-width north of Omicron Andromedae for 15 Lacertae. Just on the edge of unaided visibility, this carbon star is also a disparate double. The 5.2 magnitude variable primary will appear more red at its faintest, but its 11.0 magnitude companion is the faintest of all!

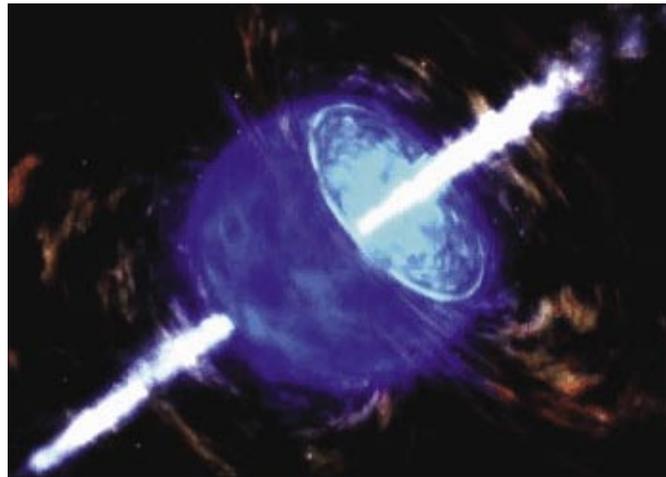


ILLUSTRATION
OF A COLLAPSAR
CREDIT: NASA

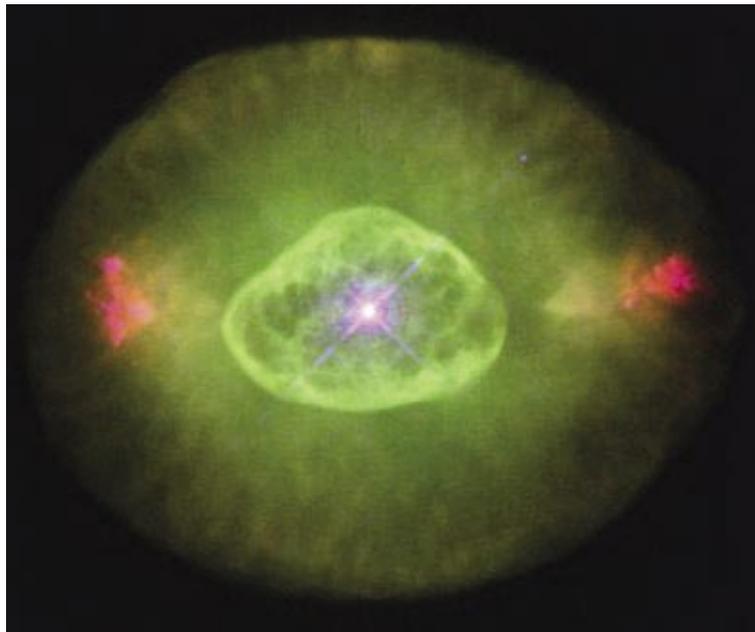
MONDAY, SEPTEMBER 11

Today celebrates the birthday of Sir James Jeans. Born in 1877, Jeans was an astronomical theoretician. During the early 20th century, he worked out the fundamentals of gravitational coalescence, contributing significantly to our understanding of the formation of solar systems, stars, and galaxies.

With the Moon out of the picture early tonight, let's head to northwestern Cygnus and the "Blinking Planetary" - NGC 6826. This 10th magnitude nebula is joined by a matched magnitude central star. The result is eye confusion. When you look at the star, the nebula brightens due to slight aversion, and when you look at the nebula, the star brightens by the same optical effect. Check it out for yourself. Find the pair of stars marking the Swan's western wing tip - Kappa and Iota. Extend the line between them continuing south east the same distance and you'll find it easily northeast of Theta. Enjoy!



SIR JAMES JEANS
(WIDELY USED
PUBLIC IMAGE)



NGC 6826
CREDIT: B BALICK,
J. ALEXANDER
(UNIVERSITY OF
WASHINGTON),
ET AL, NASA

TUESDAY, SEPTEMBER 12



LUNA 2
CREDIT: NASA

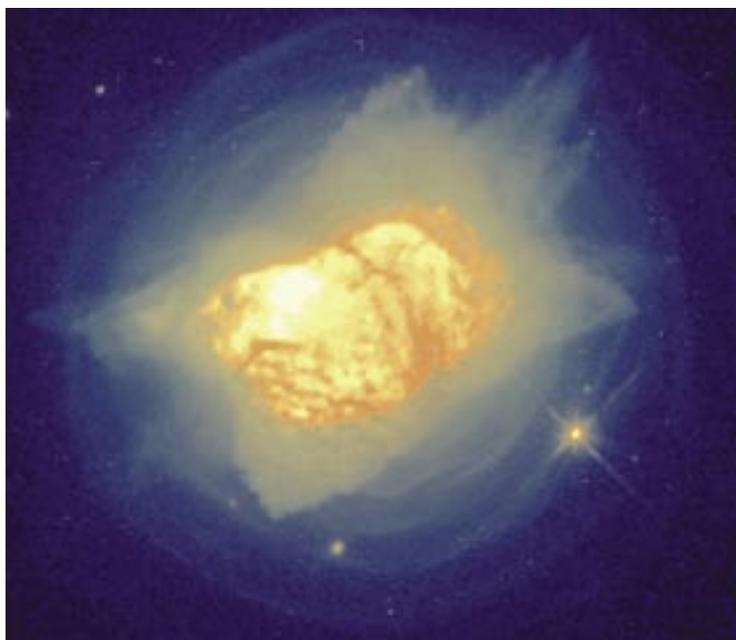
With early skydark, let's have a look at another planetary in Cygnus - NGC 7027. This one is as bright as the "Blinking," yet contains no central star. You'll find it about three finger-widths southeast of Deneb and about half that distance northeast of Nu. Power up and pay attention to the irregular shape of this planetary. How would you describe it?

Now let's look at the most splendid planetary nebula in the night sky for the small scope or binoculars - the "Dumbbell Nebula." M27 is unquestionably the brightest study of its kind. Easily located around a finger-width north of Gamma Sagittae, it's not the largest of all planetaries but is the largest of its kind on the Messier list. M27's expanse and luminosity suggest that it is quite close

to our own system. Appearing like a pale green apple core, we'll be back to visit this one later!

Today in 1959, the USSR's Luna 2 scored a hit as it became the first manmade object to strike the Moon. Let's continue to enjoy the warm summer evening as Luna and its comrade - the Pleiades - rises and have a look at its successful landing area in Paulus Putredinus.

The most outstanding lunar feature tonight is mid-placed Copernicus. From Copernicus head northeast to Eratosthenes - caught on the "tail" of the Apennine Mountains. Trace the curve of the Apennines northeast to locate prominent Archimedes - with smaller craters Aristillus and Autolycus to the east. South of this pair, and trapped along the mountain range, is a dark grey, heart-shaped area known as the "Rotten Swamp" - Paulus Putredinus. Look for the Apollo 15 landing site near Mons Hadley on the swamp's northeastern shore. More than a decade before Apollo 15, Luna 2 landed in the region between southern Autolycus and Archimedes. *Spaseba!*



NGC 7027
CREDIT: NASA

South of this pair, and trapped along the mountain range, is a dark grey, heart-shaped area known as the "Rotten Swamp" - Paulus Putredinus. Look for the Apollo 15 landing site near Mons Hadley on the swamp's northeastern shore. More than a decade before Apollo 15, Luna 2 landed in the region between southern Autolycus and Archimedes. *Spaseba!*

WEDNESDAY, SEPTEMBER 13

Tonight we have more than an hour of skydark to return for another look at M27.

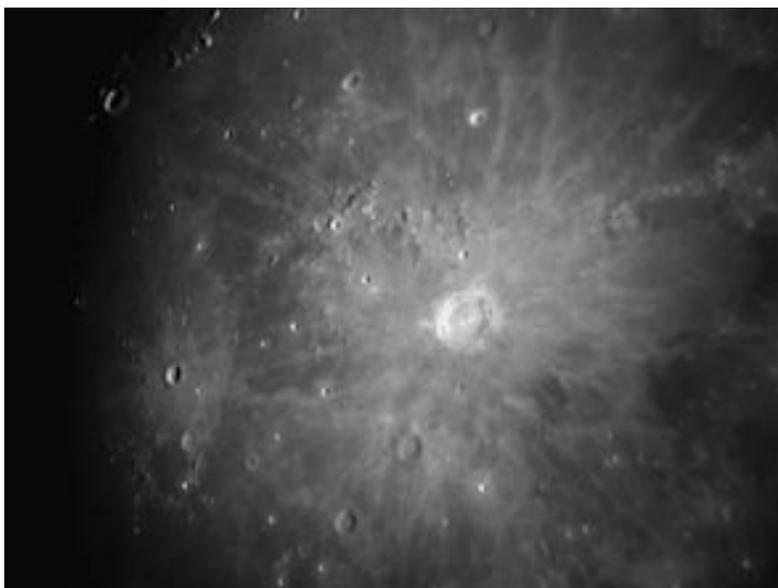
A fascinating aspect of this planetary is its “living” quality - something apparent in even modest scopes. Several factors, such as light passing through this 1000 light-year distant cloud, make it seem to subtly shift in orientation. There are also a number of faint stars whose light seems to waiver and flux as they come to the edge of resolution. The central star, magnitude 13.5, may be a source of polarized light - creating an intense magnetic field. Whatever the source of the effect, observers agree with Burnham. “The observer who spends a few moments in quiet contemplation of this nebula will be made aware of direct contact with cosmic things; even the radiation reaching us from the celestial depths is of a type unknown on Earth...”

Today in 1922, the highest air temperature ever recorded on the surface of the Earth occurred. The measurement was taken as Libya burned at a blistering 136°F, but did you know that the temperatures in the sunlight on the Moon double that?

If you’re out when the Moon rises tonight, then let’s take a look at a sunlit feature as we head for the bright point of crater Euler. Beginning toward the north in the Mare Imbrium region, look for this small, but conspicuous, crater near the terminator. Euler is roughly the same size as two craters to the east - Lambert and Pytheas - but has a noticeably higher central peak. If the timing is right, you may be able to see the peak of Mons Vinogradov peeking above the terminator to the west.



M27
CREDIT: BILL SCHOENIG
AND NIGEL SHARP/NOAO/
AURA/NSF



CRATER EULER
TRIANGULATING WITH
COPERNICUS AND KEPLER
CREDIT: GREG KONKEL

THURSDAY, SEPTEMBER 14

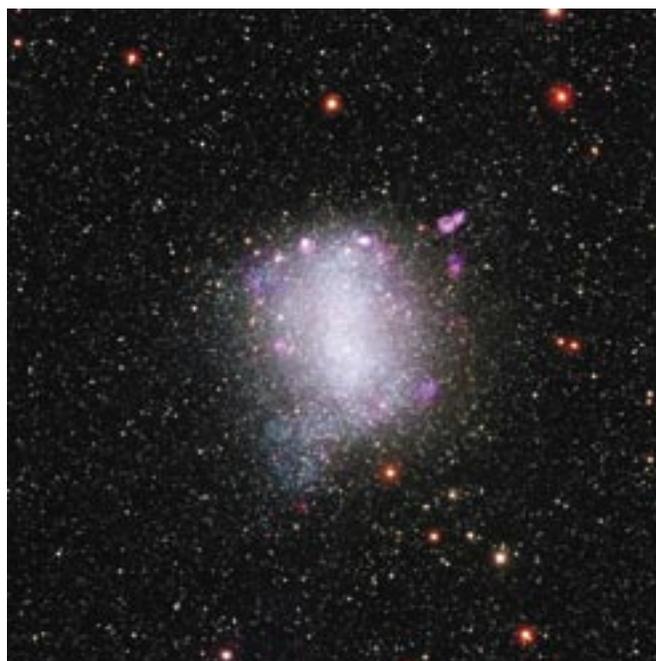
Early evening dark skies mean a great opportunity to view the “Little Gem Planetary” and “Barnard’s Galaxy” slightly less than a fist width west of Beta Capricorni.

At lowest power in large scopes, the pair can be spotted together in the same field. The blue/white NGC 6818 will be north of a large, faint shimmer of a 1.7 million light-year distant dwarf galaxy - NGC 6822.

If you’d like to try something new, return to M27 and head 2 degrees west-northwest to find NGC 6830. This rich 7.9 magnitude, cross-shaped open cluster is a real treat. Continue another 2 degrees in the same direction to pick up 7.1 magnitude cluster NGC 6823. Those with large telescopes should look for a faint sheen of nebulosity associated with this youthful open cluster!



NGC 6818
CREDIT: MITCH AND
MICHAEL DYE/NOAO/
AURA/NSF

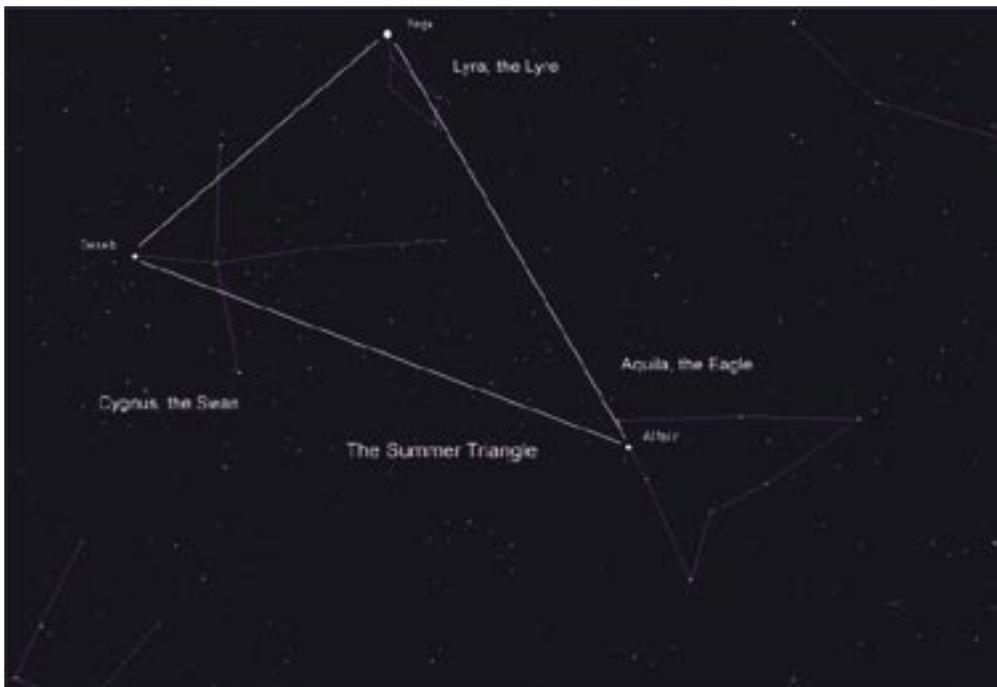


NGC 6818
CREDIT: MITCH AND
MICHAEL DYE/NOAO/
AURA/NSF

FRIDAY, SEPTEMBER 15

Tonight at skydark look for Mercury and Mars having a close conjunction. For observers in the northern hemisphere, look for the “Summer Triangle” overhead. Bright, blue Vega is now beginning its descent while Deneb approaches mid-sky. Close, bright Altair is reaching its highest point to the south. Overhead you will see eight bright stars - Sadr, Delta, Epsilon, Alberio, Deneb, Tarazed, Zeta and Altair. Lying on your back, with your head toward Polaris, it’s time to use your imagination and discover a large asterism called “The Sword in the Stone.”

Telescopically, you can find small densely populated 7.8 magnitude open cluster NGC 6834 near the very center of this image set in stars. Visible as a faint splotch in binoculars three finger-widths northeast of Alberio, most telescopes should reveal a line of 10th and 11th magnitude stars within a subtle haze of fainter members.



THE “SUMMER TRIANGLE”

SATURDAY, SEPTEMBER 16

While still well positioned overhead, let's revisit M57 to see how "low you can go" with a small telescope. Try a number of magnifications to determine



M56
CREDIT: NOAO/AURA/NSF

which one gives the clearest view of the 13.0 magnitude "test" star to its edge. Now, use low power to locate 8th magnitude globular cluster M56. You'll find it in a rich star field a little more than halfway between Gamma Lyrae and Alberio. Once located, try the same magnification used to hold our "test" star and see if you can now resolve some of this globular's 13th magnitude stars!

Although M56 might appear to fall within the borders of Cygnus, it technically is the second Messier

study in Lyra. Found by Charles himself on January 19, 1779, this cluster lies some 33,000 light-years distant and is 80 light-years in diameter. Like most all Class X globulars, its faint stars are difficult to resolve.



M71
CREDIT: REU PROGRAM/
NOAO/AURA/NSF

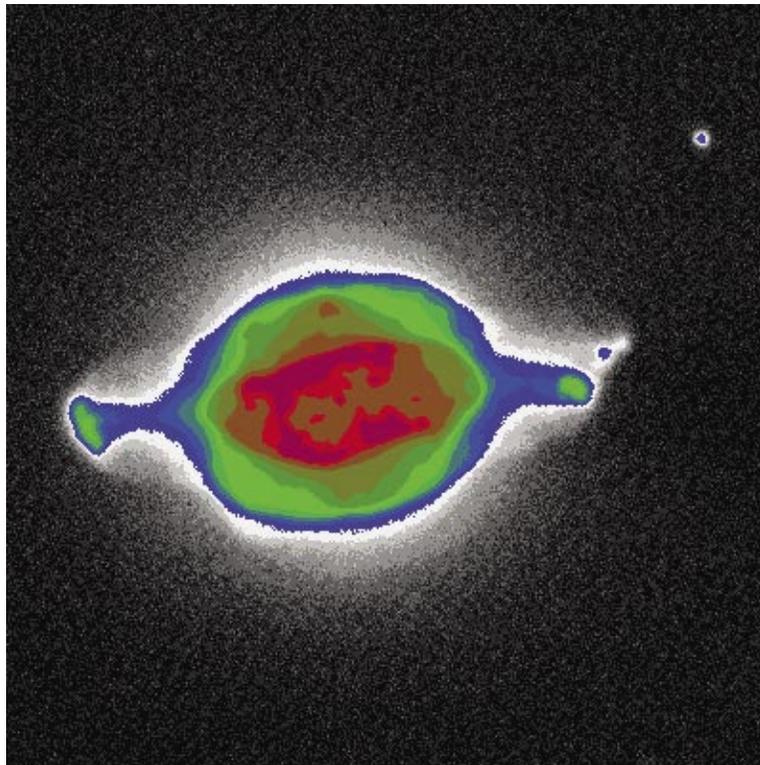
Now let's locate two faint stars in tiny Sagitta - Delta and Gamma. Almost precisely between them, binoculars or finderscopes will reveal M56's "twin" - 8.2 magnitude M71. Aside from brightness, size, and beauty of stellar field, these two globulars have very little in common. M71 is roughly one-third as distant as M56, and its brightest stars approach the 11th magnitude. Most smaller telescopes can resolve a string of stars (reminiscent of M4) across its core. Very loosely structured, it would be more fitting as an "uncertain class," but its stellar chemistry of high metal content stars means M71 has a dual

identity as both dense open cluster and globular!

SUNDAY, SEPTEMBER 17

Today in 1789, William Herschel discovered Saturn's moon Mimas. Tonight we'll look at another kind of "Saturn" as we locate the centermost bright star in the northern half of the constellation of Capricorn - Theta.

Three finger-widths north of Theta Capricorni you will see dimmer Nu Aquarii, and one finger-width west of Nu is NGC 7009. Nicknamed the "Saturn Nebula," this wonderful blue planetary is around 8th magnitude and is easily achievable in small scopes and large binoculars. At moderate magnification, you will see the elliptical shape giving rise to its moniker. With larger scopes, those "ring like" projections become even clearer!



FALSE COLOR IMAGE
OF NGC 7009
CREDIT: WIYN/NOAO/
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MONDAY, SEPTEMBER 18

Why not step outside this morning before leaving for work? If it's before the dawn, you'll be rewarded as Saturn and the Moon make a lovely pre-dawn picture.

Tonight we're heading north for a galaxy and cluster pairing - NGC 6946 and NGC 6939. Located in western Cepheus, you'll find them about a finger-width southwest of Eta.

Discovered by William Herschel on September 9th, 1798, 10 million light-year distant face-on spiral NGC 6946 spreads itself pretty thin in modest instruments. Lacking a bright core, this oval mist orients southwest to northeast. Larger telescopes will reveal traces of spiral arms - especially rotating southwest. This galaxy would appear extraordinary if we weren't looking through Milky Way obscuration to view it!

Through smaller scopes, northwestern open cluster NGC 6939 appears like a tight little formation of 11th and 12th magnitude stars similar in pattern to a very small M11. It is well resolved in larger scopes.



TUESDAY, SEPTEMBER 19

If you're up early this morning, be sure to look at the Moon with bright Regulus nearby. On this day in 1848, William Boyd was observing Saturn and discovered the planet's eighth moon - Hyperion. Since you're up, have a look at the Saturn. Large telescopes can reveal 14.0 magnitude Hyperion, and even a small scope can observe Tethys, Dione, and Rhea.

Tonight's dark sky provides a superb opportunity to trace the expanse of the Milky Way from the tail of the Scorpion through distant Perseus, but start early to make the most of it. Whether by eye, binocular, rich field refractor or dobsonian reflector, take the time to wander and wonder!

Begin southwest and see if you can spot "X" the core of our galaxy. Now trace the trail past the Small Sagittarian Star Cloud (M24) then off to the larger Scutum Star Cloud. Continuing northeast, look for the Cygnus rift - a dark lane that is also known as Barnard 186. Continue through Lacerta and into southern Cepheus and on to bright and easily recognized Cassiopeia... and finally distant Perseus on the far side of the dome of the sky. Amazing, isn't it?

Now with binoculars - or rich field refractor - repeat the same journey. How many old friends of the night sky can you recognize by sight?



M24 "THE SAGITTARIUS
STAR CLOUD"
CREDIT: VANESSA HARVEY/
REU PROGRAM/NOAO/
AURA/NSF

WEDNESDAY, SEPTEMBER 20

SERVER DOESN'T RESPOND

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- EDWIN HUBBLE AT THE
48" SCHMIDT - COURTESY
OF THE ARCHIVES,
CALIFORNIA
INSTITUTE OF TECHNOLOGY

On this night in 1948, the 48" Schmidt telescope at Mt. Palomar was busy making its first photographic plate of a distant galaxy. The astrophotographer was the same man who had ground and polished the scope's massive corrector plate, Don Hendricks. Tonight we'll join his vision as we take a return look at the fantastic M31 - "The Great Andromeda Galaxy."

Seasoned amateurs can easily point out the 2.9 million year-old gauzy light of M31. But, perhaps you've never tried. Believe it or not, this is one easy galaxy to see even without a telescope! Look overhead, can you clearly see the five stars making up tiny Delphinus? If so, look east-northeast to the diamond-shaped pattern of even brighter stars that stretches a hand span across the sky. This is the "Great Square of Pegasus." The northeasternmost star of the Great Square is Alpheratz, and from that star we start our hop. Stay with the bright chain of stars that extend east-northeast from Alpheratz and look four finger-widths away for bright Beta Andromedae. Next along that chain is three finger-width distant, brighter Mirach. Now head two more finger-widths north past fainter Mu to see an even dimmer star - Nu. Look for a faint smudge nearby. This is no cloud - it's the Great Andromeda Galaxy! And you didn't even need a telescope...

Now get out those binoculars and enjoy one of the finest, largest, and brightest galaxies in the sky!



M31
CREDIT: T.A. RECTOR AND
B.A. WOLPA/NOAO/AURA/
NSF

THURSDAY, SEPTEMBER 21

This morning before dawn, look for one of the most inspiring events you may ever witness - the Moon occulting Venus. For some viewers, this may only be a close conjunction, so please check IOTA for details specific to your area.

One of the most interesting features of the autumn sky is how slowly the stars and constellations seem to proceed across the heavens. This is an illusion after summer solstice in the northern hemisphere because skydark arrives earlier each night, making the progress of the constellations across the sky seem to “freeze.” Tonight Capella can be seen just rising to the northeast while Antares settles southwest. Four planets - Jupiter, Pluto, Neptune, and Uranus are still above the horizon - with Jupiter now very low to the west-southwest. Descending to the northwest is Ursa Major, the “Big Dipper.” Across the sky is Piscis Austrinus and lonely, but bright, Fomalhaut beginning its rise. Seven stars of the first magnitude now grace the heavens. Against this backdrop, one of the darkest skies of the month is now upon us.

Let’s have a look at another fine planetary nebula - NGC 7662. At 9.0 magnitude, this one is more commonly known as the “Blue Snowball” and can be found about three finger-widths east of Omicron Andromedae, or a little less than a hand span northwest of Alpha Pegasi. Similar in size to M57, even low power with a small scope easily reveals the planetary nature of this very fine study. Power up and you’ll discover that the annulus of this roughly circular planetary is definitely brighter inside than out. Large telescopes will highlight NGC 7662’s blue coloration and reveal a bright inner globe surrounded by faint outer ring!



NGC 7331
CREDIT: NOAO/AURA/NSF

FRIDAY, SEPTEMBER 22

Today the place to be is Suriname or French Guyana for an annular eclipse of the Sun. But take heart if you live in western Africa or eastern South America, for you



NGC 7331
CREDIT: R. JAY GABANY

will still be treated to a partial. Please check the webpages of “Mr. Eclipse” - Fred Espenak - for details on times and locations.

For the rest of us? It's New Moon! Tonight's destination starts out easy - but gets tougher. Head for Eta Pegasi and slightly more than 4 degrees north-northeast for NGC 7331. This beautiful, bright cored, tilted spiral galaxy with the western dark dust lane is how our own Milky Way would appear 50 million light-years away. Very similar in structure both to ourselves and the “Great Andromeda,” this galaxy gains details as aperture increases - yet it can be spotted with larger binoculars. But hang on... because the best is yet to come!

Return one half degree south-southwest of NGC 7331 with all the aperture you have for a challenge. In 1877, French astronomer Edouard Stephan was using the first telescope designed with a reflection coated mirror when he discovered something a bit more with NGC 7331- a galaxy group! This faint gathering of five is better known as

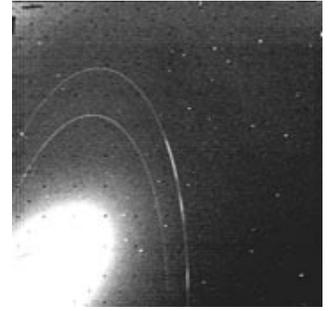
“Stephan's Quintet” and its members are no further apart than the diameter of our own Milky Way. It consists of NGC 7317, 7318A, 7318B, 7319, 7320 and more than 100 star clusters and several dwarf galaxies. Some 100 million years ago a collision left long streamers of material which created star forming regions connected by tidal pull. Enjoy their faint mystery!

SATURDAY, SEPTEMBER 23

On this day in 1846, Johann Galle of the Berlin Observatory added an eighth planet to the solar system's number. While at the eyepiece, Galle identified the planet Neptune and - for the first time in history - mathematics played a role in a planet's discovery. Would you like to try for Neptune? The planet now resides a little more than a degree northwest of 4.3 magnitude Iota Capricorni.

On this day in 1962, the prime time cartoon "The Jetsons" premiered. Think of all the technology this inspired as tonight we relax and watch the Alpha Aurigid meteor shower. Face northeast and look for the radiant near Capella. The fall rate is around 12 per hour. They are fast and leave persistent trails.

If you have binoculars or scope out tonight, then have a go at NGC 7686 two finger-widths north of Lambda Andromedae. At 5.6 magnitude, this large open cluster contains about three dozen mixed magnitude stars, with a brighter non-member in the foreground.



THE RINGS OF NEPTUNE
CREDIT: NASA

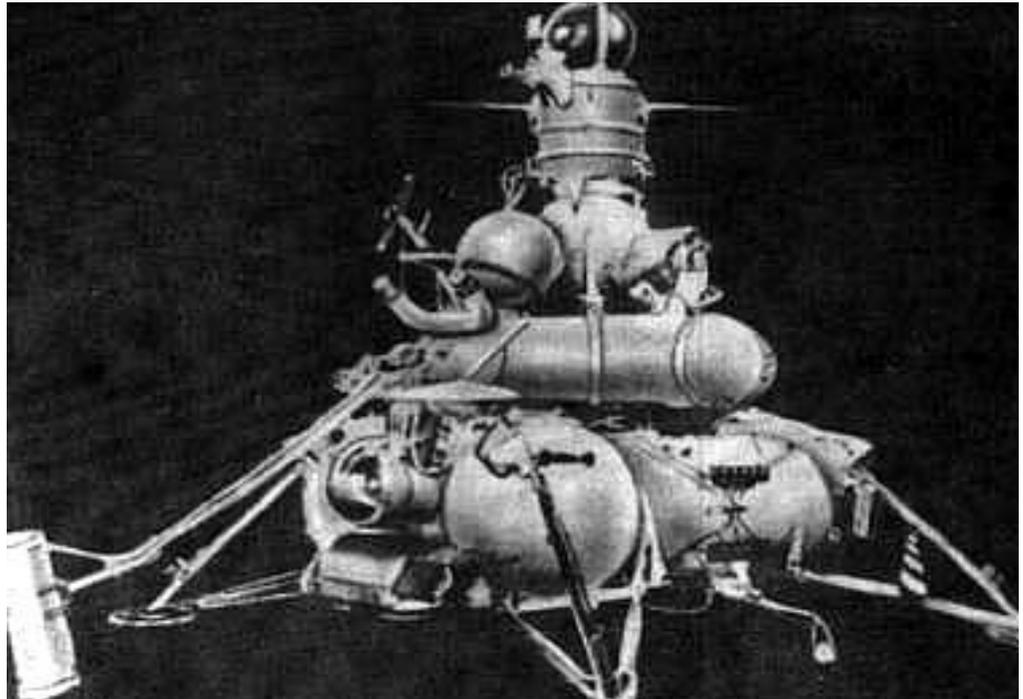
SUNDAY, SEPTEMBER 24

On this day in 1970, the first unmanned, automated return of lunar material to the Earth occurred when the Soviet's Luna 16 returned with three ounces of another world.

Tonight's skies remain dark, so let's take this opportunity to have a look at two objects from one of the more obscure catalogs...

Set your sights on Alpha Pegasi and drop due south less than 5 degrees to pick up NGC 7479. Discovered by William Herschel in 1784, this 11.0 magnitude barred spiral galaxy experienced a supernova as recently as 1990. While the 16th magnitude event near its nucleus is no longer visible, modest telescopes will easily pick out the bright core and elongation of the central bar. Larger aperture will find this one a real treat as the spiral arms curl over and under the central structure, resembling a ballet dancer en pointe. Congratulations! You've just observed Caldwell 44.

NGC 7814 is easy enough to find. Start at Gamma Pegasi and use the finderscope to center on a star around 3 degrees northwest. In the scope, look southeast to see NGC 7814 as a scratch of light in the low power field. Magnify and enjoy! This galaxy has a deeply concentrated nucleus and a very prominent dissecting dark dustlane. This one is also known by another name... Caldwell 43.

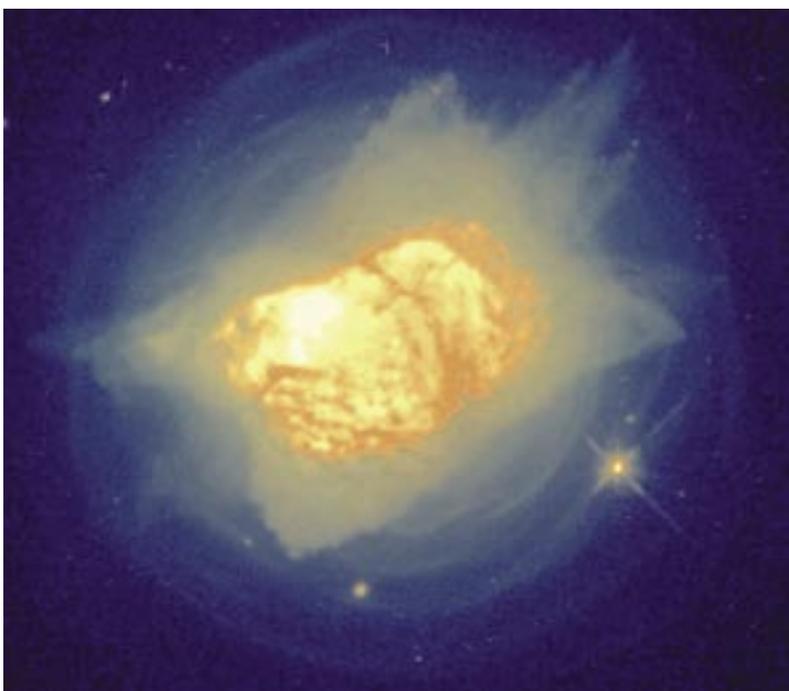


MONDAY, SEPTEMBER 25

Look for the Moon returning low on the western horizon tonight to spot a phenomenon known as “Earthshine.” This is sunlight reflected off our own atmosphere and oceans which faintly illuminates the side of the Moon not receiving direct sunlight. Try to spot some features on the “dark side.”

Tonight when the Moon sets, let’s return to some previous studies and have an “Autumn Planetary Marathon.” Start easy with M57 between Gamma and Beta Lyrae. Head north-northwest to the “Cat’s Eye” (NGC 6543) roughly between Delta and Zeta Draconis - you’ll need your charts for this one! Now southwest to the “Blinking Planetary” (NGC 6543) - found less than three degrees east-southeast of Iota Cygni. Continue east-southeast a little less than 6 degrees past Deneb to the “Box Planetary” - NGC 7027. Now on to the brightest of the ten - M27. The “Dumbbell Nebula” is located a little more than 3 degrees north of Gamma Sagittae. Now drop two hand spans south to the “Little Gem” (NGC 6818) - around 7 degrees northeast of Rho Sagittarii.

One hand span east of the “Little Gem” leads you toward the “Saturn Nebula” in Aquarius - a little more than a degree west of Nu. Now it’s a huge jump of more than two hand spans west-northwest to tiny NGC 6572 - located around two finger-widths south-southeast of 72 Ophiuchi. Continue on to compact NGC 6790 a finger-width south of Delta Aquilae. Did you find them all? Well, if the “Cat’s Eye” is the toughest to locate, then NGC 6790 is the hardest to identify. Good going! But don’t stop now... Two hand spans west-northwest leads to NGC 6210 - best located using pointer stars Gamma and Beta Herculis. Ready for the finale? Then remember you recent instructions and locate “the Blue Snowball” - NGC 7662. Excellent work!



NGC 7027
CREDIT: S. BOND/NASA

TUESDAY, SEPTEMBER 26

Tonight's slender crescent Moon won't last long, so let's use the time to advantage and take on a deep sky study.

The journey might seem like a simple one, but the rewards are great. Start by identifying bright Beta Aquarii about a fist's width above the northeastern-most corner star of Capricornus. Continue northward another five degrees, because we're going to introduce you to M2.

First seen by Maraldi in 1746 and later cataloged by Messier in 1760, M2 is easily seen in binoculars and small telescopes. This compact globular cluster is around 50,000 light-years away in the general direction of our galaxy's southern pole. Containing more than 100,000 stars (including some red and yellow giants) even small scopes will immediately pick up on M2's intensely bright core. But it will take larger scopes - and higher power - to resolve the many faint 14th to 15th magnitude members of this distant Class II globular study.

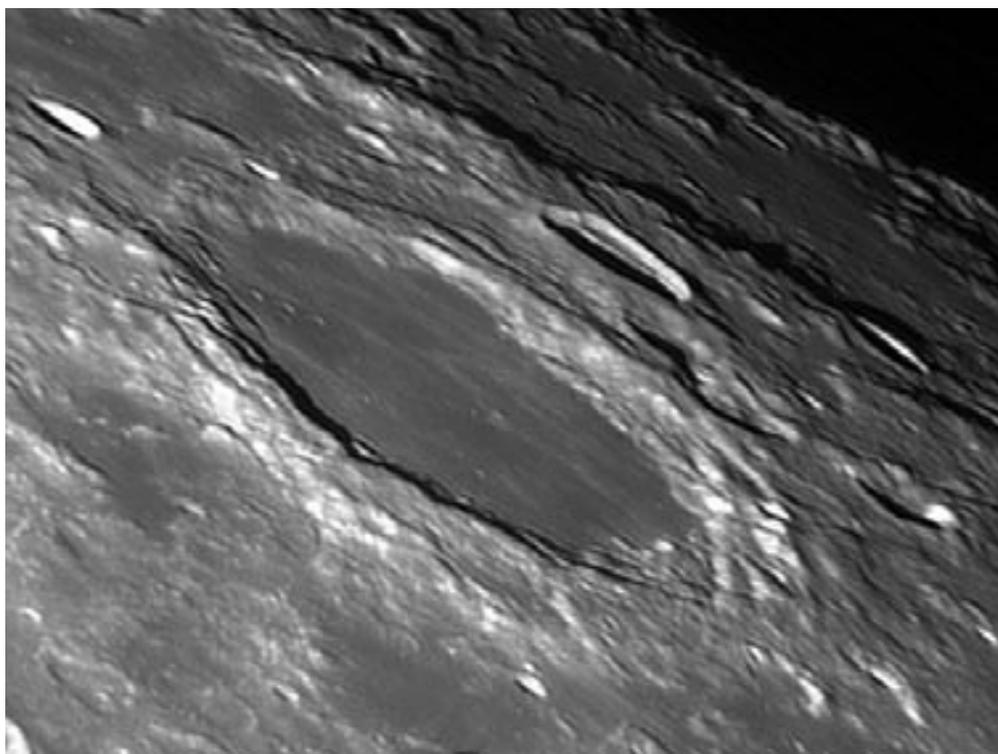


WEDNESDAY, SEPTEMBER 27

Tonight on the lunar surface, begin by identifying Mare Crisium and head north for previous study Cleomides. About two Crisium lengths further northwest, see if you can identify crater Endymion. This expansive crater will appear to have a brilliant west wall and deep shadow to the east. While it will look much like its surroundings, watch over the days ahead as its lava-filled floor darkens considerably.

Now let's study a very impressive variable star. Eta Aquilae is one of the most fascinating stars in the sky to watch and it doesn't even require a telescope. Just look less than one fist-width due south of Altair...

Discovered by Pigot in 1784, this Cepheid variable has a precise cycle of nearly a magnitude shift every 7.17644 days. During this time Eta reaches a maximum of magnitude 3.7 and declines slowly over 5 days to a minimum of 4.5. Yet it only takes two days to brighten again! This expansion-contraction cycle makes Eta very unique. To help gauge its changes, compare Eta to Beta on Altair's southeast side. When Eta is at maximum, it will be about equal in brightness.



ENDYMION
CREDIT: DAMIAN PEACH

THURSDAY, SEPTEMBER 28

Tonight east meets west on the lunar surface as we head for another beautiful crater. Look to the northern tip of Mare Fecunditatis where it joins the eastern extremity of Mare Tranquillitatis. Here you will see the awesome structure of well-worn crater Taruntius. Appearing as a bright ring, remember this location because when the Moon is full, Taruntius' incredible ray system will stretch for hundreds of kilometers across the lunar surface. Be sure to have a look at the field stars around the Moon, because tonight it will occult Antares! Be sure to check IOTA for precise times and locations for this "don't miss" event.

While waiting on Antares to reappear, let's head northeast to observe 6.9 magnitude, mid-sized open cluster - M52. Discovered by Messier on September 7, 1774, you can discover it by drawing line between Alpha and Beta in western Cassiopeia and extending it three finger-widths on the same trajectory. Viewable in binoculars, this fine grouping of fainter magnitude stars is a real treat for the scope. Larger aperture will reveal as many as a hundred stars peeping out against a rich Milky Way field.



FRIDAY, SEPTEMBER 29

Tonight on the lunar surface, let's start by identifying Mare Nectaris, then head for its south shore. Look for a U-shaped "bay." There you will catch the ruins of Fracastorius. This feature is subtle and you will see little more than a faded white outline. Perhaps at one time during Fracastorius' evolution, its walls were melted away by lava flow. At high power you may spot some low hills and craterlets. Binoculars should resolve Fracastorius as a full ring.

Return to confirm M52 tonight, then head less than a finger-width southwest to locate open cluster NGC 7510 in Cepheus. Although this small, 7.9 magnitude cluster is beyond the range of binoculars, its brightest half dozen 12th magnitude stars give a wedge-like appearance in modest telescopes at higher magnifications.



FRACASTORIUS
CREDIT: WES HIGGINS

SATURDAY, SEPTEMBER 30

Today in 1880, Henry Draper must have been up very early indeed to take the first photo of the Great Orion Nebula (M42). Although you might not wish to set up equipment before dawn, you can still use a pair of binoculars to view this awesome nebula!

Tonight on the lunar surface, take a close look at Mare Serenitatis and its south-southwest border. These are the Haemus Mountains. Look in their midst for the sharp punctuation of Class I Menelaus. This small crater has a brilliant west inner wall and deeply shadowed floor. Like Taruntius, Menelaus is another fine crater to watch for expansive ray systems as the terminator progresses.

Even with the Moon, we can turn binoculars northwards to very large open cluster IC 1396. Using very low power in telescopes, you will see a thickening of stellar density over a three full-moon sized region of numerous 8th and fainter magnitude stars just south of Mu Cephei.



THE HAEMUS
MOUNTAINS AND
MENELAUS ON THE
SOUTHERN SHORE OF
MARE SERENITATIS
CREDIT: GREG KONKEL

OCTOBER 2006



<http://www.universetoday.com>

SUNDAY, OCTOBER 1

In 1897, the world's largest refractor (40") debuted at the University of Chicago's Yerkes Observatory. Also today in 1958, NASA was established by an act of Congress. More? In 1962, the 300-foot radio telescope of the National Radio Astronomy Observatory (NRAO) went live at Green Bank, West Virginia. It held place as the world's second largest radio scope until it collapsed in 1988.



ALBATEGNIUS AND
HIPPARCHUS ON THE
TERMINATOR
CREDIT: ROGER WARNER

Tonight let's visit with an old lunar favorite. Easily seen in binoculars, the hexagonal walled plain of Albategnius appears near the terminator about one-third the way north of the south limb. Look north of Albategnius for even larger and more ancient Hipparchus giving an almost "figure 8" view in binoculars. Between Hipparchus and Albategnius to the east are mid-sized craters Halley and Hind. Note the curious

relationship between impact crater Klein on Albategnius' southwestern wall and that of crater Horrocks on the northeastern wall of Hipparchus. Now let's power up and "crater hop"...

Just northwest of Hipparchus' wall are the beginnings of the Sinus Medii area. Look for the deep imprint of Seeliger - named for a Dutch astronomer. Due north of Hipparchus is Rhaeticus, and here's where things really get interesting. If the terminator has progressed far enough, you might spot tiny Blagg and Bruce to its west, the rough location of the Surveyor 4 and Surveyor 6 landing area. Directly north of Rhaeticus will be a long series of surface "cracks" known as rimae. These particular ones are the Rimae Triesnecker and you will see the crater itself just to their west.



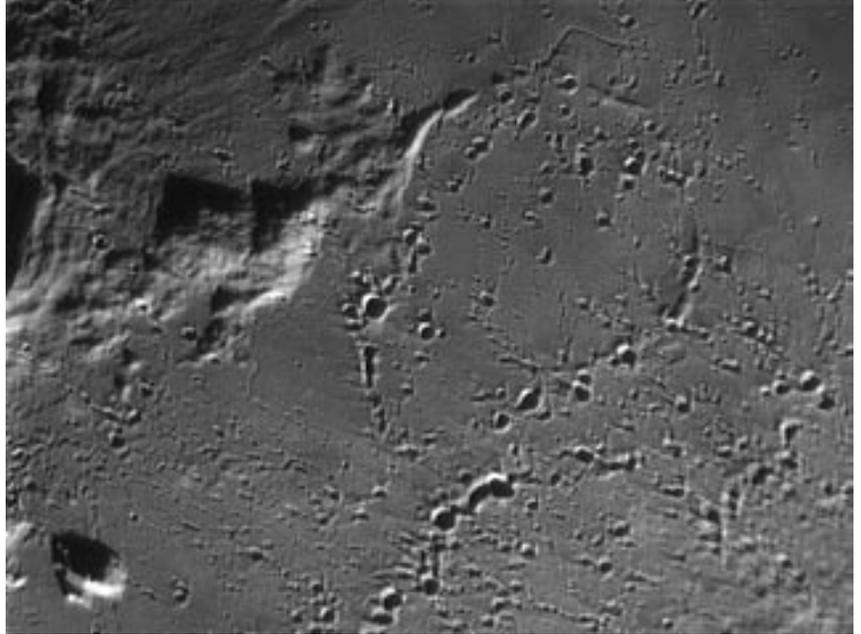
RIMAE TRIESNECKER
CREDIT: DAMIAN PEACH

Once lunar studies are complete, turn the scope north and have a look at a fine open cluster. Visible in binoculars most nights, 6.4 magnitude NGC 7243 will show more than two dozen of its brightest 10th and 11th magnitude members through the average scope and as aperture increases

- so does the stellar population. You'll find it less than 2 finger-widths west-southwest of Alpha Lacertae.

MONDAY, OCTOBER 2

Tonight on the lunar surface, we'll return to previous study Eratosthenes. Located on the south shore of Mare Imbrium right where the Apennine mountain range meets the terminator, Eratosthenes is one unmistakable crater. Named after the ancient mathematician, geographer and astronomer Eratosthenes, this splendid Class 1 crater is 58 km in diameter and 12,300 feet deep. Tonight it will display a bright west wall and a black interior hiding a massive crater-capped central peak that reaches 3570 meters high. Extending like a tail, a 50 mile long mountain ridge angles away from Eratosthenes to the southwest.



Now let's dance. If you thought Eratosthenes was it, power up and look again. Just at the end of that southwest trail of mountains are the ruins of crater Stadius, which is peppered with small meteor impacts. Do you remember Shoemaker-Levy and Jupiter? Then look to Stadius' northwest where you will see a long line of impact craters that must have occurred at roughly the same time from a series of similar sized meteors. If you turn east through Sinus Aestuum, you might spot the small impact of Bode. Go south of Stadius and trace the rilles through Mare Insularum to the blank, small ring of Gambart. Just northeast of this crater are two small punctures and the landing area of Surveyor 2.

Now let's go back to Lacerta and have a look at another moderately bright open cluster - NGC 7209. This large, 6.7 magnitude open cluster is normally visible in binoculars as a faint blur. Dominated by a handful of scattered brighter stars, most of this cluster's fainter members take up residence in their midst. Start at Pi 2 Cygni and head a bit more than two finger-widths southeast. If you get to a line of fifth magnitude stars running northeast-southwest you've gone too far - but in the right direction!

STADIUS
CREDIT: WES HIGGINS

TUESDAY, OCTOBER 3

We start tonight's lunar tour with something that can even be spotted with unaided vision - Plato. Located in the northern hemisphere of the Moon, its dark ellipse is unmistakable. Plato's floor consists of 2700 square miles of lava fill and is considered by some observers as the darkest single low-albedo feature on the Moon.



PLATO, MONS PICO
AND MONS PITON
CREDIT: GREG KONKEL

Because of its low reflectivity, this crater has the distinction of being one of the only mountain-walled plains that doesn't "disappear" as the Moon grows full. With Plato in the center of the field note the pyramid-like peak of Pico due south in northeastern Mare Imbrium. East of Pico is an unnamed dorsum - or lava wave - terminating just above crater Piazz Smyth to the south. Power up and check out the triangular peak near its end.

Having looked at the Moon tonight, take the time to view bright

southern star Fomalhaut ascending low to the southeast. Also known as "The Lonely One," Alpha Pisces Austrinus resides in a rather desolate area of the southern sky some 23 light-years away. At magnitude 1.3, Fomalhaut is the 18th brightest star of night sky. This star is nearer, but one magnitude fainter than Vega - a star of similar spectral type. At twice the diameter of our Sun, "The Lonely One" is 14 times more luminous than Sol and is surrounded by what could be a protoplanetary accretion disk.

WEDNESDAY, OCTOBER 4

Today in 1957, Sputnik 1 made space history by becoming the first manmade object to orbit the earth. Our Earth's first artificial satellite was tiny - roughly the size of a basketball - and weighed no more than the average man. Its very first 98 minute elliptical swing around the Earth set off a "space race" that inspired man to the Moon. Many of us old enough to remember Sputnik's grand passes recall just how inspiring it truly was. Take the time with children or grandchildren to check heavens-above.com to learn about the visible passes of the ISS and other bright satellites as you think about how spaceflight has changed over the last 50 years!



SPUTNIK 1
CREDIT: NASA

Tonight on the lunar surface, look southwest of striking crater Bullialdus for a pair of similar sized craters on the shore of Mare Nubium - Mercator to the southeast and Campanus to the northwest. Just to their south you will see a triangular dark area that looks like it might be part of Mare Nubium, yet has a few bright points of its own. This is Palus Epidemiarum, a very small plain. Look for the oval of crater Capuanus trapped on its southern edge.



BULLIALDUS, CAPAUNUS
AND MERCATOR
CREDIT: GREG KONKEL

Now drop back the power and look at the field of stars around the Moon...you just might discover that one of them is a planet! Not only will Uranus be very close tonight, but there will also be an occultation for some areas, so be sure to check IOTA for information.

For southern hemisphere viewers, tonight would be a wonderful opportunity to re-discover one of the finest double stars in the sky - Rigel Kentaurus. Located low to the southwest, Alpha Centauri is the third brightest star in the sky, yet the most famous due to its distance of 4.34 light-years.

THURSDAY, OCTOBER 5



ROBERT GODDARD
CREDIT: NASA

Today marks the birth date of Robert Goddard. Born in 1882, Goddard is known as the father of modern rocketry - and with good reason. In 1907, he came into the public eye behind a cloud of smoke rising from the thruster of a small solid-fuel rocket in the basement of the physics building of Worcester Polytechnic Institute. By 1914, Robert had patented the use of liquid fuel and multi-stage solid fuel rockets. Driven by efforts to put equipment ever higher, by 1920 Goddard envisioned rockets reaching the Moon. Among his many achievements, he proved that a rocket would work in a vacuum and by 1926 he had sent the first scientific package along for the ride. By 1932, Goddard launched guided flights and in 1937 mounted thrusters on gimbals and stabilized them gyroscopically. Goddard's lifetime of work went pretty much unnoticed until the dawn of the Space Age, but in 1959 (14 years after his death) he received due acclaim as NASA's Goddard Space Flight Center was established in his memory.

Today in 1923, Edwin Hubble was busily discovering the first Cepheid variable in M31. His discovery was crucial in proving "spiral nebulae" were actually independent and external galaxies. Tonight let's look at a Cepheid variable as we head towards... well... Cepheus!

"3.9" magnitude Delta, the prototype, is the easternmost in a trio of stars marking the southeastern corner of the constellation. Delta is the great-grand-daddy of all stars with smooth and predictable changes in luminosity. In fact, it's so predictable you could set your "5 day, 8 hour, 47 minute, and 32 second" clock to it. Never changing more than 0.8 magnitudes - you won't see this one disappear like Mira. As Delta's luminosity changes, so does its photospheric temperature and spectral class as it swells and contracts rhythmically. Located around 300 light-years away, Delta never gets as faint as our Sun would be one tenth the same distance. Because of great luminosities and predictable behaviors, Cepheid variables have become the "yardstick" of the Universe. Be sure to look for a 6.3 magnitude companion to Delta Cephei while you're there...

FRIDAY, OCTOBER 6

For those in western time zones, tonight is one of the most famous Full Moon nights of the year - the Harvest Moon!

Through the magic of Universal Time (UT), the Moon is full in the Americas during early evening hours of the previous day and because of this will be the closest full moon to the Autumnal Equinox. Not only is it at its closest right now, but the Moon's orbit is almost parallel to the eastern horizon causing it to rise at dusk for the next several nights in a row. Normally, the Moon clears the horizon some 50 minutes later each night, but at this time of year, the delay is just 20 minutes for mid-northern latitudes and even shorter further north. Because of this added extra light, the name "Harvest Moon" originated because it allowed farmers more time to work in the fields.

Oftentimes we perceive the Harvest Moon as being more orange than at any other time of the year. The reason is not only scientific enough - but true. Coloration is caused by the scattering of the light by particles in our atmosphere. When the Moon is low, as it is now, we get more scattering effect and it truly is a deeper orange. The very act of harvesting itself also produces dust and oftentimes that color will last through the whole night.

So, cursing the Moon for lighting the sky tonight, enjoy it for what it is...a wonderful, natural phenomenon!



HARVEST MOON OVER KITT PEAK OBSERVATORY
CREDIT: PHIL MASSEY, LOWELL OBSERVATORY/NOAO/
AURA/NSF



<http://www.universetoday.com>

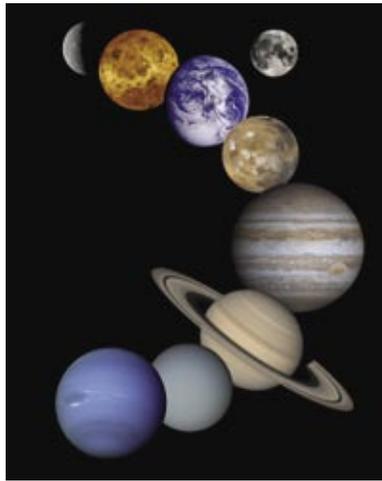
SATURDAY, OCTOBER 7



NIELS BOHR
(PUBLIC DOMAIN IMAGE)

Today celebrates the birthday of Niels Bohr. Born in 1885, Bohr pioneered atomic physics. In his quest to understand atoms, Bohr had a vision - one right out of the night sky. He conceived of the atom as a tiny solar system, where electrons became planets and the nucleus a tiny sun!

Today is also the official UT date of the full moon. Tonight three planets grace the night sky at skydark. Furthest west is distant Pluto - less than one degree southeast of Xi Serpentis. Neptune has now progressed a bit more than one degree northwest of Iota Capricorni and Uranus is near Lambda Aquarii. If you rise early, you can also catch Saturn preceding Regulus across the sky in good observing position. Venus and Mars are now too close to the Sun for observation. Mercury and Jupiter are very low to the western horizon at sunset. And the Earth? You won't see it as long as you keep looking up!



SOLAR SYSTEM
CREDIT: NASA



<http://www.universetoday.com>

SUNDAY, OCTOBER 8

Today marks the birthday of Ejnar Hertzsprung. Born in 1873, Hertzsprung proved the existence of giant and dwarf stars in the early 1900s. His work implied a relationship between color and luminosity, but his method wasn't truly recognized until rediscovered by Henry Russell. Later that method became the foundation for virtually all subsequent astronomical work as the Hertzsprung-Russell diagram. Hertzsprung's use of absolute magnitude applied to that diagram will come into play tonight - and throughout the week - as we have a look at the globular cluster M15 in Pegasus.

One of the most profound questions of the early 20th century related to the true age and scale of the universe. To solve this riddle meant to get a sense of the nature of the stars. As astronomers measured more and more stellar distances (based on methods pioneered by Bessel), it became clear that stars varied tremendously in absolute brightness - not because of distance - but because of things like size, temperature, mass, and age. Most stars were found to be similar to our own Sol. Such stars continue to illuminate a very small part of the Milky Way galaxy for billions of years. The stability of our Sun - and many like it - meant they were living life in the middle lane - neither squandering nuclear fuel, nor hoarding it. These stars are found in the main sequence region of Hertzsprung and Russell's (H-R) diagram and have a predictable range of brightness based on color and surface temperature.

But, the very brightest stars don't necessarily fall in line in this way. Some are very massive, youthful, and hot - such as Deneb. Others are very old, less massive, relatively cold, and hugely swollen - such as Antares. A very few are long or short term variables like Delta Cephei and RR Lyrae. These "standard candle" variables could be used to determine the scale of things in the early 1900s, but their distances still had to be worked out!

Tonight head about two finger-widths northwest of Epsilon Pegasi with either binoculars or scope. As you look at 6.4 magnitude globular cluster M15, you will see something that can supply the key to both the age and size of the then known universe - our Milky Way.



EJNAR HERTZSPRUNG
CREDIT: LAKE AFTON
PUBLIC OBSERVATORY



M15
CREDIT: NOAO/AURA/NSF

MONDAY, OCTOBER 9

Tonight is the peak of the Draconid meteor shower with its radiant near the westerling constellation Hercules. This particular shower can be quite impressive when comet Giacobini-Zinner passes near Earth. During that time, the fall rate jumps to 200 per hour and has even reached 1000! Comet Giacobini-Zinner achieved perihelion on July 2, 2005. Because tonight's fast rising Moon will greatly interfere with these faint meteors, we can still keep watch - but first let's practice a little lunacy.

Through binoculars, look along the northeast shore of Mare Serenitatis for the bright ring of Posidonius. Now look at Mare Crisium and get a "feel" for its size. A little more than one Crisium's length west of Posidonius you'll meet Aristotle and Eudoxus. Drop a similar length south and you'll find tiny, brilliant crater Linné exposed on the expanse of Mare Serenitatis. So what's so cool about this little white dot? With only binoculars you are resolving a crater one mile wide, found within a seven mile wide bright patch of ejecta from a quarter million miles away!

Tonight we again visit the M15 globular and learn more about the scale of the Universe - circa 1900. On a decent night, a modest telescope will resolve about a dozen 13th magnitude stars outside M15's core region. Most of these stars are red giants with absolute magnitudes of -2. Such stars appear 15 magnitudes fainter than they would be if they were at an astronomically standardized distance. Based on this 15 magnitude loss in intensity, we should be able to figure out how far away M15 is, but this is circular reasoning. In the early 1900s, astronomers didn't know that the brightest stars in M15 were absolute magnitude -2. They first needed to know how far away the globular was to make sense of that. Here's where the H-R diagram helps out. The most massive and swollen red giants (those nearing the end of their lives such as Betelgeuse and Antares) can be as luminous as absolute magnitude -6, but you can't assume that the brightest red giants in a globular cluster are as bright as Antares and Betelgeuse. Why? Because we later discovered that all stars in a globular cluster entered the main sequence about the same time - some 12 billion years ago. Meanwhile, the very brightest ones - the Denebs - are no longer around. They exited the main sequence, became red giants and exploded a long, time ago, and possibly in a dwarf galaxy far, far away!



M15
CREDIT: HALDAN
COHN WIYN/NOAO/
NSF COPYRIGHT WIYN
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TUESDAY, OCTOBER 10

Today in 1846, William Lassell made an extraordinary new discovery while at the eyepiece - Neptune's brightest moon Triton. At magnitude 13.5, we might see it using moderate aperture, but it gets no further than 17 arc-seconds from the planet. To try Triton, use techniques similar to locating Pluto. Through a larger scope, locate Neptune a little more than a degree northwest of Iota Capricorni. At high power, make a field sketch of Neptune and neighboring faint stars. Be sure to come back again and visit the Association of Lunar and Planetary Observers - ALPO - for more information.

Thanks to the late-rising Moon... M15 awaits!

With the advent of the H-R diagram, stars could be plotted for color-temperature and luminosity. A large enough sample known to be the same distance would allow solid guesses about how bright those 13th magnitude red giants in M15 really were. We assume all stars in a globular cluster are at the same distance - even if we don't exactly know what that distance is. Something peculiar was noticed about all globular clusters investigated using this approach. Their red giants were more plentiful and much dimmer than expected. They weren't as massive as Antares or Betelgeuse - and it also implied they were very old stars.

When revisiting M15, or any globular, you will observe something incredibly ancient. As these clusters aged, many of their brightest and finest died out a very long time ago. Today, as a result of that great age, stars only several times more massive than our Sun are swelling up to become red giants. In the case of M15, something equally remarkable is occurring - the cluster's core is collapsing in on itself. The cause is perhaps those high-mass red giants now taking the form of powerful black holes...

Once the Moon climbs up from the east, and if the lunar terminator has not advanced too far at your location, look at the southeast shoreline of Mare Crisium for Agarum Promontorium. Note its progress northward across the dark plain before disappearing beneath the once molten lava. In times past, great lunar observers noted a mist-like appearance in this area - a transient phenomenon observers should make note of and report whenever seen.

WEDNESDAY, OCTOBER 11

With early dark tonight we have more time to spend contemplating the mystery of globular clusters.

Class IV M15 lies within a large flat triangle of three 7th magnitude stars. On a good night, two or three dozen outlying members can be resolved through

a modest telescope. It also reveals a very compact and brilliant, blue core - a core far more concentrated in appearance than that of neighboring Class II M2 to the south, which may very well be the most uniformly dense cluster visible in the night sky. Hundreds of stars seem to hint at resolution. Double the aperture and they all come out to play!

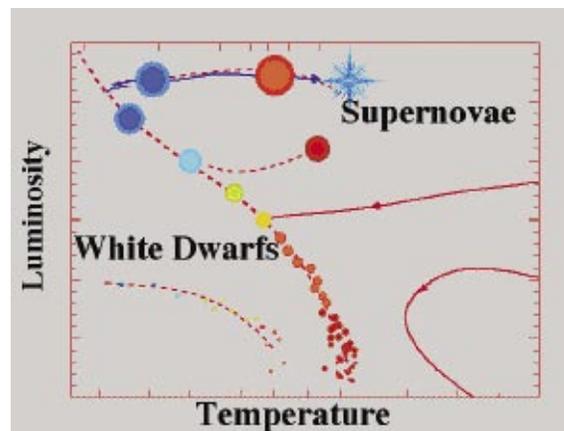
If most stars in globulars are reddening with age, we wonder why so many appear blue? The bluest stars in the sky - such as Vega - all have higher surface temperatures - certainly

twice our own Sun. Such stars are three or four times more massive and don't live nearly as long due to their higher consumption rate of hydrogen. If Sol were at the distance of M15 it would appear as a star of the 19th magnitude. Such stars are not the ones waiting to become red giants. These "solar type" stars hardly contribute to the light of the cluster at all. Blue stars like Vega and Fomalhaut would begin around the 15th magnitude at M15's distance. These stars are within the H-R diagram's main sequence and provide the bulk of the cluster's "blue" light.



NEPTUNE AND TRITON
FROM PALOMAR
CREDIT: D. BANFIELD,
P.D. NICHOLSON & B.J.
CONRATH, PALOMAR OBS.,
JPL, NASA

HR DIAGRAM
CREDIT: NASA



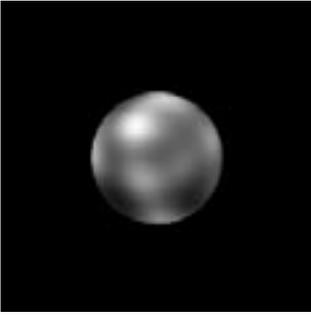
THURSDAY, OCTOBER 12

Today in 1892, astronomy great E. E. Barnard puzzled over an early photographic plate. In doing so, he became the first astronomer to discover a comet - 1892 V - using photography! But it wasn't Barnard's first comet. His career began in 1881 and 1882 with three comet discoveries through a 5" equatorial refractor purchased at great personal expense five years earlier. While a student of mathematics at Vanderbilt University, Barnard discovered eight comets at the eyepiece of the University's 6" refractor. It was at this telescope in 1884 that he discovered the 1.7 million light-year distant dwarf galaxy NGC 6822, located in northeastern Sagittarius. Tonight, before it heads too far southwest, head about a fist width west of Beta Capricorni and discover it for yourself!



M15 CORE REGION
CREDIT: HST/NASA

FRIDAY, OCTOBER 13



PLUTO
CREDIT: NASA

Today marks the founding of the British Interplanetary Society in 1933. “From imagination to reality,” the BIS is the world’s longest established organization devoted solely to supporting and promoting the exploration of space and astronautics.

Tonight we’ll do them proud by having a speculative look at distant Pluto - the only planet in the solar system yet to see a “flyby” from an Earth-sourced probe. The “unexplored planet” now lies a little less than one degree south-southeast of Xi Ophiuchi. Consult with star charts available on the Internet to determine which little 14th magnitude “star” is our solar system’s 9th planet. (Or use the sketch method described elsewhere in this book to follow its motion.)

SATURDAY, OCTOBER 14

With comfortable early evening dark skies, let's head off again to M15 and M2 - the last in a series of bright, beautiful globular clusters to be seen after skydark until spring.

Astronomers now know there are more than 150 globular clusters associated with the Milky Way Galaxy. These globulars take up positions throughout the galaxy with most orbiting the galactic core outside the galactic plane. We also know that some 400 globulars are associated with our next-door neighbor in space - the Andromeda Galaxy. If only we knew precisely how far away such intergalactic beacons are, we could truly get a sense of the scale of the Universe...

Unraveling the mystery of globular cluster distances took more than simply analyzing the break off point on the H-R diagram to show at what point bright semi-massive blue stars start to become red giants. Using the H-R diagram - in conjunction with other methods - eventually allowed astronomers to deduce a certain globular cluster's distance. The globular was discovered by Jean-Dominique Maraldi in 1746, then added to Messier's list as M15 in 1764. We now know it is located 33,600 light-years away.



M15
CREDIT: HST/NASA

SUNDAY, OCTOBER 15



NATIONAL RADIO
ASTRONOMY OBSERVATORY
CREDIT: NASA

Today in 1963 saw the first detection of an interstellar molecule. This discovery was made by a team of scientists headed by Sander Weinreb using the MIT Millstone Hill 84-foot dish. Using new correlation receiver technology, hydroxyl molecules were found in the interstellar medium (ISM) based on absorption bands associated with light coming from supernova remnant Cas A. By the dawn of the new millennium, nearly 200 different interstellar molecules had been identified and many are considered organic in nature...

Tonight, let's see what's up there in the region of Cas A using visible light. The nearest bright star to Cas A is Beta Cassiopeiae - the bright star westward of the "W." To locate the region of Cas A, go about three finger-widths due west of Beta and follow the subtle curve of three 5th magnitude stars. Cas A lies less than one degree south-southwest of the second star in the sequence of three. This star is a complex 5th magnitude multiple star system associated with variable star AR Cas.

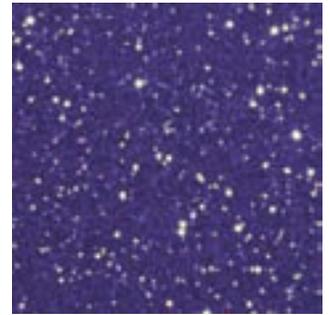
Through binoculars, two stars of the AR system are easily resolved - the 4.9 magnitude primary is seen to be led across the sky by a 7.1 magnitude secondary (component C) which is a very tight double itself. Its 8.9 magnitude partner is resolvable in mid-sized scopes. Large aperture scopes may also be able to distinguish a 9.3 magnitude, second (B) component from the primary. Smaller scopes are back in the running again when attempting three 11th magnitude stars - none of which are close to the primary. Intermediate scopes can also hope to pick out a 12.9 magnitude H component northwest of C. 8.9 magnitude F also has a 9.1 magnitude near twin to the east-northeast. If you can see them all you should probably wrap an observatory building around your telescope - if one isn't there already!

If you like to follow brightness changes in variables - AR Cas is not a good choice. This eclipsing type variable only fluctuates by a tenth of a magnitude over a period of 6 earth days.

MONDAY, OCTOBER 16

With early evening dark skies, let's return to the region of Cas A and see what else we can find. Although Cas A itself is invisible in amateur equipment, it is known to be associated with a 10,000 light-year distant supernovae remnant related to an unnoticed event occurring more than 300 years ago. The remnant itself has now expanded to a region filling some 10 light-years of space and has been imaged using orbiting X-ray observatories.

The closest deepsky study to Cas A is the dense and compact open cluster NGC 7510. This diminutive, magnitude 7.9 study can be just glimpsed as a hazy patch in large binoculars and small scopes, with a few of its brightest 10th magnitude members resolvable at higher magnifications. Doubling the aperture brings out a dozen or so 12th magnitude stars against the teeming glow of numerous fainter members. Double the aperture again, and 60 stars to magnitude 14 are possible. Many amateurs have discovered that the combination of a small rich field refractor, a 6" apochromatic refractor, and 12" newtonian makes for the ultimate in observing equipment...but don't forget those binoculars!



CASSIOPEIAE A REGION
CREDIT: NASA

TUESDAY, OCTOBER 17

Tonight the large, bright and scattered open cluster M39 is in favor just after skydark. Located between Deneb and Alpha Lacertae, this 4.0 magnitude cluster can be seen as a faint haze unaided and easily resolves into over a dozen stars through binoculars. Since we've visited with this one before, let's use it as a touchstone and look around to see what else is up there!

A degree and a half south of M39 is its "echo" - the large, faint, 7.2 magnitude open cluster NGC 7082. Easily overlooked within a V-shaped array of brighter stars, this cluster takes some concentration, along with a larger scope, to resolve it as physical members based on its two dozen or so faint components.

Returning to M39, head two finger-widths southwest in the direction of Deneb to seek 6.8 magnitude IC 1369. Mid-sized instruments will show a dozen or so 12th and 13th magnitude members within a misty haze.

Look for Regulus accompanying tonight's Moon!



WEDNESDAY, OCTOBER 18

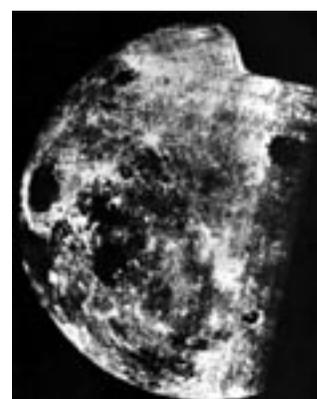
If you're up before dawn have a look at two brilliant points of light - Venus and Spica. Today in 1959, Luna 3 began returning the first photographs of the Moon's far side. Also today - but in 1967 - Venera 4 became the first spacecraft to probe Venus' atmosphere.

Today Venus lies within 3 degrees of the Sun and 4 degrees of Mars - some 108,000,000 kilometers from Earth. The proximity of Venus and Mars to the Sun was thought of as a form of "combustion" by ancient astronomers - many of whom also practiced alchemy and astrology. Today we no longer think of the Sun as actually renewing the planets by fire, but we know that trying to observe Mars and Venus under such circumstances is hazardous to the health of our optical orbs!

Instead, let's return tonight to use M39 as our touchstone and seek out something well-away from the blinding Sun. Starting with M39 head less than two finger-widths east-southeast to a 7.2 magnitude open cluster. This one is associated with the 12th magnitude "Cocoon Nebula." Collectively known as IC 5146, this cluster with nebulosity consists largely of 12th magnitude stars, and is around mid-sized. Barely detectable in a small scope, this 4000 light-year distant cluster needs aperture to come out and play. Large scopes may make the nebula possible - although an appropriate filter may be necessary from most observing sites. To assist in finding the Cocoon, look for the stream of the obscuration nebula B168 touching its eastern frontier.



LUNA 3
CREDIT: NASA



LUNA 3 FAR SIDE IMAGES
CREDIT: NASA

IC 5146:
"THE COCOON NEBULA"
CREDIT: JULIE AND
JESSICA GARCIA/NOAO/
AURA/NSF

THURSDAY, OCTOBER 19

Not only is the Moon furthest from Earth right now, but it will also occult asteroid Juno at approximately 18:00 UT.

Dark skies mean the perfect chance to have another look at the “Saturn Nebula” now well positioned at skydark. At magnitude 8.0, the Saturn Nebula - NGC 7009 - can be located through binoculars, but due to small apparent size, may not be easily recognized. Here’s your opportunity to use a small scope at low power and make a study of two fine nebulae - NGC 7009 and M57. Your assignment, should you decide to accept, is to view them using both binoculars and a low power telescope to see how they fit in with brighter stars in their fields. This will improve your sense of the way larger planetary nebulae look through binoculars.



NGC 7009
“THE SATURN NEBULA”
CREDIT: NOAO/AURA/NSF

FRIDAY, OCTOBER 20

We are now slipping into the stream of Comet Halley and one of the finest meteor showers of the year. If skies are clear tonight, this would be the perfect chance to begin observations of the Orionid meteor shower. But get to bed early and rise well before dawn!

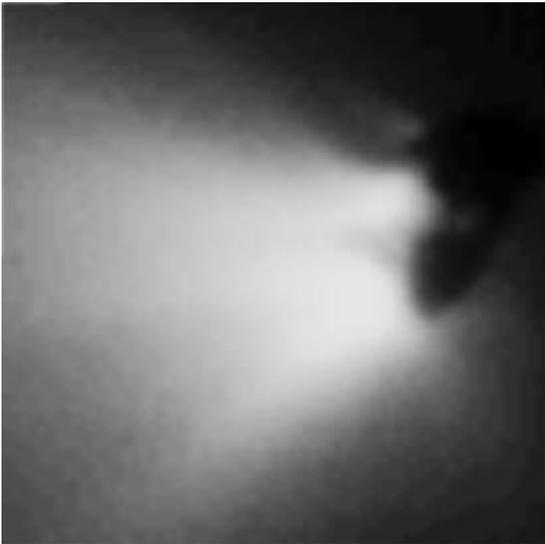
Have a large scope and want a challenge? Try the 10th magnitude, “bright” reflecting nebula NGC 7023. To locate this difficult study, start at 3.0 magnitude Beta Cephei and head southwest less than two finger-widths to 5.2 magnitude T Cephei. What? No T? It makes sense - this one is a Mira-type variable capable of going “deep” - to magnitude 11.3! Instead center on a solitary 7th magnitude star (SAO 19158) and avert your vision to scan around. Look for an oriental fan-shaped nebulosity to the south. This is the brightest portion of the nebula itself. Very large amateur scopes will also begin to reveal the very faint cluster now condensing out of this nebulous cloud of gas and dust.



NGC 7023:
“THE IRIS NEBULA”
CREDIT: ADAM BLOCK/
NOAO/AURA/NSF

SATURDAY, OCTOBER 21

Be sure to be outdoors before dawn to enjoy one of the year's most reliable meteor showers. The offspring of Comet Halley grace the early morning hours as they return as the Orionid meteor shower. This dependable shower produces an average of 10-20 meteors per hour maximum, and best activity begins before local midnight on the 20th, and reaches its peak as Orion stands high to the south about two hours before local dawn the 21st. With only one day to go until New Moon, this looks to be the year's premier meteor shower!



COMET HALLEY
(RAW IMAGE FROM GIOTTO
MULTICOLOR CAMERA)
CREDIT: NASA

Although Comet Halley has now departed the inner Solar System, its debris trail remains well organized - allowing us to predict when this meteor shower will occur. The Earth first enters the stream at the beginning of October and does not leave until the beginning of November. This makes your chances of "catching a falling star" above average! These meteors are very fast, and although faint, occasional fireballs do leave persistent trails.

For best success, get away from city lights. Face south-southeast, relax and enjoy the stars of the Winter Milky Way. The radiant is near Betelgeuse, but may occur from any part of the sky. The meteor watching experience is much more comfortable if you include a lawn chair, blanket, and thermos of your favorite beverage.

Clouded out? Don't despair. You don't always need eyes or perfect weather to keep the watch. Tune an FM radio to the lowest frequency that doesn't receive a clear signal. An outdoor FM antenna pointed to the zenith increases your chances - but isn't essential. Simply turn up the static and listen. Those hums, whistles, beeps, bongs, and occasional snatches of signals are distant transmissions being reflected off a meteor's ion trail!

SUNDAY, OCTOBER 22

Something very special happened today in 2136 B.C. A solar eclipse occurred and it had been predicted by Chinese astronomers. A good thing, because royal astronomers were executed for failure!

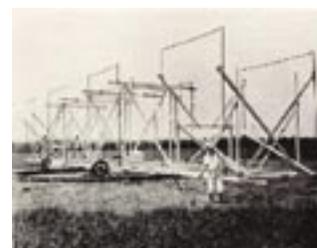
Today is the birthday of Karl Jansky. Born in 1905, physicist Jansky was also an electrical engineer. His pioneering discovery was non-earth-based radio waves at 20.5 MHz. This serendipitous discovery occurred while investigating radio noise in 1931 and 1932.

In 1975, Venera 9 kept busy for almost an hour sending Earth its very first look at Venus' sharply-etched surface of flat rocks and angular stones.

Tonight is New Moon: it's the perfect time to revisit the Veil Complex and North American Nebula. Having trouble aiming at the zenith? Then let's leave these two nebulae for an hour and head off to revisit the "Cluster and Galaxy" pair that are well positioned at skydark in Cepheus - dense open cluster NGC 6939 and 9th magnitude face-on spiral NGC 6946. Take the time to travel a fist width northeast of Deneb for M39 as well.

Interested in something new while we're waiting? Try M73 - a faint asterism of stars in southern Aquarius - and its neighbor M72 - the faintest of Messier globular clusters. Like double star M40, the asterism M73 is an anomalous study whose nebulous appearance qualified for Messier's list of comet-like objects. Through a modest scope, this asterism appears to be a small triangle of three 10 to 12th magnitude stars. The brightest is south, mid is north and the dimmest is to the west between the two brighter members. High power will show the 12th magnitude star to be double - separated by about 10 arc-seconds. Larger scopes will hold all four stars in the asterism direct. Most observers agree these four stars seem to be related.

M72 was discovered on the night of August 29, 1780 by Pierre Méchain. This 55,000 light-year distant globular is the most challenging of the 29 Messier globular clusters. At magnitude 9.2, and 7 arc minutes in apparent size, Class IX M72 is almost beyond detection at low power through average scopes. Small, dim, and not particularly condensed, it's amazing that Méchain managed to detect it, but you'll find them both southwest of Nu Aquarii.



KARL JANSKY
CREDIT: NASA



SOLAR ECLIPSE
CREDIT: NSO/AURA/NSF



M73
CREDIT: REU
PROGRAM NOAO/AURA/NSF

MONDAY, OCTOBER 23

With tonight's dark skies, let's head toward a big scope challenge before the lunacy resumes. Tonight we'll seek out 10.0 magnitude, 5 arc-minute sized galaxy IC 10 in Cassiopeia.

Starting at Beta, shift a degree and a half east. First noted by Lewis Swift in 1889 at the Warner Observatory in Rochester, NY, it wasn't until the 1960s that motion studies confirmed that this dwarf galaxy was a true member of our Local Group.



IC 10
CREDIT: ADAM BLOCK/
NOAO/AURA/NSF

TUESDAY, OCTOBER 24

Tonight the slender crescent Moon will offer a real challenge for visual observation low on the western horizon. If you do see it, this delicate sliver will be faintly illuminated by the glow of what was once known as the “da Vinci effect” - but is now called Earthshine. Look for Jupiter and Mercury very nearby.

If you do look to the lunar surface tonight to the extreme north, you could possibly see the beginning of crater Gauss on the edge, or Mare Marginis about one quarter the way along the limb to the south. Perhaps Mare Smythii will show well just north of central, or crater Humboldt will be seen just to the south.

Today in 1851, William Lassell was busy at the eyepiece of his privately-owned 24 inch reflector telescope in Liverpool, England. His discovery was Uranus’ moons Ariel and Umbriel. At magnitudes 14.4 and 15.1, this pair is beyond most backyard equipment, but you can give it a try. Have a look at this distant world - now easily found a little less than a degree south-southwest of Lambda Aquarii. Keep in mind that these two natural satellites of Uranus are tougher to spot than Oberon and Titania, not only because they are slightly fainter - but also because they orbit close to the planet.

Tonight the Moon will set well before skydark. Let’s have a look at a real “class act” - M75. Start at Beta Capricorni and head southwest about four finger-widths.

This Class I, 8.6 magnitude study was discovered by Pierre Méchain on the night of August 27, 1780. William Herschel went on to resolve this 68,000 light-year distant cluster in 1784. Often described as a fainter version of M3 in Canes Venatici, it has a high intrinsic brightness of magnitude -8.3. M75 and M80 are two of the most highly compressed of all globular studies.



“EARTHSHINE”
CREDIT: GREG KONKEL



M75
CREDIT: NOAO/AURA/NSF

WEDNESDAY, OCTOBER 25



HENRY RUSSELL
CREDIT: NASA

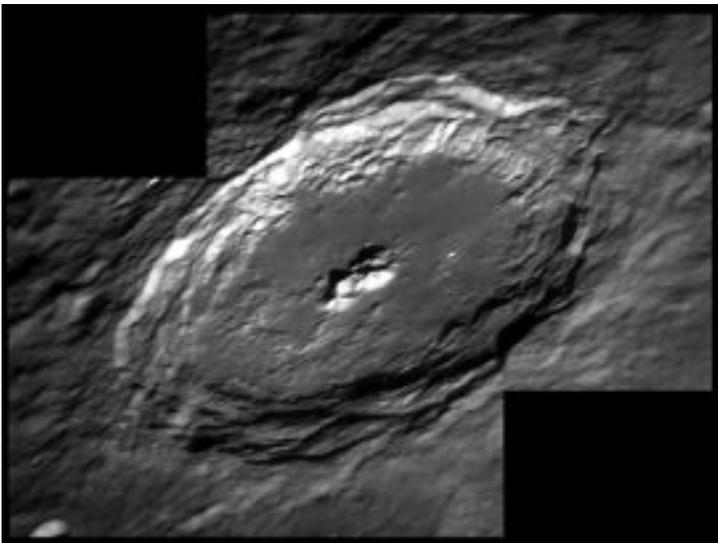
And who was watching the planets in 1671? None other than Giovanni Cassini who had just discovered Saturn's moon Iapetus. Early risers can look for this 10th magnitude Saturnian satellite about an hour or so before sunrise.

Today is the birthday of Henry Norris Russell. Born in 1877, Russell was the American leader in establishing the modern field of astrophysics. As the namesake for the American Astronomical Society's highest award (for a lifetime of contributions to the field), Mr. Russell is the "R" in H-R diagrams - a word first used in a 1914 paper.

Tonight on the lunar surface you will see the beginnings of Mare Crisium, a unique feature since it is not connected to any other mare. This highly curved, low reflecting area is about the size of the state of Washington. Further south you will see the emerging and ancient crater Langrenus. Look for equally old crater Petavius about one-third the way north of the southern cusp. Using bin-

oculars see if you can spot crater Vendelinus between the two. This eroded ancient will disappear in the days ahead.

And when the Moon disappears just before skydark, have a look at 8.2 magnitude galaxy M110. It's not hard to find. Just use low power and travel off the Andromeda Galaxy's western edge. This dwarf elliptical satellite galaxy of the Milky Way's Local Group has the combined mass of 10 billion suns and extends some 25,000 light-years on the major axis. Visible in binoculars as a patchy elongation, small scopes require very dark



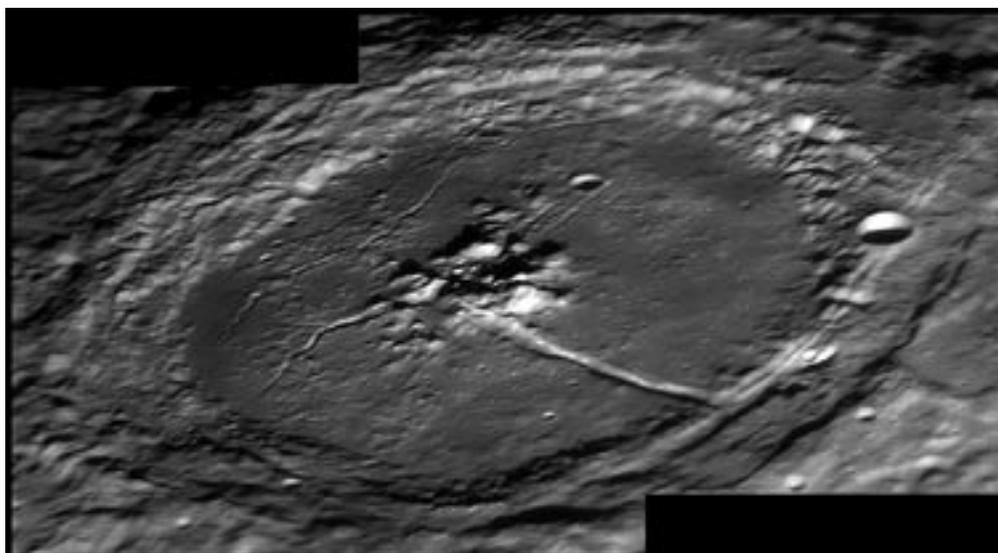
LANGRENUS
CREDIT: DAMIAN PEACH

nights and low magnifications to truly appreciate its expansive nature. M110 is to M31 what M43 is to M42 - a superb study in isolation...but made less so by having an extraordinary companion.

THURSDAY, OCTOBER 26

Tonight look again at the lunar surface and how our study craters have changed. Relocate Petavius and power up on its southern edge. If skies are steady you will see a series of confluent craters with dark interiors. At the northern end of this series lies the small, Class 2 punctuation of crater Hase.

When the Moon disappears just before skydark, have a look at 8.2 magnitude dwarf galaxy M32. Just return to the Andromeda galaxy and look along its eastern edge. This satellite has the combined mass of 3 billion suns and is 8,000 light-years in diameter. Visible in binoculars as a faint diffuse star, small scopes will see it much like a small globular cluster, but no matter how much aperture and magnification you give it, this one remains totally unresolved.



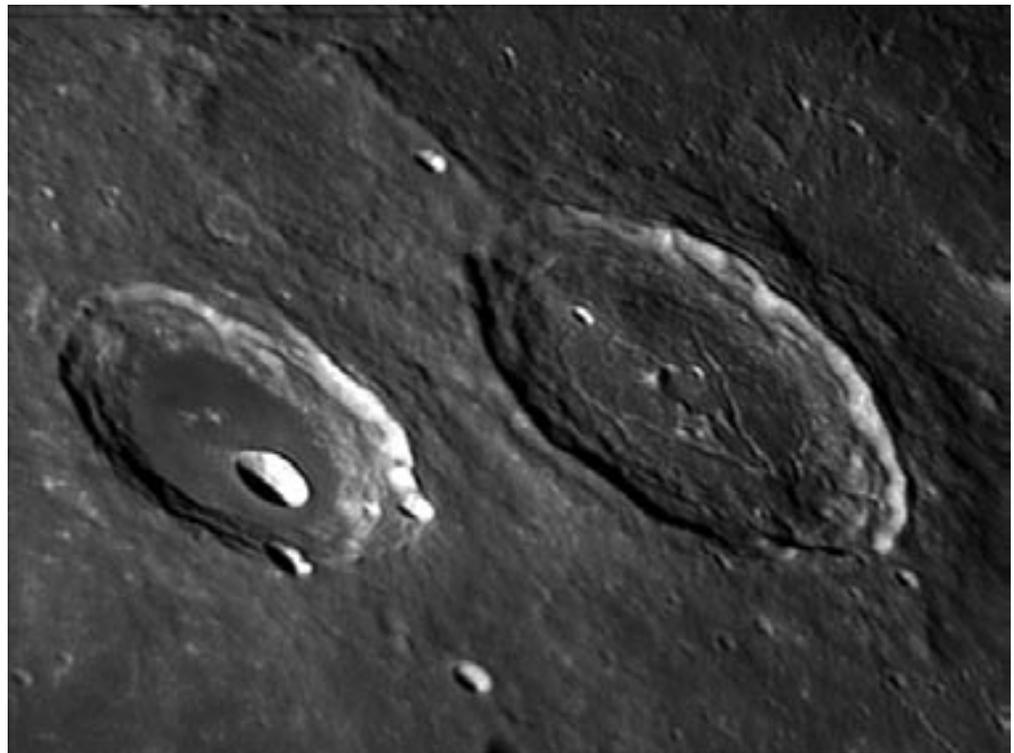
PETAVIUS
CREDIT: DAMIAN PEACH

FRIDAY, OCTOBER 27

Tonight on the lunar surface, let's head well northwest of Mare Crisium for some of the Moon's most impressive craters. Near the terminator is Atlas to the east and Hercules to the west. Note how deep and rugged they appear. As your eye moves back towards Mare Crisium, you will also see another impressive pair, smaller Cepheus and larger Franklin.

When we've finished lunar study, let's track down the two outer planets - Uranus and Neptune - while waiting for the Moon to set. 8.0 magnitude Neptune is now well placed near Iota Capricorni. Uranus is within a degree southwest of Lambda Aquarii. At magnitude 5.8, binoculars should have no trouble revealing it as the second brightest "star" in the field.

Once it gets dark turn your scope toward tiny Delphinus and its two brightest stars - Alpha and Beta. Point your scope at the star northeast - Gamma Delphini - and enjoy the lovely yellow and green pair at the "nose" of this beautiful Celestial Dolphin.



ATLAS AND HERCULES
CREDIT: DAMIAN PEACH

SATURDAY, OCTOBER 28

Today in 1971, Great Britain became the 6th nation to launch a satellite into space.

Tonight let's study lunar features. Along the terminator, the majority of Mare Tranquillitatis will be visible and joined to the north by the beginnings of Mare Serenitatis. Here you will find our first "marker" - the ancient walled plain Posidonius. Inside Serenitatis and running parallel with the terminator are the snake-like lines of Smirnov - a beautiful collection of wrinkled ridges known as "dorsa." To the south look for the "three ringed circus" of craters Theophilus, Cyrillus, and Catharina. Focus on sunlit Mare Nectaris to the southeast. Cutting between Theophilus in the north, and shallow open crater Beaumont in the south is a thin, bright line. Congratulations! You've just spotted an officially "unnamed" lunar feature we can refer to as Dorsum Beaumont. Very cool...

Now turn binoculars towards the cluster-rich region of Cassiopeia. Just for fun, take a blank sheet of paper and make a large "W." As you are sweeping Cassiopeia, jot down some marks where you see stars condense. Then later reference star charts to identify precisely what you've "discovered for yourself!"

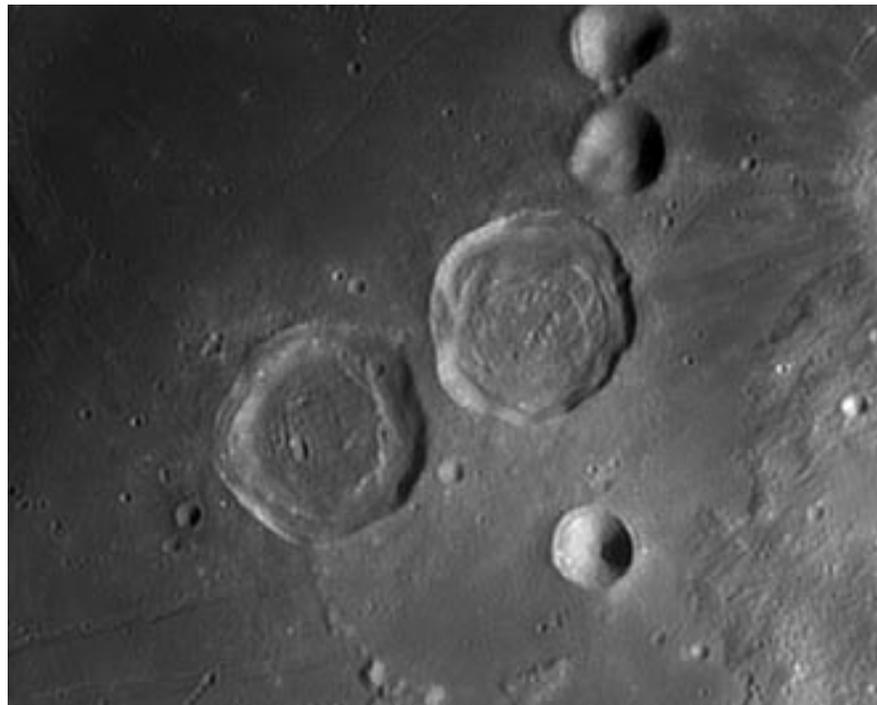


DORSA BEAUMONT
CREDIT: ROGER WARNER

SUNDAY, OCTOBER 29

On this night in 1749, Guillaume-Joseph-Hyacinthe-Jean-Baptiste Le Gentil was at the eyepiece of his 18' focal length telescope. His study of choice was the Andromeda Galaxy, which he believed to be a nebula. Little did Le Gentil know at the time, but his descriptive notes also included M32. It was the first small galaxy discovered and another 175 years would pass before such a thing would be recognized by Edwin Hubble as such.

Tonight, all of Mare Tranquillitatis, and the majority of Mare Serenitatis will be revealed just north of the terminator's mid-point. On the northwestern shore of Serenitatis, the eastern portion of the Caucasus Mountains will emerge in the sunlight. Tonight let us again take an historic journey to the southwest edge of Tranquillitatis and visit with the Apollo 11 landing area. Although we can never see the "Eagle" telescopically, we can find where it landed. Tracing the western wall of Tranquillitatis, look for the small circles of craters Sabine and Ritter. Once located, switch to your highest magnification. Look in the smooth sands to the east to see a parallel line of three tiny craters. From west to east, these are Aldrin, Collins, and Armstrong - the only craters to be named for the living. Just south of these three tiny punctuations is where Apollo 11 touched down, forever changing our perception of space exploration.



SABINE AND RITTER
CREDIT: DAMIAN PEACH

MONDAY, OCTOBER 30

Tonight along the terminator west of the Caucasus Mountains, two craters - Aristillus and Autolycus - will stand out impressively. The larger and northernmost is Aristillus. If the sunlight is high enough, you may be able to see ridges in its thick walls or the Sun rising over its multiple center peaks. Watch in the days ahead as it gains a ray system. To the south is much smaller Autolycus. Its walls are not as impressive, but it, too, will gain a ray system.



ARISTILLUS AND
AUTOLYCUS
CREDIT: GREG KONKEL

TUESDAY, OCTOBER 31

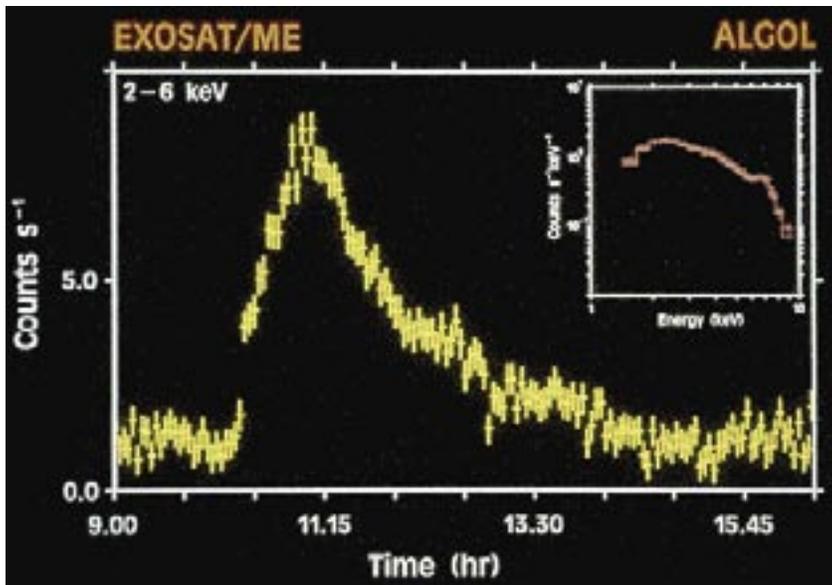
Happy Halloween! Many cultures around the world celebrate this day with a custom known as “Trick or Treat.” This evening instead of tricking your little



M45: “THE PLEIADES”
CREDIT: STEVE MANDELL

ghouls and goblins, why not treat them to a view of the lunar surface? Tonight the Apennine Mountain Range will appear exceptionally beautiful, and if one of them asks you what that crater is that is caught on the Apennine southern tail? You can tell them it’s Eratosthenes!

After the goblins their wanderings, let’s go haunt the night with ghostly M45. The date of the Pleiades culmination has been celebrated through its rich history with ancient rites – but there is one that really fits the occasion. What could be spookier than to imagine a bunch of Druids celebrating the Pleiades’ midnight “high” with Black Sabbath? This night of “unholy revelry” is still observed in the modern world as “All Hallows Eve.”



ALGOL’S LIGHTCURVE
CREDIT: NASA

spookier than to imagine a bunch of Druids celebrating the Pleiades’ midnight

“high” with Black Sabbath? This night of “unholy revelry” is still observed in the modern world as “All Hallows Eve.” Now identify Beta Persei, better known as Algol. Ancient history has given this star many spooky names and my favorite is the “Demon Star.” Medieval astronomers and astrologers associated Algol with danger and misfortune, and we believe that Beta’s strange visual variable properties were noted throughout history. At 93 light-years away, Algol is the nearest eclipsing binary of its kind and is treasured by the amateur astronomer, for it requires no

special equipment to easily follow its 10 hour eclipse.
Thanks for haunting the night with me...

NOVEMBER 2006



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WEDNESDAY, NOVEMBER 1

On this day in 1977, Charles Kowal made a wild discovery - Chiron. This was the first of a multitude of tiny, icy bodies found in the outer reaches of the solar system. Be on the lookout as the Moon will occult another solar system body tonight - Uranus. Be sure to check IOTA for times and locales.

Tonight one of the most impressive of all lunar features will emerge to the south - crater Clavius. Within Clavius you will see a near-spiraling curve of progressively smaller craters beginning with Rutherford breaking the southeast wall. Steady seeing and high power will go on to reveal numerous smaller craters populating its broad floor. Be sure to check out crater Porter to the northeast echoing Rutherford. After delighting in Clavius' extraordinary interior detail, use it to locate other interesting features. Between its southwest wall and the terminator lies another major (but smaller) mountain-walled plain known as Blancanus, which may be deeply shadowed. Return to Clavius and head about the crater's width northwest for pentagonal Longomontanus.



CLAVIUS
CREDIT: ROGER WARNER

THURSDAY, NOVEMBER 2

Today celebrates the birth of an astronomy legend - Harlow Shaply. Born in 1885, Shaply paved the way in determining the distances to stars, clusters, and the center of our Milky Way galaxy. Among his many achievements, Shaply directed the Harvard College Observatory. Today in 1917 “first light” was captured by the Mt. Wilson 100” Hooker reflector.

Although we don’t have that much aperture to study with tonight, we can still get a very satisfactory look at the lunar surface. Through binoculars head north and look for old favorite, Sinus Iridum. Around central, follow the emergence of sharply-etched Copernicus. Those with telescopes should attempt to locate the similarly sized “ghost crater” Stadius to the east.

Now let’s turn those binoculars towards a pair of intriguing asterisms of 5th and 6th magnitude stars located near Ursa Minor - the Little Dipper. The first is a large group of four bright stars with a slightly fainter member in its midst. You’ll find the “Butterfly Asterism” about a fist width south-southeast of Gamma Ursae Minoris towards Eta and Zeta Draconis. Now let’s try for the slightly smaller “Box and One Asterism” - a group of four primarily 6th magnitude stars taking the form of a parallelogram less than two finger-widths east of Zeta Ursae Minoris.

What’s in the box? That awaits a darker night and far more aperture...



HARLOW SHAPLY
CREDIT: NASA

FRIDAY, NOVEMBER 3



LAIKA
CREDIT: NASA

On this day in 1955 one of the few documented cases of a person struck by a falling meteorite occurred. What are the odds on that?

In 1957, the Russian Space Program launched its first “live” astronaut into space - Laika. Carried aboard Sputnik 2, our canine hero was the first living creature to reach orbit. Sputnik 2 was designed with sensors to transmit ambient pressure, breathing patterns and heartbeat of its passenger, and carried a television camera. The craft also monitored ultraviolet and x-ray radiation to further study the impact of space flight on human occupants. Unfortunately, the technology of the time offered no way to return Laika to Earth, so she perished in space. On April 14, 1958, Laika and Sputnik 2 returned to Earth in a fiery re-entry after 2,570 orbits.

The Moon will be closest to the Earth tonight, so let’s revisit crater Copernicus and put some power its way. Through steady skies, high magnification easily brings out its central mountain peaks, but look closely at that east wall. Can



COPERNICUS
CREDIT: ROGER WARNER

you resolve the small A crater lodged within it? The shock region around Copernicus’ exterior is equally fascinating with its runneled appearance. At the limits of this these ramparts, you’ll see the double impact of tiny crater Fauth to the south, and Gay-Lussac to the north. If conditions are good you might also spot the Gay-Lussac Rima running diagonally southwest to northeast tangential to Copernicus. About a Copernicus-width southwest look for impressive, but smaller impact crater Reinhold. Now let’s walk...

To the southeast of Reinhold, you will spot very similar crater Lansberg. At this crater’s southern boundary will begin a series of low ridges which may be the remains of extinct crater walls. Almost directly in the center of these is the landing area for the Luna 5 mission. If you continue southeast about the same distance into the smooth sands of Mare Insularum, you’ll be in the landing area for Surveyor 3 and Apollo 12.

Since we’ve got the scope out, let’s revisit M57. To the southwest is an asterism of six stars called “The Chalice of the Ring.” The faintest of these stars is magnitude 12.3. Power up to darken the sky as much as possible. To aid in identifying this asterism, most eyepieces at 200X will feature M57 in the middle of the field and leave the stem of the “Chalice” visible at its farthest extent to the southwest.

SATURDAY, NOVEMBER 4

This morning will be the peak of the Southern Taurid meteor shower. Historically noted around the world for producing fireballs, the Taurids are best seen in the early morning hours as the Moon heads far west. The radiant for this shower lies near Aldebaran, but did you know the Taurids come in two streams?

It is believed the parent comet shattered while passing the Sun 20,000 to 30,000 years ago. The larger “chunk” is now known as periodic comet Encke. The remaining debris turned into a few very small asteroids, and many meteoroids. The larger meteors pass through the atmosphere creating astounding “fireballs” known as bolides. Although the fall rate for this particular shower is rather low at 7 per hour, these slow traveling meteors (27 km per second) are usually very bright and appear to almost “trundle” across the sky. With chances of seeing a bolide high all week, be sure to get out early and often!

Tonight the Moon will play havoc with the skies almost all night, but it can't stop us from seeing double! Binoculars should have a look at 3.8 magnitude Algedi (Alpha Capricorni) and its widely-spaced 4th magnitude companion. Both stars are solar spectral types (G stars) - but that's where their resemblance to our Sun ends. These two are yellow giants...and a rare alignment of two bright stars, for they are not a true binary. Alpha 1 is 690 light-years distant while Alpha 2 is six times closer.

If you brought your scope out tonight, challenge yourself to Pi Capricorni. Look for an 8.5 magnitude companion 3.2 arc seconds southeast. Pi is the more southerly of two stars south of Alpha.



COMET ENCKE
CREDIT: NASA

SUNDAY, NOVEMBER 5

It's officially Full Moon once again. Native American legend refers to this as the Full Beaver Moon. Because the northern climate is now getting colder, it became the time to set beaver traps before swamps froze - leaving trappers a supply of warm furs to survive the winter months. Some also believe that



CREDIT: ROGER WARNER

the Beaver Moon may have been so named for the beavers themselves, who ready their homes for coming cold. No wonder this is also called the Frosty Moon as well!

And frosty is just how the Moon will appear to binoculars or telescopes. Look at both the west and eastern limbs. Is the Moon truly "Full" tonight, or can you still see a bit of the terminator?

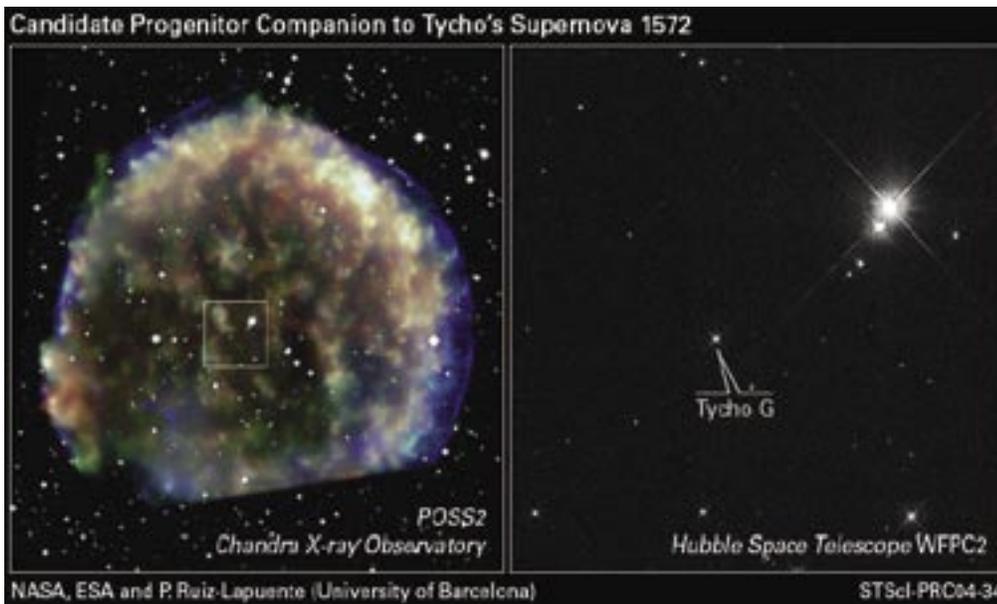
Tonight let's look to a very "cool" star - Enif. Magnitude 2.5 Epsilon Pegasi has a photospheric temperature of 4500 K, and is a class K su-

pergiant around 700 light-years distant. Its total luminosity is nearly 7000 times that of our Sun. Enif's "surface" has a diameter of 150 million miles - a size which would leave the orbit of planet Earth only 18 million miles above a sea of orange flame! Assuming that such a planet could exist with a moon, nothing ever resembling an eclipse could occur. That moon would "transit" across Enif's ruddy face taking three and half days to complete a single pass. Imagine sunsets and sunrises lasting more than 3 hours!

MONDAY, NOVEMBER 6

Look for the Moon and the Pleiades to be very close together tonight.

On this night in 1572, Tycho Brahe was moved enough to sit down and record the emergence of a bright new star in Cassiopeia - and begin a celebrated career in astronomy. Brahe's "Nova Stella" was thought by him to be the first "New Star" observed in the heavens. Initially seen to be as bright as Jupiter, SN1572 went on to rival Venus and for almost two weeks and could be found in daylight. Within 16 months (March, 1574), SN1572 faded from sight. Now primarily a 10,000 light-year distant radio source, its remnant has expanded nine times faster (9000 km/s) than M1 and is now almost four arcminutes in apparent size. Seen primarily at very long wavelengths, you can view SN1572's locale near Kappa Cassiopeia. Using Eta Cassiopeia as a starting point, extend a line to Kappa. Continue that line one degree and use binoculars to look for a line of faint stars heading northwest. The very first in this series of marks the location of SN1572.



"TYCHO'S SUPERNOVA"
CHANDRA AND HUBBLE IMAGES
CREDIT: NASA

TUESDAY, NOVEMBER 7

This evening the Moon rises at skydark - but that doesn't mean we can't observe. Start around three finger-widths west-northwest of previous study star, Enif, to view globular M15. For large aperture, power up to resolve its interior planetary nebula - Pease 1. Now head a fist width south to the expansive core of globular M2. Both studies may be seen in large finderscopes and binoculars - even under moonlight!

Now wait until the Moon clears most of the atmospheric disturbance and have a look at the brilliant ring of Manilius on the northeast edge of Mare Vaporum just north of lunar central. To its northeast, look for the grey oval of Mare Serenitatis. Follow the bright ray to the south shore and say hello to the even brighter ring of Menelaus!



LUNAR RAYS
CREDIT: ROGER WARNER

WEDNESDAY, NOVEMBER 8

Born this day in 1656, Edmund Halley made his mark by determining the orbital period of the comet now bearing his name. In 1718 Halley went on to discover that the “fixed stars” displayed motion of their own. Sir Isaac Newton - and the world - owes a debt of gratitude to Halley for helping publish a rather famous work on the laws of gravity and motion. Hang onto your hat, because orbit and motion is about to come into play. One of the biggest events of the year is about to happen...the Mercury Transit.

At least a portion of this major event can be seen from both Americas as the transit begins near the sunset hour. For lucky viewers on the western edge of North America, all of New Zealand and the eastern edge of Australia and Asia, the entire event will be visible as we move between the International Date Line and sunset and rise. The only folks who will miss out will be Europe and Africa.

Because this is such a significant occurrence, plan well in advance to get a proper solar filter or to make arrangements will a local observatory or university to view. If this isn't possible, let's repeat instructions on safe solar projection methods.

First off, NEVER look at the Sun through any unfiltered optical aid. Mylar, smoked glass and exposed film are NOT safe. #12 welder's glass or solar filter film taped securely to binocular lenses is suitable for short periods, but be extremely careful that the entire viewing surface is covered. A very safe way to observe the transit with no special equipment is to project an image of the Sun through a telescope or binoculars onto a white screen. This can be something as simple as a paper plate or cardboard. Make sure that telescope finders are covered and one set of lenses for binoculars.

By using the shadow method to aim, you'll see a circle of light on your screen - the Sun. Adjust the distance until it is about the size of a small plate, then focus until the edges are sharp. You are now ready to view the transit.



EDMUND HALLEY
CREDIT: NASA



MERCURY TRANSIT
CREDIT: COR BERREVOETS

THURSDAY, NOVEMBER 9



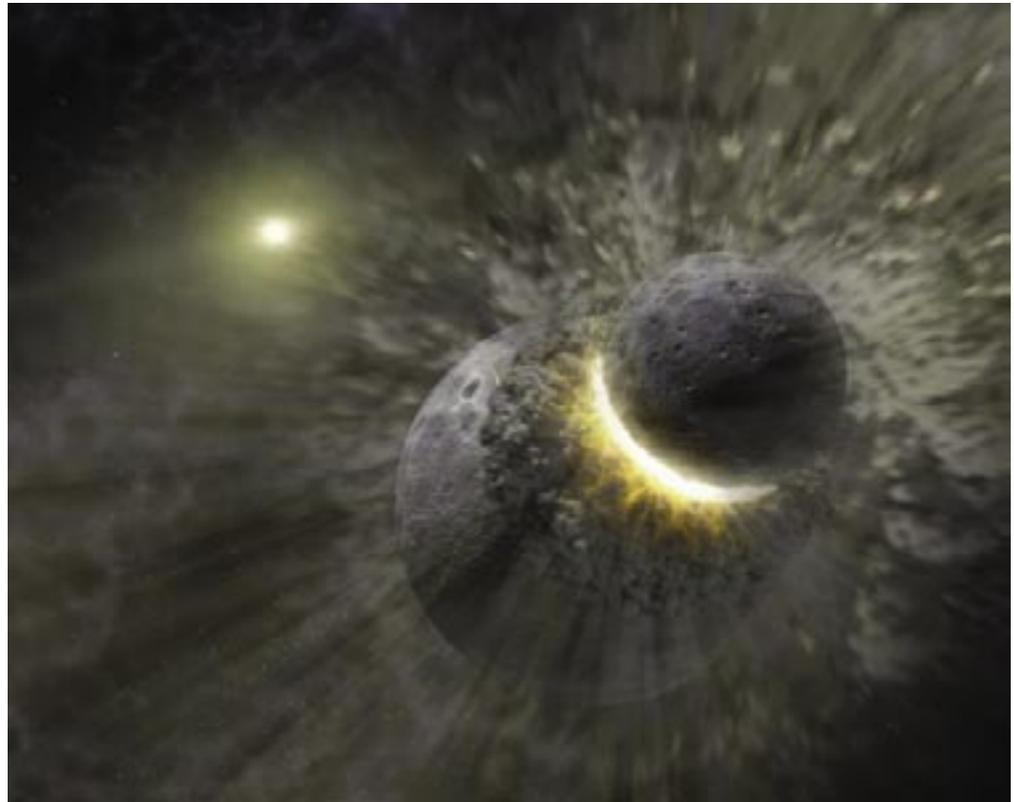
CARL SAGAN
CREDIT: NASA

Today is the birth date of Carl Sagan. Born in 1934, Sagan went on to become a planetologist, exobiologist, popularizer of science and astronomy, and novelist. His influential work and enthusiasm for the Cosmos inspired us all. In his memory we have no further to look than brilliant Vega.

In Sagan's most popular novel *Contact*, Vega was chosen to be the main character's first wormhole transit stop. In the fictional work, astronomers are puzzled that such a young star system - still filled with debris left over from formation - could possibly be the source of broadcasts from an ancient extra-terrestrial civilization. In reality, Vega was one of the first stars determined to have a large heat-radiating circumstellar cloud around it. Interestingly, that cloud may actually be a disk - since we see Vega from its pole, not its equator. This accretion disk may be the type that forms planets.

As you view Vega tonight, keep in mind that it has 2.5 times our Sun's mass, and converts hydrogen to helium at a more prodigious rate. It will remain on the main sequence for only about a billion years before becoming a red giant. Unlike Algol, or the many blue stars in globular clusters, Vega has no nearby red giant companion to "refuel" itself through gravitational theft.

ARTISTIC CONCEPT OF
HOW MAJOR COLLISIONS
MIGHT HAVE CAUSED DUST
RING AROUND VEGA
CREDIT: NASA



FRIDAY, NOVEMBER 10

Unseen by observers, the planets Mars, Mercury, Venus, and Jupiter are now within nine degrees of the Sun. Venus is moving west to become an evening star. Mars has turned the corner to begin the long, slow process of moving towards its next opposition on December 24, 2007.

After astronomical dusk, Capricorn will give way to Aquarius, while overhead Cygnus will give way to Pegasus. Of the five circumpolar constellations, Cepheus will be at its highest - later to be followed by bright Cassiopeia, then faint Camelopardalis, and Lynx in turn. Draco now is to the west and Ursa Major begins its ascent in the morning hours. All is well in the heavens as we approach Zero hour.

The closest bright star marking Zero hour is Beta Cassiopeiae - Caph. The finest deep sky study lying near Zero hour in the northern hemisphere is NGC 7789 located about two finger-widths southwest. Dense, but relatively faint, this 6.7 magnitude open cluster will appear galaxy-like to smaller scopes and binoculars. Located within 3 minutes of Zero hour, this 8,000 light-year distant cluster explodes with 12th magnitude and fainter stars with large aperture and dark night skies. It is truly magnificent.

SATURDAY, NOVEMBER 11



VESTO SLIPHER
CREDIT: NASA

A true observer was born on this day in 1875. His name was Vesto Slipher, who spent some very quality time with the 60" and 100" telescopes on Mt. Wilson. Slipher was the first to photograph galaxy spectra and measure their redshifts, which led to the discovery of the expansion of the universe by Edwin Hubble.

Tonight let's use our eyes, binoculars or small scopes take a look at a "Slipher" galaxy as we head towards Andromeda and M31. Containing over 300 billion stars, it's one of the largest galaxies known. In 1912, Slipher analyzed it spectroscopically to discover its blue shift: "The magnitude of this velocity, which is the greatest hitherto observed, raises the question whether the velocity-like displacement might not be due to some other cause, but I believe we have at the moment no other interpretation for it. Hence we may conclude the Andromeda Nebula is approaching the solar system with a velocity of about 3000 kilometers per second."

For larger scopes, let's challenge ourselves to a galaxy lying very close to the Zero hour within the Great Square of Pegasus. Start at Gamma and head about 3 degrees northwest to locate a "scratch of light" - NGC 7814. This magnificent 10.5 magnitude spiral is edge-on in presentation. Containing a bright nucleus, high power will reveal a razor-edge dustlane almost perfectly bisecting the galactic core, then extending out to its wispy spiral extensions!

SUNDAY, NOVEMBER 12

Wouldn't you love to have been there in 1949 when the first scientific observations were made with the Palomar 5-meter (200-inch) telescope? Or to have seen what Voyager I saw as it made a flyby of Saturn on this date in 1980? Or to have been around in 1833 - the night of the Great Leonid Meteor Shower! But this is here and now, so let's make our own mark on the night sky as we begin studies of the Andromeda Family...

The two galaxies we are about to explore are relatively easy to find but difficult to see in even a mid-sized scope. Our first study is NGC 185 - a 9.2 magnitude located precisely 6 degrees and 49 arcminutes due north of M110. Once you've found this distant M31 companion, the real test will be similarly-sized but fainter (9.4) magnitude neighbor NGC 147 - located almost precisely one degree due west. More about this pair later.

While you're out, be sure to watch for members of the Pegasid meteor shower. With a radiant near the Great Square, this stream lasts from mid-October to late November and was once quite spectacular. Watch for a peak on November 17. If you're still out when the Moon rises, look for Saturn only about a finger-width away!



"SATURN AT NIGHT" -
VOYAGER 1 IMAGE
CREDIT: NASA



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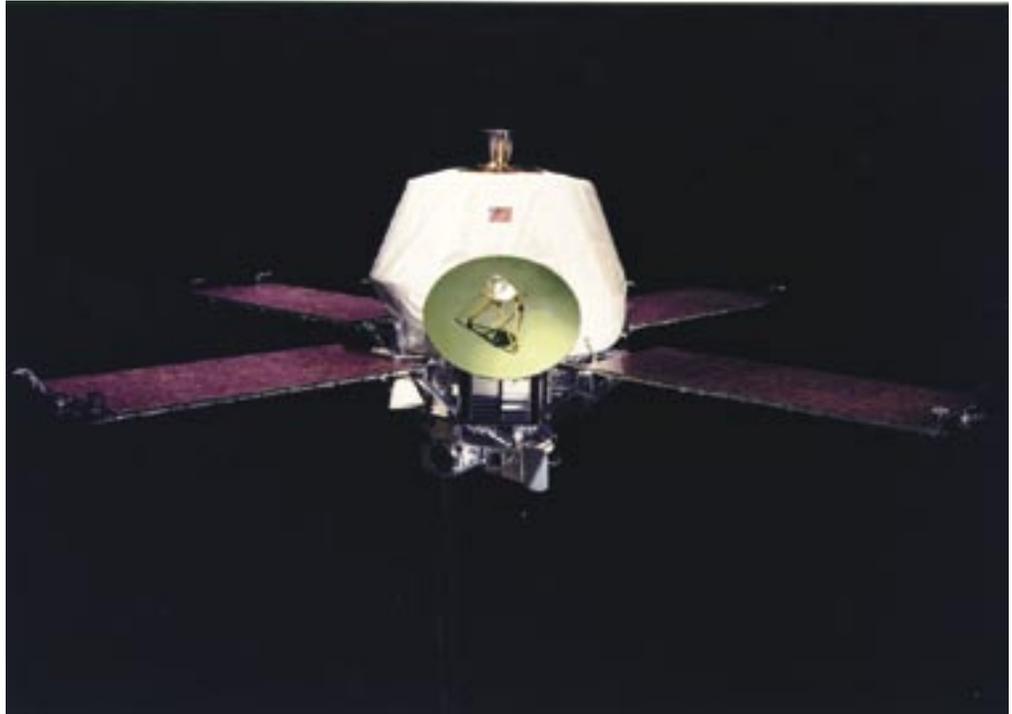
MONDAY, NOVEMBER 13



JAMES CLERK MAXWELL
(WIDELY USED
PUBLIC IMAGE)

Today is the birthday of James Clerk Maxwell. Born in 1831, Maxwell was a leading theoretician on electromagnetism and the nature of light. On this day in 1971, Mariner 9 became the first space probe to orbit Mars.

Tonight we return to the Andromeda Family companions. Both galaxies were discovered by a Herschel. Father William found NGC 185 on November 30, 1787, while son John discovered NGC 147 on September 8, 1829. Both galaxies are thought to be about 2.5 million light-years away. NGC 185 presents nearly face-on, while NGC 147 is seen more obliquely. In 1944, Walter Baade resolved both galaxies photographically using the 100 inch Mt Wilson reflector. The two are bound together as a true pair and lie within 100,000 light-years of one another.



MARINER 9
CREDIT: NASA

TUESDAY, NOVEMBER 14

Viewers in Turkey and Africa are urged to visit IOTA. Asteroid Froeschle will occult star 76 Tauri on this Universal Date.

Like the visible Andromeda galaxy and its telescopic family, there are also two more visible members of the overall “Local Group.” For Southern Hemisphere observers, tonight would be a great opportunity to study the Small Magellanic Cloud. At 210,000 light-years away, this near neighbor to the Milky Way will be apparent to the naked eye just north of Beta Tucanae. Easily viewed in binoculars and incredible in telescopes, the Small Magellanic Cloud is home to the rich globular cluster 47 Tucanae. As the second brightest globular cluster in the sky, 47 was once believed to be a star until the 1750s when French astronomer Nicolas Louis de Lacaille discovered its true nature.



SMALL MAGELLANIC CLOUD
CREDIT: NOAO/AURA/NSF

WEDNESDAY, NOVEMBER 15



SIR WILLIAM HERSCHEL
CREDIT: NASA

Today marks a very special birthday in history. On this day in 1738, William Herschel was born. Among this astronomer-musician's many accomplishments were the discoveries of the planet Uranus in 1781; the motion of the Sun in the Milky Way in 1785; Castor's binary companion in 1804; and infrared radiation. Herschel also discovered many of the clusters, nebulae, and galaxies that make up Dreyer's New General Catalog (NGC) as well as a staggering number of double stars. Tonight let's look towards Cassiopeia as we remember this great astronomer!

Almost everyone is familiar with the legend of how Queen Cassiopeia came to be bound to her chair, destined for eternity to turn over and over in the sky, but did you know this constellation holds a wealth of double stars and galactic clusters? Seasoned sky watchers are long familiar with Cassiopeia's many objects, but let's begin our exploration with two of its primary stars.

Looking much like a flattened "W," the southern-most bright star is Alpha. Also known as Schedar, this magnitude 2.2 spectral type K star was once suspected of being variable, but no changes have been seen since the advent of modern astronomy. Binoculars reveal Schedar's orange-yellow coloring, but a telescope brings out more. In 1781, Sir William Herschel discovered a 9th magnitude companion star. Today's telescopes easily separate the blue-white component's distance of 63". A second, even fainter companion at 38" is mentioned in lists of doubles, and a third 14th magnitude companion was spotted by S.W. Burnham in 1889. All three stars are optical companions only, but make 175 light-year distant Schedar a delight to view!

Just north of Alpha is our next destination - Achird (Eta Cassiopeiae). Discovered by Herschel in August 1779, Achird is among the most widely known binary stars. The 3.5 magnitude primary is spectral type G, meaning it has a yellowish color much like our own Sun, but is 10% larger than Sol and 25% brighter. Its 7.5 magnitude secondary is a dwarf M-type star and appears distinctively red. It has half the mass of our Sun, crammed into a quarter of Sol's volume and is 25 times dimmer. Beyond the reach of binoculars, Eta B angles off to the northwest some 12 arc seconds distant and makes this pairing a true pair of color - one of the season's finest!

THURSDAY, NOVEMBER 16

Today in 1974, there was a celebration at Arecibo, Puerto Rico, as the gleaming new surface of the giant 1000-foot radio telescope was dedicated. At the time, a quick radio message was broadcast in the direction of the globular cluster M13 by a group of astronomers interested in SETI research.

Tonight, let's see what signals are being sent to us from the 21,000 years ago as we view the "Great Hercules Cluster." What wavelengths shall we use? We suggest 400 - 740 nanometers. What kind of instrument sees in this range? Your very own eyes. Look northwest to the far side of the Hercules "keystone" around 2 finger-widths south of the most northwestern star - Eta. Although you'll need a very dark sky to see 5.9 magnitude M13 unaided, add a pair of binoculars or a telescope and have a look back in time!

And if you have time, be sure to begin observations of the Leonid meteor shower. The peak begins after midnight.



ARECIBO
CREDIT: NASA

FRIDAY, NOVEMBER 17



LUNOKHOD 1
CREDIT: NASA

On this day in 1970, long running Soviet mission Luna 17 successfully landed on the Moon. Its Lunokhod 1 rover was the first wheeled vehicle to leave tracks on the surface. Expected to function three lunar days, Lunokhod 1 continued to operate for eleven. In that time, Lunokhod traversed 10,540 meters, transmitted more than 20,000 television pictures, some 200 television panoramas and performed more than 500 lunar soil tests. Spaseba!

Get up very early this morning because the annual Leonid meteor shower is underway - but for those seeking a definitive date and time, we just can't do that. The meteor shower itself depends on debris shed by comet 55/P Tempel-Tuttle as it passes through the inner solar system every 33.2 years. Once assumed to be strictly a 33 year cycle, astronomers came to realize that the debris dispersed irregularly from the cloud that lagged behind the comet. With each successive pass of Tempel-Tuttle, new debris filaments are left in space near older ones. This creates the different streams the Earth crosses at varying times, making blanket predictions unreliable.

We may never know precisely where and when the Leonids might decide to be their most active, but we do know that a good time to look for them is well before dawn on November 17, 18, and 19. With the Moon mostly out of the way, wait until radiant Leo rises and your chances of spotting the offspring of periodic comet Tempel-Tuttle becomes high. Improve your luck by traveling to a dark sky location; and be sure to dress warmly and be comfortable!

SATURDAY, NOVEMBER 18

Keep watching for the Leonids before dawn this morning.

Tonight let's take a closer look at M31. Many observers often mistake the core region of the Andromeda Galaxy as being the whole picture, but this galaxy is so extensive that we often overlook its true size. For larger apertures, head to the southern edge and look for a slightly nebulous condensation. This is a 12.0 magnitude HII region with its own designation - NGC 206. Discovered by William Herschel on October 17, 1786, this 2.9 million light-year distant study is some 2,000 light-years in size and could be very similar to our own Orion Nebula.

Now look to the eastern edge and trace the perimeter to the north where you'll discover the arc of a dark lane distinguishing the core region from an outer spiral arm. Be sure to look for a second fainter dark arc north of that. Both lanes sweep down and dissipate roughly between the bright central region and companion galaxy M110.



M31: "THE GREAT
ANDROMEDA GALAXY"
CREDIT: STEVE MANDEL

SUNDAY, NOVEMBER 19

With dark skies, it's time to hunt down difficult NGC 404 - a bright star and galaxy pair. Center on Beta Andromedae and look for 10.1 magnitude NGC 404. For an equally tough challenge, let's return to the "Box and One" roughly a fist width from Polaris towards Ursa Minor. "The One" is 11.2 magnitude NGC 6217 - a face-on barred spiral with two faint wispy arms taking the form of an "S." This one requires all the aperture possible to make out structure.



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MONDAY, NOVEMBER 20

Today also celebrates another significant astronomer's birth - Edwin Hubble. Born in 1889, Hubble became the first astronomer to identify Cepheid variables in M31 - establishing the extragalactic nature of the spiral nebulae. Continuing with the work of Carl Wirtz, and using Slipher's redshifts, Hubble calculated the velocity-distance relation for galaxies. This is known as "Hubble's Law."

Tonight is New Moon, and what better time to celebrate Hubble's achievements? For smaller scopes and binoculars, return and enjoy the Andromeda Galaxy, but for those out there with a large scope that really like a challenge?

Then let's dance...

Let's head out 260 million light-years away, and about 3 degrees west-northwest of Beta Triangulum for galaxy cluster Abell 262. This huge, challenging group is extremely faint and includes NGC 703, NGC 704, NGC 705, NGC 708, NGC 709, and NGC 710. Although there are more than a hundred galaxies in this group, the most dominant is 13.7 magnitude elliptical NGC 708. Possessed of a Seyfert Active Galactic Nucleus (AGN), this galaxy may contain a super-massive black hole that allows it to devour its companions. While most of these intensely faint galaxies are ellipticals, magnitude 14.6 NGC 705 may be a spiral, and NGC 709 lenticular. To capture a handful of these galaxies is truly an accomplishment.



EDWIN HUBBLE
CREDIT: NASA

TUESDAY, NOVEMBER 21

Tonight let's honor the south and head for Fomalhaut - Alpha Pisces Austrinus. Due south by around 7 degrees is a "stepping stone" series of three 10th magnitude galaxies. The first is a fairly small, 10.0 magnitude elliptical galaxy - IC 1459. Another 6 degrees further south is magnitude 10.4 NGC 7410. This uniformly illuminated tilted spiral shows little sign of structure. A little less than 4 degrees further south will bring you to 10.5 magnitude IC 5267 - a near face-on spiral that appears as a very pale oval. Now return to Fomalhaut and head east-northeast a little more than 3 degrees for NGC 7507 - a small, 10.4 magnitude elliptical galaxy. Happy galaxy hunting!

WEDNESDAY, NOVEMBER 22

Tonight let's use binoculars or small scopes to go "cluster hunting" in Cassiopeia.

The first destination is NGC 7654, but you'll find it more easily by its common name of M52. To find it easily with binoculars, draw a mental line between Alpha and Beta and extend it about the same distance along the same trajectory. This mixed magnitude cluster is bright and easy.

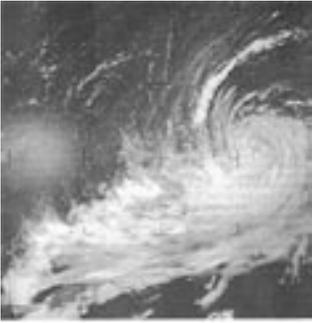
The next, NGC 129 is located almost directly between Gamma and Beta. This is also a large, bright cluster that resolves in a small scope but shows at least a dozen of its 35 members to binoculars. Near the cluster's center and north of a pair of matched magnitude stars is Cepheid variable DI Cassiopeiae - which changes by about a magnitude in a period of a week.

Now head for northeastern Epsilon and hop about three finger-widths to the east-southeast. Here you will find 3300 light-year distant NGC 1027. Seen as an attractive "starry patch" in binoculars, small scopes will have a wonderful time resolving its 40 or more faint members.



M52
CREDIT: NOAO/AURA/NSF

THURSDAY, NOVEMBER 23



TIROS II SATELLITE
IMAGES
CREDIT: NASA

Tonight in 1885, the first photograph of a meteor shower was taken. In 1960, weather satellite Tiros II was launched. Carried to orbit by a three stage Delta rocket, the “Television Infrared Observation Satellite” was about the size of a barrel. Operating for 376 days, Tiros II sent back thousands of pictures of Earth’s cloud cover and was successful in its experiments to control orientation of the satellite’s spin and its infrared sensors. Oddly enough, on this day in 1977 a similar mission - Meteosat 1- became the first satellite put into orbit by the European Space Agency. Why not try observing satellites on your own? Thanks to many on-line tools and services from agencies like NASA, you can be alerted by email whenever a satellite makes a bright pass overhead!

While you’re out, see if you can spot the slim crescent of the Moon hanging briefly on the western skyline just after sunset.

Tonight let’s return to Cassiopeia for a small scope study of two open clusters in the same field of view. Starting at northwestern Beta, look less than two finger-widths northwest for pair NGC 7790 and NGC 7788. Southern NGC 7790 is a fairly large 8.5 magnitude cluster composed of two dozen scattered, faint stars. Northern NGC 7788 is roughly half the size of its companion and slightly fainter. Containing faint stars of mixed magnitude, at high power a small scope should resolve out an arrowhead-shaped region in this cluster.

For binocular observers, head out to the “Double Cluster” and look only a finger-width north. Like many fine deepsky studies which accompany grander partners, you’ll find Stock 2 surprisingly impressive. This degree-wide magnificent cluster is often overlooked, but tonight appreciate its many magnitudes and delightful asterisms.

FRIDAY, NOVEMBER 24

Tonight let's begin our adventures on the Moon as we take a much closer look at the southeastern edge of Mare Crisium. To the southeast, you will spot large crater Condorcet. Due east of Crisium, you will see a smooth, dark area near the limb - Mare Marginus. Continuing south of Marginus you will see a very elongated, on-the-edge feature known as crater Jansky, bordered on the inside by Neper. Return again to Crisium and look for the blank, grey oval of Firmicus to the southeast, just before you meet Mare Undarum. Note the fine central peak in Firmicus!

When the Moon sets, let's head northwest of Gamma to Kappa Cassiopeiae for two open clusters which share the same field of view to its north. The western NGC 146 is tougher to see as an actual cluster but has a pair of brighter stars in its midst. Eastern NGC 133 is less populated, but its overall population is slightly brighter. Both are moderately concentrated.



APOLLO IMAGES OF THE
MARE CRISIUM AREA
CREDIT: NASA

SATURDAY, NOVEMBER 25

Let's begin again on the lunar surface as we head for our marker crater north of Mare Crisium - Cleomides. To Cleomides' east, begin by identifying Delmotte, and to the northwest, Trailes and Debes. Now head south again to Crisium on the terminator and trace the long frozen wave of lava along its west bank known as Dorsum Oppel. Did you catch the two small punctuations of Swift to the north and Pierce to its south? When you reach the central point of the western shoreline, look for Promontorium Olivium and Lavinium. It's easy to catch the sharp, small crater Picard to the east, but did you spot the ruins of Yerkes between them? Or, even tinier Curtis east of Picard!

Tonight let's travel about a finger-width east-northeast of Delta Cephei for new open cluster NGC 7380. This large gathering of stars has a combined magnitude of 7.2. Like many young clusters, it is embroiled in faint nebulosity. Surrounded by a dispersed group of brighter stars, the cluster itself may resolve around three dozen faint members to mid-aperture.



MARE CRISIUM
CREDIT: GREG KONKEL

SUNDAY, NOVEMBER 26

Today in 1965 marks the launch of the first French satellite - Asterix 1.

Tonight let's go to the southern lunar cusp to identify two small, but very nice craters. Using previous study Fabricus, continue south and look for the pair connected side to side - rather than end to end. This is crater Watt with Steinheil intruding on it. Remember the distance traveled south from Fabricus to this pair, and extend that distance even further south. Seen on the limb is crater Biela. If conditions are stable, you might pick up a tiny black point in Beila's west wall - Biela C.

Tonight turn your eyes towards 1000 light-year distant Delta Cephei, one of the most famous of all variables. It is an example of a "pulsating variable" - one whose magnitude changes are not attributed to an eclipsing companion, but to the expansion and contraction of the star itself. Discover what John Goodricke did in 1784...you can follow its near one magnitude variability by comparing it to nearby Epsilon and Zeta. It rises to maximum in about a day and a half, yet the fall take about four days.



CRATERS STEINHEIL
AND WATT
CREDIT: TAMMY PLOTNER

MONDAY, NOVEMBER 27

On the lunar surface, the three rings of Theophilus, Cyrillus and Catharina will emerge, but tonight let's power up on Theophilus and see what we can find!

The area just northeast of Theophilus - where Mare Tranquillitatis and Mare Nectaris join - is called Sinus Asperitatis. Toward its center you will see the remains of a once grand nameless crater holding the younger, sharper Torricelli in its center. Dropping back to Theophilus, just outside of its east wall, you will also find a young crater - Madler. As you head east across the northern shore of Mare Nectaris, look carefully for two partial rings. The northernmost is so eroded that it never received a name, while a slight, faint horseshoe marks all that remains of Daguerre.

Now let's return to Delta Cephei and take a closer look. It is also a well-known double star that was measured by F.G. W. Struve in 1835. Its 6.3 magnitude companion has not shown change in position or separation angle in the 171 years since Struve looked at it. Chances are this means the two are probably not a physical pair, yet S.W. Burnham discovered a third, 13th magnitude companion in 1878. Enjoy the color contrast between its members.



THEOPHILUS,
CYRILLUS AND CATHERINA
CREDIT: GREG KONKEL

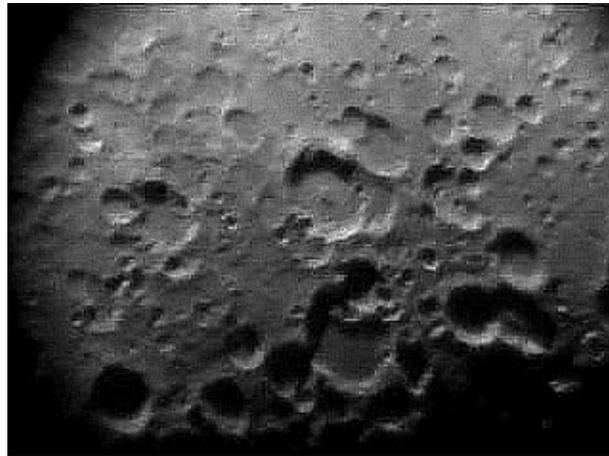
TUESDAY, NOVEMBER 28

Tonight not only will the Moon and Uranus be close, but there will be an occultation. Please check IOTA for specifics in your area.

Are you ready for some more lunar work? Then let's start by identifying previous study Maurolycus.

Maurolycus is found about two Crisium lengths southwest of Theophilus and in tonight's light will appear especially fine. But look just north of Maurolycus to pick out the battered remains of Class III crater Gemma Frisius, an Astronomical League challenge. Spanning 56 miles and descending 17,100 feet below the lunar surface, you'll find its walls broken, yet enough of its northern boundary remains to clearly reveal the impact that created Goodacre. Look for the shadows which blend Goodacre and Gemma Frisius together.

Before we retire to the shadows tonight let's study small, open cluster NGC 225, located a finger-width northwest of Gamma Cassiopeiae. This 7th magnitude collection has been described by some as looking like a sailboat. A more fascinating description might be that of the "Metamorphosis Cluster"- since the southwest region of the cluster looks like a butterfly asterism and to the northeast is the caterpillar asterism. While just barely detectable as an unresolved patch through binoculars on a dark night, tonight's Moon means that magnification is needed just to make out its half dozen brighter 9th magnitude members. Modest scopes should reveal two dozen stars to magnitude 12.



STOFER, MAUROLYCUS
AND GEMMA FRISIUS
CREDIT: TAMMY PLOTNER

WEDNESDAY, NOVEMBER 29

Tonight let's head back to the Moon's north towards the long scar of the Alpine Valley. This easy to spot feature will help to find another challenge crater. Where the valley joins the lunar Alps, follow the range south into Mare Imbrium. Along the way you will see the protruding bright peaks of Mons Blanc, Promontorium DeVille, and at the very end, Promontorium Agassiz ending in the smooth sands. Southeast of Agassiz you will spot the Astronomical League challenge, Cassini. This shallow crater holds another challenge within - Cassini A. Look carefully, Can you spot the B crater on Cassini's inner southwestern rim, or small M crater just outside the northern edge?



NGC 457
CREDIT: NOAO/AURA/NSF

Now to Cassiopeia and its unusual, bright central star - 100 light year distant Gamma. Once thought variable, it's been known for some very radical shifts in terms of temperature, spectrum, magnitude, color, and diameter. It is also a visual double star, but its close, disparate companion isn't easy - it's 3000 times fainter than the primary!

Four degrees southeast of Gamma is Phi Cassiopeiae. By aiming binoculars or telescopes at this star, it's easy to locate an interesting same-field open cluster - NGC 457. This bright and splendid galactic cluster has received a variety

of names over the years due to its uncanny resemblance to various figures. It has been called the "Owl" and the "Dragonfly," and most recently the "E.T. Cluster." As you observe it through a telescope, it's easy to see why. Bright Phi and HD 7902 appear like eyes glowing in the dark and the dozens of stars that make up the body appear like outstretched arms or wings. (For E.T. fans? Check out the red "heart" star in the center.)

All this is very fanciful, but what is NGC 457, really? Both Phi and HD 7902 may not be true members of the cluster. If magnitude 5 Phi were part of the group, they would have to be at a distance of approximately 9300 light-years, making them the most intrinsically luminous stars in the sky - far outshining even Rigel and Deneb! To get a rough of idea of what this means, if we were to view our own Sun from that distance, it would be no more than magnitude 17.5. The fainter members of NGC 457 comprise a relatively "young" star cluster spanning some 30 light-years of space. Most members are about 10 million years old, yet there already is an 8.6 magnitude red supergiant in the center. No matter what you call it, NGC 457 is an entertaining and bright cluster you will find yourself returning to again.

THURSDAY, NOVEMBER 30

On this day in 1954, Elizabeth Hodges of Sylacauga, Alabama was struck by a 4 kilogram meteor after it crashed through the roof of her house and bounced off the radio. Duck!

There's no ducking lunar impacts, though...and tonight we'll have a look at the grandest impact of all, Class I crater Tycho.

Spanning 56 miles and descending 13,800 feet below lunar surface, Tycho's massive walls are 13 miles thick. As one of the youngest craters, Tycho might not look like much tonight, but it is surely one of the most impressive of all features when the Moon reaches Full. Look around Tycho for six small craters encircling it like an old analog telephone dial. To the southeast, another prominent feature calls attention to itself - Maginus. Power up and look closely at the more than 50 meteoritic impacts that have all but destroyed it. The very largest of the wall craters is on the southwest crest and is named Maginus C. On the outer north wall, look for less conspicuous Proctor. It, too, has been struck many times!

This evening Uranus is high in the south right after skydark. Although the planet was first cataloged as a 6th magnitude star (34 Tauri), it was the first outer planet discovered. At 5.8 magnitude, you'll find it slightly less than one degree south-southwest of 4th magnitude Lambda Aquarii. The nearest star that is similar in brightness is magnitude 6.1 variable FM Aquarii. Located a little more than three degrees south-southwest of Lambda, FM varies through pulsation (a Delta Scuti type) and ranges no more than 0.03 magnitudes every two hours.



TYCHO
CREDIT: ROGER WARNER

DECEMBER 2006



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FRIDAY, DECEMBER 1

Born today in 1811 was Benjamin (Don Benito) Wilson, the namesake of Mt. Wilson, California.

The Moon is closest to Earth and tonight we'll start at the Carpathian Mountains directly north of mighty Copernicus' east wall. Some of these peaks reach as high as 6,600 feet and could have been formed from extruded lava. Can you trace them beyond the terminator? To the northeast, Eratosthenes shows very nicely. Continue about one Crisium length north of Copernicus for the sharp puncture of Class I Pytheas. Another half-Crisium length further north, discover a slightly larger, but less prominent, Class I crater - Lambert - residing on an unnamed ridge.

Tonight we know the name of our study, so set your sights on double star Alfirk (Beta Cephei). At magnitude 3.3, Alfirk is easily spotted as the northwesternmost star of the constellation Cepheus. Beta A is a hot, 3.5 magnitude, B-spectral type star accompanied west-southwest by a 13.6 arc second distant 7.8 magnitude blue companion. This one is comparable to Polaris in resolution, so take the opportunity to view both!



BENJAMIN WILSON
CREDIT: ALHAMBRA
HISTORICAL SOCIETY



COPERNICUS AND
ERATOSTHENES
CREDIT: ROGER WARNER

SATURDAY, DECEMBER 2



200" HALE TELESCOPE
CREDIT: NASA

Today in 1934, the largest single mirror in telescope history took form as the blank for the 200-inch Mt Palomar Hale reflector was cast in Corning, NY.

Tonight peaceful Gassendi calls, but we'll visit the "Ocean of Storms" by taking a voyage across the southern Oceanus Procellarum.

Set sail from the port of Gassendi and head north to small crater Gassendi B. As you move across the grey sands, look for a serene wave following the southwestern shore. This is Dorsum Ewing and you'll see it trail south into the pockmark of Herigonius east of Gassendi B. East of Herigonius are two additional craters - the northernmost is Norman. Return again to Dorsum Ewing and follow it north where it leads to some low hills and the tiny crater Scheele and more prominent Wichmann even further north. If you look closely at Wichmann you will see it as a small impact on what appears to be the remains of a long-ago flooded, now terribly eroded crater. Ride the waves in the "Ocean of Storms" to see which port it takes you to!

Now we're off to Aquarius to resolve a stunning matched set of 4th magnitude stars separated by 2.1 arc seconds - Zeta Aquarii. To locate Zeta, start at Alpha and look due east about two finger-widths. Center on the pair and use as much power as sky conditions permit.



MARE HUMORUM AND
CRATER GASSENDI
CREDIT: TAMMY PLOTNER



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SUNDAY, DECEMBER 3

Today in 1971, Soviet Mars 3 became the first spacecraft to make a soft landing on the Red Planet. Two years later on this date Pioneer 10 was the first spacecraft to fly by Jupiter. One year later, Pioneer 11 did the same thing!

Tonight let us go from one extreme to another as we begin on the northernmost limb of the lunar surface. From the northernmost Sinus Roris, look for lens-shaped crater Markov. To Markov's northeast is a large, flat crater with very few distinguishing characteristics. Its name is Oenopides. If conditions are stable, look for a gray slash on the lunar limb further north of Oenopides known as Cleostratus. On the southern limb, look for familiar craters Wargentín, Nasmyth and Phocylides. Even farther south, note the long oval Pingre.

Be sure to look at the "field stars" around the Moon tonight, for the Pleiades are very, very close!

Now let's go to extremes on stars as we look for two doubles - one north and the other south. 4.0 magnitude Kappa Cephei is located a little more than a fist width southwest of Polaris. Center on Kappa at the lowest power and look for 8.0 magni-

tude Kappa B 7.4 arc seconds east-southeast. Now head for 4.5 magnitude 91 (Phi 1) Aquarii high in the south just after skydark. It's the westernmost member of a tangle of 4th and 5th magnitude stars - all called Phi! Look for its 8.5 magnitude companion leading it across the sky to the northwest. This 150 light-year distant pair has a blue dwarf for a secondary and an orange-yellow sub-giant primary.



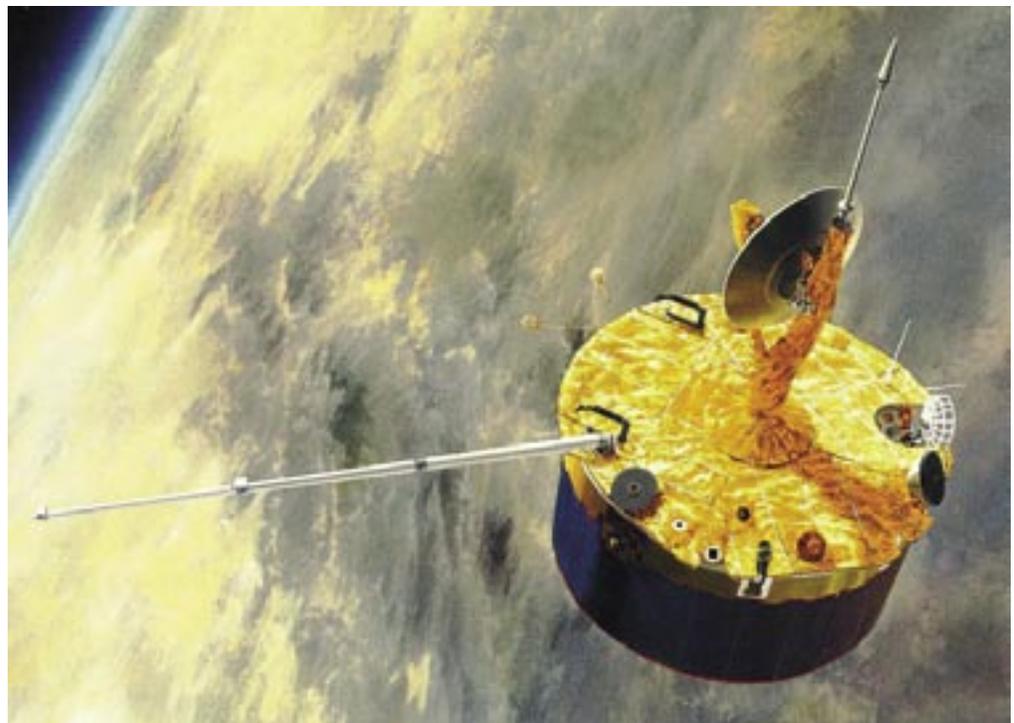
"PIONEER 10
PASSING JUPITER"
CREDIT: NASA

MONDAY, DECEMBER 4

Today in 1978, the Pioneer-Venus Orbiter became the first spacecraft to achieve Venus orbit.

Tonight the great Grimaldi will again capture the eye, but let's head south-east for another featureless dark grey oval - Crueger. Continuing south, the next crater - Darwin - is hard to see because of a rather un-craterlike appearance. Darwin is best caught by focusing on the rima that includes its eastern wall. Look for a Y formation pointing towards Crueger.

Although skies are bright, we can still see double. Locate 5.0 magnitude Lambda Arietis and its companion. This wide pair is an excellent challenge for binoculars. Both stars are F spectral types and should appear ivory in color to most observers. Having trouble in binoculars? Try a finderscope of equal power and aperture. To locate Lambda, look a finger-width west-southwest of Hamal - Alpha Arietis.



PIONEER VENUS ORBITER
CREDIT: NASA

TUESDAY, DECEMBER 5

Tonight is Full Moon and has been given names such as the “Cold Moon” or “Long Nights Moon.” This is the time of winter cold and nights have become long and dark. In some cultures, this is also called the “Moon before Yule.” No matter what it’s called, early winter nights are indeed long and cold. Look for Luna moving high across the sky, opposite the now low Sun.

A star for all seasons is Polaris. Take the opportunity to see what magnification gives the best view of its 8.9 magnitude companion. This one can be tough for small scopes during Full Moon, so try for the right magnification to balance things like sky contrast and image scale. This teaches lots of lessons that really make a difference in resolving even more desperate disparates!



FULL MOON
CREDIT: RICARDO BORBA

WEDNESDAY, DECEMBER 6

With just a short time before the Moon rises tonight, have a look at a splendid set of colors - 1 Arietis. Because this pair is faint, you will need to apply “stellar geometry” to track it down. To find it, start with Alpha and Beta and form a right triangle whose third point is less than a finger-width northwest of Beta. Center the scope at moderate powers on that locale, then use the finder to pick out the nearest 6th magnitude star - 1 Arietis. Look for a 7.8 magnitude green companion south-southeast of the 5.8 magnitude white primary.

Tonight Southern Hemisphere observers should watch for the peak of the Phoenicid meteor shower. With an estimated hourly fall rate of 5, this particular shower might not seem exciting, but it has an unusual place in history. In 1956 over 100 meteors per hour were recorded - leading to the shower’s discovery. This stream is believed to be the offspring of lost periodic comet Blanpain, first observed in 1819. Although the exact time of peak activity is unpredictable, past observations show that it begins right after sunset radiating from a constellation already high in the southern sky. The shower is also unusual because it leaves few visible trails - but is well-known for occasional bright flashes and exploding fireballs!



METEORS
CREDIT: NASA

THURSDAY, DECEMBER 7

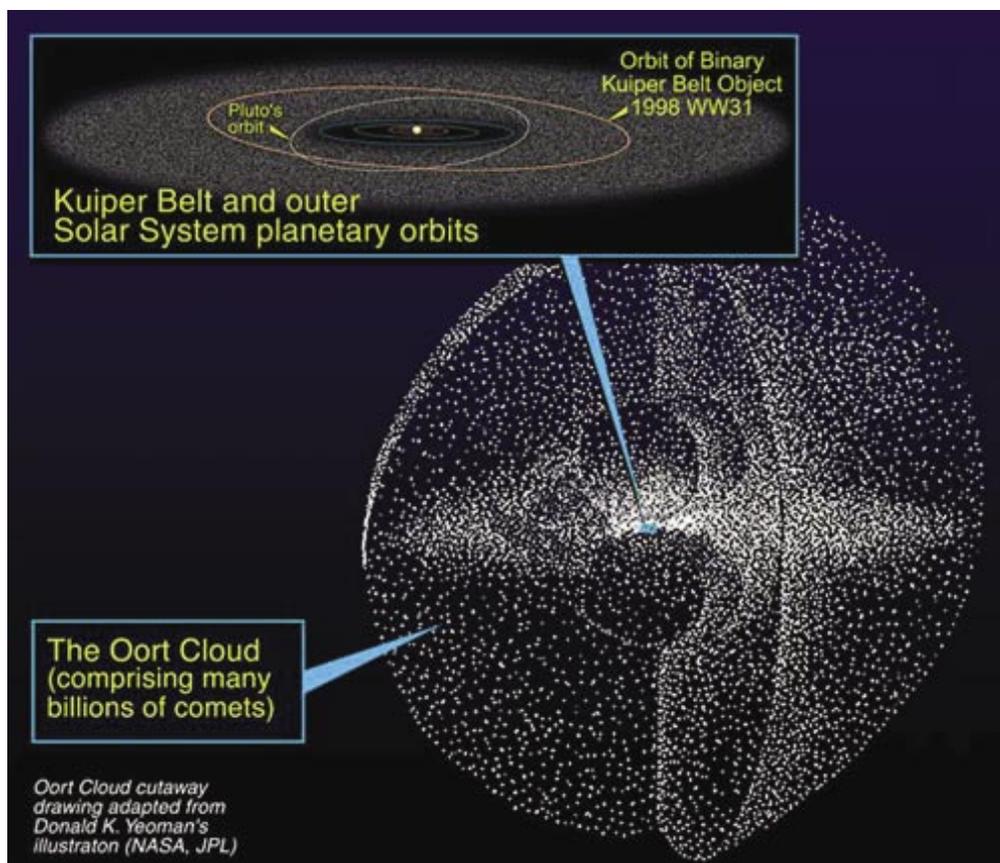
Today is the birthday of Gerard Kuiper. Born 1905, planetary scientist Kuiper discovered the faint moons of Uranus and Neptune while first recognizing a belt of small particles outside the orbit of Uranus. In addition, Gerard was the first to realize Titan had an atmosphere, and specialized in studying the origins of comets in the solar system - especially those with orbits associated with the debris belt carrying his name!

Tonight let's honor Kuiper's achievements by observing Neptune and Uranus before they head too far west for good viewing. Look for magnitude 7.9 Neptune as a tiny high-power blue disk a little more than a degree northwest of Iota Capricorni. Magnitude 5.8 Uranus displays a slightly larger aqua disk south-southwest of Lambda Aquarii.

Watch as Pollux and the Moon accompany each other across the sky tonight...



GERARD KUIPER
CREDIT: NASA



THE KUIPER BELT
AND OORT CLOUD
CREDIT: JPL/NASA



<http://www.universetoday.com>

FRIDAY, DECEMBER 8

With an hour before moonrise, let's journey to a sparse portion of the Milky Way now high in the north just after skydark. Start by locating the two circumpolar constellations Cepheus and Cassiopeia and split the distance between Beta Cassiopeiae and Delta Cephei. Notice the stepping stones of 5th and 6th magnitude stars connecting them. Halfway between our two marker stars, go due south half a fist's width. This brings us to a region of some 5 degrees in diameter devoid of stars brighter than magnitude 6.5. Sweep the area with binoculars or a telescope. Any suggestions as to why a 20 square degree area of the Milky Way would be so deficient in visible stars? Think obscure...



THE CONSTELLATION
OF CASSIOPEIA
CREDIT: NASA

SATURDAY, DECEMBER 9

Southern Hemisphere viewers, you're in luck again! Tonight will be the maximum of the Puppis-Velid meteor shower. With an average fall rate of 10 per hour, this particular apparition could also be visible to those far enough south to see the constellation itself. Very little is known about this meteor shower except that the streams and radiants are very tightly bound together. Since studies of the Puppis-Velids are just beginning, why not take the opportunity to watch? Viewing will be an all night event and although most of the meteors are faint, the Puppis-Velids are known to produce an occasional fireball.

For those of us not so lucky, we'll take advantage of early dark skies to study something that can't be easily seen from the southern hemisphere.

Let's start with a star count. Tonight the Great Square of Pegasus is directly overhead. Dress warm and start about 75 minutes after sunset and begin to fully dark adapt your eyes. Have a seat and relax while the stars come out. You'll probably notice bright Vega to the northwest and Capella to the northeast right away. Within 10 minutes you'll see the four stars of the Great Square - all brighter than the 3rd magnitude. Not long afterward, 3.6 magnitude Omicron Andromeda will appear to the north. Looking toward the Great Galaxy you will notice 4.4 magnitude Nu. When you can see Nu, it's time to count stars within the "Great Square" itself. If you can see two stars direct then stars are visible to magnitude 4.6 and you're off to a great start. Add another and it's deeper still - magnitude 4.8. Four stars means 5.0. Five, and you're down to 5.2. Six and it's 5.4, seven and it's 5.5. As each new star is noticed, check near Nu for signs of M31. Most folks will be able to hold three or four stars before noticing the "Little Cloud." By seven, you will see it without any problem at all.



"THE ANDROMEDA GALAXY"
CREDIT: STEVE MANDEL

SUNDAY, DECEMBER 10

Be sure to look in the early morning hours for a close appearance of the Moon and Saturn. This will also be an occultation for a limited portion of our world, so be sure to check IOTA for details!

Tonight will be the peak of the Monocerotids - another example of an obscure and unstudied shower because no one is exactly sure of where the precise radiant is located. By keeping watch loosely on the constellations Gemini and Monoceros, you may see a few of these faint and fast meteors at a rate of 3-12 per hour. Who knows? Perhaps one of these strange meteors may have been responsible on this date in 1984 for striking a mailbox in Claxton, Georgia!

Now let's saddle up Pegasus and go galaxy hunting - it's one wild ride!

Start by revisiting the brightest - 10.5 magnitude NGC 7814. To find it, locate Gamma and head west-northwest for an accompanying 7th magnitude field star. Power up on NGC 7814. Larger scopes will detect a razor thin dark dustlane bisecting the galactic core.

Now back toward Gamma about one degree northwest for NGC 14. This average tilted spiral displays an asymmetrical structure complicated by the presence of what appears to be a faint star. This one needs a mid-sized scope, but small ones will detect a tiny blur of light under good dark sky conditions.



MONDAY, DECEMBER 11

On this date in 1863, Annie Jump Cannon was born. Her work led to the modern system of classifying stars by spectra. Tonight let's celebrate her achievement by viewing some stars that have unusual visual spectral qualities. Use a star chart and locate Mu Cephei. Nicknamed the "Garnet Star," it is perhaps one of the reddest stars visible to the unaided eye. At 1200 light-years away, this spectral type M2 star shows a delightful blue-purple "flash." If you still don't perceive color, try comparing Mu to bright neighbor Alpha, a spectral type A7, or "white" star. If you'd like something a bit more unusual, then head for S Cephei about halfway between Kappa and Gamma toward Polaris. Its intense red makes this 10th magnitude star an incredibly worthwhile hunt.

To see an example of a B spectrum star, look no further than the Pleiades... all the components are blue/white. To try orange, look to Aldebaran, or Alpha Tauri, and say hello to a K spectrum star. Now that your curiosity is aroused, would you like to see what our own Sun would look like? Then look no further than Alpha Aurigae, better known as Capella, and discover a spectral class G star - 160 times brighter than Sol. If you're enjoying the game, then have a look at one of the most unusual spectral stars of all - Theta Aurigae. Theta is a B class, or a blue-white, but not because of having the usual strong lines of helium. Its abnormal concentration of silicon makes this incredibly unusual double star seem to glitter like a "black diamond."

Still no luck with "stars of color?" Don't worry, it takes practice. The cones in our eyes are color receptors. When we are in the dark, the color-blind rods take over. By intensifying the starlight through a telescope or binoculars, we can usually excite the cones in dark-adapted eyes to perceive color.

Tonight is also the peak of the Sigma Hydrid meteor stream. Its radiant is near the head of the Serpent and the fall rate is 12 per hour - but these are fast and faint. Practice looking for color in them, too!



ANNIE JUMP CANNON
CREDIT: NASA

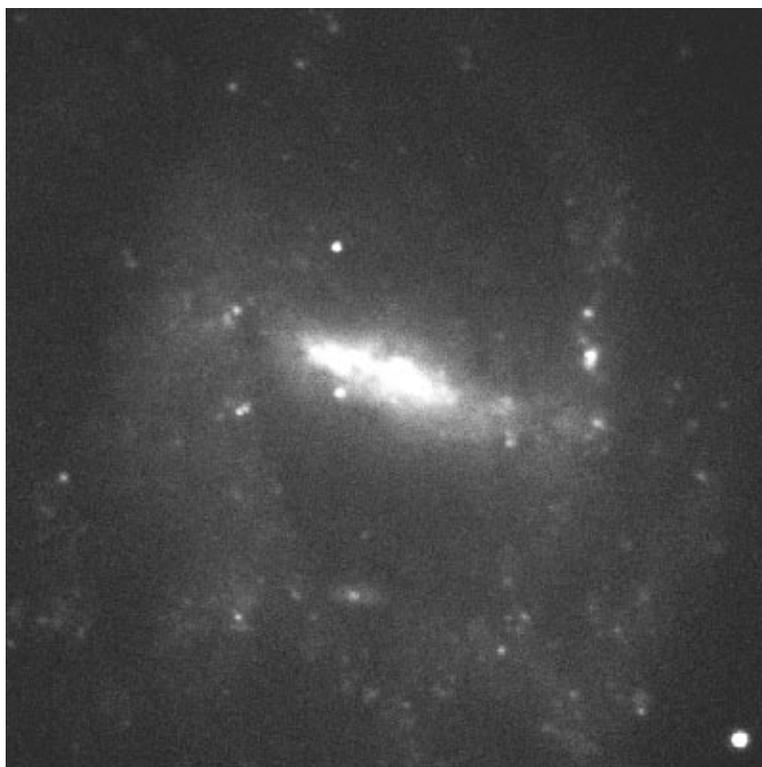
LINK BROKEN

[HTTP://RST.GSFC.NASA.GOV/SECT20/LEC07_04.JPG](http://rst.gsfc.nasa.gov/sect20/lec07_04.jpg) - SPECTRUM CHART
- CREDIT:
NASA

TUESDAY, DECEMBER 12

Let's return to Pegasus tonight and continue our galactic hunt.

We will be studying NGC 7741 about three degrees due south of 78 Pegasi. This extraordinary 11.4 magnitude spiral is 30 million light-years away and reveals one of the most unusual bar and spiral structures imaginable. Photographs shows what looks like an old vinyl record with a bright scratch from one side to the other and broad, luminous, near concentric outer grooves. Most mid-sized telescopes will sense the edge of unusual, rectangular spiral extensions. Large scopes will reveal hints of its true nature as an oddly shaped hub and wheel of luminosity in space. Use low and medium powers to view this oddity!



NGC 7741 -
CREDIT: WIYN/NOAO/
NSF COPYRIGHT WIYN
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WEDNESDAY, DECEMBER 13

Today in 1920, the diameter of a star was first measured by Francis Pease using an interferometer at Mt. Wilson. His target was Betelgeuse. Tonight let's have a look at the giant star in the northeastern corner of Orion. Rising just after skydark, Betelgeuse is winter's brighter and larger version of Antares. Like many red giants, it is inherently unstable - varying irregularly by as much 1.3 magnitudes in cycles up to six years in length. At its brightest, Betelgeuse can appear more luminous than Rigel and its diameter could encompass all the inner planets and much of the asteroid belt. Due to low density, observers would have a hard time determining where space ended and the star began! Allowing for all ranges of radiation, Betelgeuse is more than 50,000 times brighter than our own Sun. Like Antares, it is a "star within a star" - its dense core region radiating with such ferocity that internal pressure drives matter away. Betelgeuse's core has probably fused all its hydrogen and is now releasing energy through helium fusion - resulting in atoms essential to organic life (carbon and oxygen). Even though it hasn't gone supernova yet, when it does it will outshine the Moon!

LINK BROKEN

[HTTP://RST.GSFC.
NASA.GOV/SECT20/
ORIGINALS/FIGC_22.JPG](http://rst.gsfc.nasa.gov/sect20/originals/figc_22.jpg)
- BETELGEUSE
- CREDIT: NASA

THURSDAY, DECEMBER 14



TYCHO BRAHE
CREDIT: NASA

Today is a very busy day in astronomical history. Tycho Brahe was born in 1546. Brahe was a pre-telescopic astronomer who established the first modern observatory in 1582 and gave Kepler his first job. In 1962, Mariner 2 made a flyby of Venus and became the first successful interplanetary probe. In 1972, the last humans returned to Earth from the lunar surface. Eugene Cernan left the final boot print at Taurus-Littrow and said it was “the end of the beginning.”

Tonight will be one of the most hauntingly beautiful and most mysterious displays of celestial fireworks - the Geminids. Meteor showers are known to be the product of comets - but when astronomers first began looking for the Geminids’ parent comet, they found none. It wasn’t until 1983 that science detected an object to match the meteoroid stream. But this was no comet - it was an asteroid...

Originally designated 1983TB, and renamed 3200 Phaethon, this rocky solar system member has a highly elliptical orbit. But asteroids don’t fragment like comets - or do they? Originally believed to have debris caused by a collision, further study revealed the meteoroid “path” was associated with Phaethon nearing the Sun. The asteroid now behaves like a comet...

What exactly is this “thing?” Science believes Phaethon may be an extinct comet that gathered a thick layer of interplanetary dust during its travels, yet retains an icy nucleus. We may never fully understand what Phaethon is, but we can fully appreciate the annual display it produces. Look towards Castor and you might catch a “shooting star”!

FRIDAY, DECEMBER 15

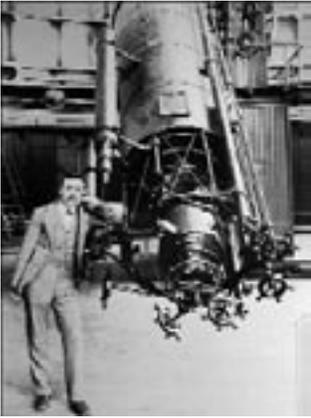
Today in 1970, Venera 7 made a soft landing on Venus - making it the first probe to successfully touch down on another planet.

Just after sunset, look to the southeast and land your eyes on Venus! The planet now shows a nearly full disk and is located some 110 million kilometers from Earth. The planet's bright globe will be difficult to resolve telescopically due to very low sky position. Try stacking colored filters to reduce the glare and reveal its gibbous shape.



VENERA 7
CREDIT: NASA

SATURDAY, DECEMBER 16



EDWARD EMERSON
BARNARD
(WIDELY USED
PUBLIC IMAGE)

Today we celebrate the birthday of Edward Emerson Barnard. Born in 1857 and raised by his mother during the American Civil War, E. E. Barnard began his career as an observational astronomer whose skill at the eyepiece led to the discovery of three comets by the age of 25. After a successful amateur career, Barnard studied mathematics at Vanderbilt University where he continued scanning the sky using the University's 6" refractor to discover eight more comets - and a galaxy. After graduation, he took professional employment at Lick observatory and again proved his talent for observation by discovering Jupiter's 5th moon Amalthea - something missed by numerous other very competent observers. Barnard later became one of the early pioneers of astrophotography which carried his powers of discovery well beyond the solar system!

To honor this celebrated name in astronomy, let's try some studies pioneered by Barnard - dark or obscuration nebulae. You might think them impossible to see, but that doesn't mean they can't be detected. Even casual observers of the Milky Way notice large dark rifts where the faint sheen of innumerable unresolved stars is lost to view. There's the key...obscuration nebulae are seen against the faint glow of more distant stars (or brighter nebulae) because they absorb visible light. Care to try for an obscuration nebula? Then let's do Barnard 150 in Cepheus. Look for a curved filament about a finger-width south of Eta Cephei. Or Barnard 163 - less than a degree south-southeast of the center of expansive open cluster IC 1396 south of Mu Cephei. You can always look for Barnard 169 - a set of thin curved lanes just northwest of magnitude 5.6 LZ Cephei.



<http://www.universetoday.com>

SUNDAY, DECEMBER 17

Tonight we are going to challenge our observing eyes on a “stepping stone” series of 11th magnitude galaxies. Start at 3.7 magnitude Gamma Piscium, then shift a degree and a half northwest to locate 11.7 magnitude NGC 7541. Detectable in modest scopes, this highly tilted spiral will appear cigar shaped in larger instruments. From NGC 7541, head a little more than 2 degrees north-northwest to slightly brighter elliptical galaxy NGC 7562. This one will show a condensed core fading rapidly into space. Less than 2 degrees north-northwest of NGC 7562 lies a pair of close, magnitude 11.1 elliptical galaxies - NGC 7619 and NGC 7626. They are within 7 arc-minutes of each other and are virtual twins - slightly brighter versions of NGC 7562. Continuing north-northwest is the big scope challenge IC 1486, a small, 13th magnitude, football-shaped elliptical requiring high magnification to distinguish itself from a fuzzy star.

And if anyone asks you what you did tonight? Tell ‘em you “went fishing!”

MONDAY, DECEMBER 18

Readers of this year-long tour know that the most splendid examples in our Local Group of galaxies are our own Milky Way, the Magellanic Clouds and the Great Galaxy in Andromeda. But a distant contestant is the object of tonight's exploration - the 3 million light-year distant Triangulum galaxy, M33.

To locate M33, start by sweeping with binoculars between Alpha Triangulum and Beta Andromedae. You will pick up a faint, large and very round contrast change. Since M33 is so large, you'll find this galaxy best at low power in all scopes. Small aperture will see its misty appearance, while most mid-sized scopes reveal spiral structure - giving rise to its nickname - the "Pinwheel." For those with large aperture, prepare yourself to visit with NGC objects outside our own galaxy. One of the most easily noted is NGC 604, a nebulous region in the northeast section.



"THE PINWHEEL GALAXY"
- M33
CREDIT: BILL SCHOENIG
NOAO/AURA/NSF

TUESDAY, DECEMBER 19

Tonight we continue our study of the Triangulum Galaxy. Possibly seen by Hodierna in the mid-seventeenth century, Charles Messier logged it the night of August 25, 1764. Although M33 is not much more than 50,000 light-years in diameter, it is about average in physical size for a spiral. Astronomers have determined that all three major members of the Local Group are being inexorably drawn together, but it's likely that M33 and M31 will converge long before the resulting super-galaxy joins with our own. Meanwhile, much of M33 will be thrown off into space by gravitational action and both galaxies will undergo fantastic explosions of star birth as gas and dust rapidly condenses.

Return again tonight to study and look for subtle details - with attention to NGC 604.

Like most spiral galaxies, M33 consists mostly of stars, gas, dust, and exotic "dark matter." Obscuring dust is most easily found in great dark lanes that absorb visible light and put out "cold heat" (far infrared). Gas interpenetrates the dust, but depending on how excited the gas is, it can also put out energy. Some of that energy is detected as radio waves - emanating from neutral hydrogen, while other energy is seen as visible light caused by ultraviolet stimulation

from nearby stars. Dark matter is totally undetectable because it appears to have nothing to do with light whatsoever - neither blocking it, nor radiating it. Dark energy, however, can be felt as negative gravity and such matter may actually comprise 90% of all substance present in the Universe. Interestingly, there is far more dark matter outside the visible borders of galaxies than within them.

Tonight we're going to track down an intense region of starburst activity within a vast 1500 light-year HII region on the outskirts of M33. This region is so large and bright it can even be detected in small telescopes. NGC 604 can be seen as a condensed luminous spot with a surface brightness equal to that of the core of the M33 galaxy. As you look for it, keep in mind that it is some 35 arc-minutes northeast of M33's nucleus at the tip of the galaxy's east-sweeping spiral arm. That locale lies near the frontier where "dark matter" begins to influence the observed mass of the galaxy.



"THE PINWHEEL GALAXY"
CREDIT: STEVE MANDEL

WEDNESDAY, DECEMBER 20



WALTER S. ADAMS
CREDIT: YERKES
OBSERVATORY/UNIVERSITY
OF CHICAGO

Today in 1904, the Mt. Wilson Solar Observatory officially opened its doors. Today also marks the birth in 1876 of Walter S. Adams. Observing from Mt Wilson, Adams uncovered the true nature of Sirius' companion. First seen by Alvan Clark in 1862, Sirius B is an aged white dwarf whose expansive red giant phase ended long ago.

If you are up early, take a few minutes to enjoy the peak of the Coma Berenicid meteor shower. Although meteor activity is low (with an average fall rate of about seven per hour), the Coma Berenicids still warrant study.

Noted first in 1959, the stream was traced in 1973 to another minor shower bearing the same orbit known as the December Leo Minorids. As we know, meteoroid streams are often associated with comets - but in this case no comet was confirmed. Observed in 1912 by amateur astronomer B. Lowe, the comet was officially designated 1913 I and was only subsequently seen four times before it was lost to sunrise. Using Lowe's observations, independent researchers computed the comet's orbit. The stream however, was later forgotten until 1954. At that time, Fred Whipple made a connection between photographic studies and the enigmatic comet Lowe. Continued observations determined that the orbital period of the parent comet was around 75 years - but the two major meteor streams occurred 27 and 157 years apart! Thanks to the uneven dispersion of material, it may be another decade before we see some real activity from this shower, but even one meteor can make your day.

And if you want to make your "night" an early one, why not try looking for another odd shower? Tonight is also the peak of the Delta Arietids. These unusual meteors bear something in common with last week's Geminids - their source appears to be the sun-grazing asteroid Icarus. Around twelve fast, bright "shooting stars" per hour should be visible early in the evening due to the high sky position of the radiant - constellation Aries. Tonight's New Moon favors observation!

LINK BROKEN

[HTTP://RST.GSFC.NASA.GOV/SECT20/SNOW-WD.JPG](http://rst.gsfc.nasa.gov/sect20/snow-wd.jpg) - SIRIUS AND SIRIUS B - CREDIT: NASA

THURSDAY, DECEMBER 21

Tonight the slender crescent Moon will slip below the horizon well before sky-dark. Autumn will soon give way to winter and our 2006 tour of the heavens will later come to an end. The holiday season now is before us and the Sun is about to turn the corner and take up its northern swing just as the north temperate winter gets especially cold. Tonight we encourage you to set up your largest scope and return to visit the night sky. Before launching on a final tour, take a moment after sky dark to follow the grand sweep of our own galaxy from the west-northwest - where its faint sheen is most luminous - to the south-southeast, where it can only be noted by the profusion of fainter unaided eye 4th through 6th magnitude stars and numerous "galactic" clusters.

With this expansive view held before you, turn to your scope and revisit the Andromeda family of galaxies now hanging overhead as Alpheratz and Algenib of the eastern Great Square point the time to "Zero hour" at sky-dark on the longest night of the year...

Start at the Great Andromeda Galaxy itself and note round M32 due south of M31's splendid core. Head one degree north-northwest from M32 to M110's smoothly graduated light disappearing softly into the night. Push less than 7 degrees due north from M110 to Omicron Cassiopeiae for the "just this side of the edge" dwarf elliptical NGC 184. Slew a degree west to "on-the-edge" NGC 147. Return to M31 and look less than a degree due south of M110 for NGC 206 - a difficult but small-scope achievable HII star forming region 100 times larger than M42... in another galaxy. Remembering that view, make the leap across Mirach to M33 and its HII region - NGC 604, a region that eclipses even M31's NGC 206. Go low power and follow the face-on Triangulum galaxy's northeast and southwest sweeping spiral arms. Keep in mind that all we see of it - even through the largest professional instruments - is but a tiny fraction of all the gravitational influence making such grand spiral structure possible.

Happy solstice!



"THE ANDROMEDA FAMILY"
M31, M32 AND M110
CREDIT: BILL SCHOENIG
AND VANESSA HARVEY/REU
PROGRAM/NOAO/AURA/NSF

FRIDAY, DECEMBER 22

Get up early because the pre-dawn hours have a treat in store - the Ursid meteor shower. Cruising around the Sun every thirteen and a half years, Comet 8P/Tuttle shed some skin and although the comet never passes inside Earth orbit, six years later we burrow through its debris trail. Not so unusual? Think again, because it took as much as six centuries before the comet's debris trail is was deflected enough by Jupiter's gravitation to pass into our atmosphere!

With no interference from the Moon, this circumpolar meteor shower could see early dawn activity of up to 12 per hour. By keeping watch on the constellation Ursa Major, you just might spot one of these slow moving, 600 year old travelers burning up the sky.

With dark skies tonight, why not stop to take a good look at a pair of galaxies just on the other side of "Zero Hour." The first is 12th magnitude NGC 16, lying a little less than a finger-width south of Alpha Pegasi. Due to small size, its compact elliptical core can just be distinguished by mid-sized scopes with good sky conditions. If you have large aperture, be sure to power up and try to get a sense of the core region's fuzzy frontier.

Continue around another finger-width south of NGC 16 to locate another 12th mag galaxy - NGC 23. As a tilted spiral of similar size to NGC 16, this one doesn't take well to higher powers. Don't confuse the faint star along its frontier for a supernova! Large scope users might also look for a neighboring 13th magnitude companion - NGC 26.

SATURDAY, DECEMBER 23

Today in 1672, astronomer Giovanni Cassini discovered Saturn's moon Rhea. Saturn can now be seen well above the eastern horizon by midnight. At magnitude 1.4, it rivals slightly brighter Regulus which trails it slightly to the south across the sky. Now some 1.4 million kilometers from Earth, Saturn's apparent size is 19.3 arc seconds. Making up for its modest size, is the 40 arc second apparent diameter ring system which is still well aspected.

Tonight after sunset, be on hand as the Moon makes a very brief appearance on the western horizon. Get out those binoculars and have a look! About mid-point on the southeastern quadrant, see if you can pick out the dark grey expanse of Mare Australe. Around central near the limb, look for another elongated deep grey oval - Mare Smythii. Just north of Smythii you might spy crater Neper on the edge, or Mare Marginus north of it. Crater Hubble awaits you just a bit further north, and at the extreme north along the limb is Humboldtianum.

When the Moon sets, take advantage of continuing dark skies and have a look at NGC 7793 around 4 degrees south-southeast of Delta Sculptor. Although southern hemisphere observers are favored, some viewers in the north can still get a glimpse of this 9.1 magnitude galaxy. This fairly large galaxy is moderately inclined, and as a result may appear quite misty at the edges. Look for fainter and more challenging NGC 7755 about two degrees to the northwest.

SUNDAY, DECEMBER 24

Today in 1968, Apollo 8 became the first manned spacecraft to orbit the Moon. Let's celebrate that event by having a look at the lunar surface.

While the slender crescent will show few details, head south of emerging Mare Crisium and look for a patchy grey area near the center called Mare Undarum. The large grey oval you see to the west is crater Firmicus.

Let's honor our southern friends once again as we head toward the incomparable NGC 55. Located about two finger-widths north-northwest of Alpha Phoenicis, this large, near edge-on galaxy is truly a southern gem. At magnitude 7.8, this bright member of the Sculptor galaxy group can easily be spotted in binoculars. Mid-sized scopes will begin resolution of mottling in the structure, while large aperture will show individual stars, nebulous areas, and dark dust clouds - with a very prominent one east of the nucleus. Rock on...



NGC 55
CREDIT: T.A. RECTOR/
NOAO/AURA/NSF

MONDAY, DECEMBER 25

Wishing you all the very best for the holiday season! Like a present, Sir Isaac Newton was born this day in 1642. He invented his own mathematics (calculus), and used it to describe a huge amount of what we now consider modern physics. Even young children are aware of his simple laws of motion and gravity. It wasn't until the age of the Great Observatories that another physics genius, Einstein by name, came along and things changed again!

Did you get a new telescope or binoculars? Then head to the Moon. Beginning in the north, look for the deep gray oval of crater Endymion. Moving south, note a small, shadowed gray patch marking Mare Struve where a series of craters begins - Messala, Bernoulli, Geminus, and Cleomides. Do you see smaller craters Debes and Tralles caught on Cleomides' west? Now we've arrived at Mare Crisium. The two tiny dark ovals south are Firmicus and Apollonius. Now Mare Feconditatis, with huge Langrenus and Vendelinus along its eastern shore. Can you spot the faded Petavius further south, with its central peak?

There are a number of very fine dark sky studies present tonight. Start at Beta Ceti and look around three finger-widths north-northeast for a large 8th magnitude planetary nebula - NGC 246. Achievable in binoculars or scopes, observers will see a pale bubble of vaguely bluish light containing a pair of stars. Returning to Beta, drop south-southeast around four finger-widths to one of the finest galaxies in the night

sky - NGC 253, the Sculptor Galaxy. This large, spindle-shaped galaxy was discovered by Caroline Herschel in 1783 using a small reflector. A 10 million light-year distant treat!

Now head slightly more than a fist width northeast of Betelgeuse to put you in the area for NGC 2264 - also known as the "Christmas Tree" cluster! This bright asterism is a celebration in silver and gold. A present from the Cosmos...



SIR ISAAC NEWTON
(WIDELY USED
PUBLIC IMAGE)



"THE CHRISTMAS
TREE CLUSTER"
CREDIT: T.A. RECTOR
(NRAO/AUI/NSF AND
NOAO/AURA/NSF) AND
B.A. WOLPA (NOAO/AURA/
NSF)



<http://www.universetoday.com>

TUESDAY, DECEMBER 26

Tonight let's enjoy the serenity of the crescent Moon well above the western horizon. Tonight's challenge is an unusual series of craters known as the Rheita Valley. One-third the way up from the southern cusp, you will see on the terminator a group of three craters running north to south - Metius, Fabricus and Janssen. From Metius, look northeast for a small crater with thick walls and small central peak. This is Rheita. Along Rheita's west wall is a long rannel cutting through the rugged terrain. This 230 mile long feature, with a 100 mile southern extension, looks as though it might have been the result of a series of impacts much older than Rheita itself. Note how each impact overlays the next - ending near southern crater Young.

Now head for 5.7 magnitude NGC 752 - easily found in finderscope or binoculars around three finger-widths south of Gamma Andromedae. Missed by Messier - but probably a discovery of Hodierna over 100 years earlier - William Herschel cataloged it September 21, 1786. Although bounded by a spiral of brighter stars to the north, the brightest actual members of this 1300 light-year distant and one billion year-old cluster are of the 9th magnitude - within reach of all equipment.



RHEITA VALLEY
(RIGHT SIDE OF IMAGE)
CREDIT: GREG KONKEL

WEDNESDAY, DECEMBER 27

Born today in 1571 was Johannes Kepler - astronomer and assistant to Tycho Brahe. Kepler used Brahe's copious notes of Mars' positions to formulate his three laws of planetary motion.

For telescope users, the Moon gives a wonderful opportunity to revisit ancient crater Posidonius. Its 84 kilometer by 98 kilometer expanse is easily seen in the most modest of optical instruments and it offers a wealth of detail in its eroded walls and 1768 meter high central peak. Be sure to continue southward from Posidonius to the edge of Mare Serenitatis to view the Apollo 17 landing area!

Now let's head towards M34 about halfway between Algor (Beta Persei) and Almach (Gamma Andromedae). No doubt about it, Giovanni Batista Hodierna discovered this large, 5.5 magnitude open cluster at least 110 years before Charles Messier recorded it on August 25th 1764. One look at the cluster explains why - this 80 plus member, 1400 light-year distant group is very compressed - even presenting a faint nebulous patch to the unaided eye on a good dark night. Through binoculars, its dozen bright members make it plain that you are seeing a cluster of stars. Look for numerous doubles in this curiously "cross-shaped" cluster - an area joined by numerous fainter arcs and groupings.



JOHANNES KEPLER
CREDIT: NASA



M34
CREDIT: REU PROGRAM
NOAO/AURA/NSF



<http://www.universetoday.com>

THURSDAY, DECEMBER 28



ARTHUR EDDINGTON
CREDIT: AMERICAN
INSTITUTE OF PHYSICS
NIELS BOHR LIBRARY

Today we celebrate the birth of Arthur S. Eddington. Born in 1882 - Eddington was a key theoretical astrophysicist who explained how stars form out of accretion disks. Eddington also coined the astronomical phrase “expanding universe” to describe the mutual recession of distant galaxies.

For moon watchers tonight, let’s celebrate 35 years of space exploration as the Apollo 11 landing site becomes visible. For telescopes and binoculars the landing area will be found near the terminator at the southern edge of Mare Tranquillitatis. For those of you who like a real challenge, try spotting small craters Armstrong, Aldrin, and Collins just east of the easy craters Sabine and Ritter. No scope? No problem! Look at the Moon. The dark round area you see on the northeastern limb is Mare Crisium. The dark area below that is Mare Fecunditatis. Now look mid-way along the terminator for the dark area that is Mare Tranquillitatis. We were there...

Now we’ll head further south telescopically to identify the unusually shaped crater Hypatia. Can you spot its rima on the southern shore of Tranquillitatis? Perhaps the bright pockmark of Moltke on its north edge will help. Hypatia sits on the northern shore of a rugged area known as Sinus Asperitatis. Do you see Alfraganus on the terminator? Follow the terrain to Theophilus and look west for Ibyn-Rushd with crater Kant to the northwest and the beautiful peak of Mons Penck to its east.

Unseen today, but of symbolic and aesthetic interest, is the fact that the planets, Jupiter, Mars, Mercury, Venus, Neptune, and Uranus are near alignment. Jupiter now precedes the Sun in rising by two hours and is found near Antares in Scorpio. Its rival, Mars, rises a little more than an hour later. Mercury roasts within six degrees of the Sun and cannot be seen without great care. Venus disappears about an hour after sunrise and at magnitude -3.9, should be visible unaided. Neptune sets less than 3 hours after the Sun and Uranus joins all the others 90 minutes later. All six planets now form very close to a right angle in space. Add Pluto now north of Mercury and that makes seven. Who’s missing? Saturn still needs morning skies for best seeing conditions... and don’t forget the Earth beneath your feet. That great rotating orb is about to complete another anthropocentric anniversary of revolution around everybody’s favorite star - Sol!



HISTORICAL AREA
CREDIT: TAMMY PLOTNER



<http://www.universetoday.com>

FRIDAY, DECEMBER 29

Tonight is a wonderful chance for binoculars and small telescopes to study the Moon. Craters Aristotle and Eudoxus to the north are easily apparent, along with the Caucasus and Apennine mountain ranges. For those seeking a bit of a telescopic challenge, look no further than the Valles Alpes. More commonly known as the “Alpine Valley” this deep gash cut across the northern surface will be easily visible and lighting conditions will be just right to explore its 1.6 to 21 kilometer wide and 177 kilometer long expanse. Using it as your guide, start at the western point and drop south along the Montes Alpes where you will see three bright peaks - Mons Blanc, Promontorium DeVille and Promontorium Agassiz. Can you see lonely Mons Piton in the grey sands of Mare Imbrium? Now look east for Astronomical League challenge Cassini with its interior A and B craters. Further southeast you’ll spy small Theaetetus.



If you’d like to stay out a bit longer, then have a look at another fine double for moonlit nights - Eta Persei. Eta is challenge for smaller binoculars, because the faint secondary puts this one squarely into the class of small scope studies. Eta A is a K-type star appearing golden-yellow to the eye. Larger scopes will reveal the 8.5 magnitude secondary’s A-type blue tint. The overall impression is of a widely disparate version of summer’s famous Alberio! You’ll find this one about a fist width northwest of Alpha Persei.

ALPINE VALLEY
CREDIT: ROGER WARNER

SATURDAY, DECEMBER 30

Be sure to take out your telescopes and have a look at the Moon tonight. One of the most sought-after and unusual features will be visible to small telescopes in the southern half of the Moon near the terminator - Rupes Recta. Also known as "The Straight Wall," this 130 kilometer long, 366 meter high feature slopes upward with the steepest angle on the lunar surface at 41 degrees. A challenge under these conditions, use triple ring craters Ptolemy,

Alphonsus and Arzachel to guide you. The "Straight Wall" will appear as a very thin line stretching across the edge of Mare Nubium. Look for bright crater Birt along the west to help spot it.

Now let's go east and take a high power look at companion craters. Starting at the northern point of Rupes Recta, you'll find yourself at Promontorium Taenarium. Just to the west of the point is splendid Alpetragius with its huge central peak. To the southeast is Arzachel, which sports a similar size central peak along with rimae and interior craterlets. Southwest is small Thebit with a very formidable puncture on its west wall. Further south will bring you to eroded old



RUPES RECTA:
"THE STRAIGHT WALL"
CREDIT: ROGER WARNER

Purbach. Note how the sands of time have made its western area much higher than the east. On its south wall lies Regiomontanus. See how many details you can find in this old crater!

For a really superb treat, let's go to Almach - the third and westernmost bright star in Andromeda. Gamma Andromedae is actually an exquisite double. At magnitude 4.8, its beautiful blue companion would make a fine addition to many of the fainter constellations in the night sky - but it took the presence of the deep golden magnitude 2.3 primary to make it the beauty we see tonight. This lovely colored pair is a "must" for any size telescope!

SUNDAY, DECEMBER 31

Today is the birthday of Robert G. Aitken. Born in 1864, Aitken was a prolific American observer who discovered and catalogued more than 3100 double and binary stars.

Before we head out to view the Moon, let's have a look at a fine triple star system - Iota Cassiopeiae. Iota is easily found by making a mental line between Delta and Epsilon - the two easternmost stars of the Cassiopeia "W." Now go northeast a little less than the same distance between them. Resolvable through small scopes, this splendid and disparate triple is close! Magnitude 7.6 Iota B is 2.6 arc seconds southwest of magnitude 4.7 Iota A. The more comfortably spaced 8.4 magnitude turquoise C star is found 7.1 arc seconds east-southeast of the primary. The colors are warm-yellow, aqua, and turquoise and it takes a steady night to separate that B star!

Before the year ends, let's journey one last time to the lunar surface on the south shore of Mare Nubium and look for ancient crater Pitatus. Although we have been here before, what may transpire as you view this area will be well worth your time. During lunar sunrise, a break between Pitatus and westward neighbor Hesiodus can cause a beautiful phenomenon known as the "Hesiodus Sunrise Ray." For a very brief moment, a shaft of sunlight will shine through this break and create an experience you will never forget.

And now we wish you a most Happy New Year and we'll see you tomorrow...



PITATUS AND HESIODUS
CREDIT: WES HIGGINS

RESOURCES



<http://www.universetoday.com>

While there are many great resources out there to help you along your way to enjoying the hobby of astronomy, there's a few that I think you'll find very useful!

www.lunar-occultations.com

This is the International Occultation and Timing Association website. Their accurate information provided for viewers around the globe will prove invaluable.

www.heavens-above.com

This site is easy to use, concise, and offers perfect information and charts for viewing satellites, asteroids and often bright comets.

www.spaceweather.com

Space Weather will keep you up-to-date on solar and auroral events and well as many other things. This is definitely a good tool!

www.astroleague.org

The Astronomical League website offers many fine observing programs for the amateur astronomer and offers a wealth of resources.

www.fourmilab.ch/yoursky

"Your Sky" is a wonderful interactive planetarium tool that allows you to create customized maps and sky views specific to your location.

www.skyandtelescope.com

Sky and Telescope magazine offers terrific on-line tips, charts and information, as well as many articles for the amateur astronomer.

www.astronomy.com

Astronomy magazine also has on-line resources, observing tips and news.

www.lpl.arizona.edu/alpo

The Association of Lunar and Planetary Observers (ALPO) is a comprehensive, educational and very useful website.

www.aavso.org

The American Association of Variable Star Observers (AAVSO) will offer you the kind of information you need to study variable stars.

www.ltpresearch.org

Lunar Transient Phenomena Research is a great place for those who like to know about upcoming and unusual lunar events.

www.lunarrepublic.com

The Lunar Republic website offers up some of the very finest on-line reference materials available.

www.mreclipse.com

Be sure to visit the pages of “Mr. Eclipse” - Fred Espenak, for the very best in eclipse information.

www.universetoday.com

The Universe Today is the essential tool for up to the moment breaking news stories dedicated to both space and astronomy.



<http://www.universetoday.com>

ABOUT THE AUTHOR...

Tammy Plotner

Born before the great “Space Race”, Tammy’s parents encouraged her interests. From those beginning space missions, a love was born of watching celestial phenomena - be it a pass of Sputnik, a meteor shower, or a solar eclipse. She purchased her first real telescope to view Comet Halley and when she and her family moved to dark, rural Ohio, astronomy turned into a passion.

For 20 years, the fleet of telescopes grew along with the desire to study and write. Graduating from handwritten journals to on-line daily reports that span more than six years, her desire to share her experience and knowledge with other beginners and amateurs led her down many starry roads... And into public outreach.

Tammy is currently the president of the Richland Astronomical Society at Warren Rupp Observatory where she also serves as a grant manager, education director, webmaster and board member. She is also a member of the Astronomy For Youth team and served both on the board and as webmaster. Tammy is a member of the Astronomical League webmaster team, serves as a NASA “Space Place” editor, and is heavily involved with the Night Sky Network.

Her credits include many observing awards from the Astronomical League and reporting for the Lunar Transient Phenomena Research team, as well as several other observing organizations. As a freelance writer, Tammy has won many awards, been published in SETI and enjoyed success in various periodicals and websites. But, she is probably best known for her articles and the long running column in The Universe Today - “What’s Up”. Tammy has traveled all over the United States giving astronomy outreach programs. You’ll find her at schools, colleges, libraries, science festivals, star parties, state parks, at the Observatory, and right here in her own backyard - doing what she loves best.

Traveling at light speed...

theastronomer.tripod.com

www.wro.org

www.astronomyforyouth.org



ACKNOWLEDGMENTS



COMET HALE-BOPP
CREDIT: JASON SHINN

“When one has weighed the Sun in balance, and measured the steps of the Moon, and mapped out the seven heavens, there still remains oneself. Who can calculate the orbit of his own soul?”

“We are all in the gutter, only some of us are looking at the stars.”

– Oscar Wilde

Throughout the years, it has been my great pleasure and privilege to know many professional and amateur astronomers along with some genuinely wonderful people who made this possible. It’s time to thank them...

Jeff Barbour

Inspired by the early 1900’s masterpiece: “The Sky Through Three, Four, and Five Inch Telescopes”, Jeff got a start in astronomy and space science at the age of seven. As a writer, Jeff has written numerous articles for Universe Today including topics on the history of Astronomy (“What Did Galileo See?”), cosmology (“Early Black Holes Grew Up Quickly”) observational astronomy (“What Telescope is Right for You?”), propulsion systems (“Positron Drive: Fill ‘er Up For Pluto”), breaking news (“Near Perfect “Einstein Ring” Discovered”), and commentary (“Are We Alone?”).

Currently Jeff devotes much of his time playing jazz guitar, writing novels, observing the heavens, and maintaining his own observational astronomy based website. Father of two grown boys, he and wife-Sharon live among the redwood groves and hillsides of the Santa Cruz Mountains of California. Jeff can often be found with other members of the Santa Cruz Astronomy Club at star party outings beneath the Night Sky... Jeff says to all his readers: “Carpe Noctem”.

As a friend, rival, co-observer and co-conspirator of many years, Jeff has also been a co-author - providing the basis for many of the studies you see here. We’ve spent many happy times sharing the eyepiece, pouring over books,

charts and text together and without him, none of this could have come together quite the same.

astro.geekjoy.com

Cor Berrevoets

From the Netherlands, Cor had an early affair with astronomy until a solar eclipse passed by. He then purchased a telescope, became interested in optics and developed the Aberrator. After his scope became properly aligned, he added a second-hand webcam and started programming again - which resulted in the awesome freeware program - RegiStax. The things he enjoys seeing most are Moon, Sun and planets. Even after upgraded to a C11 scope, he still finds these are the most interesting subjects.

<http://aberrator.astronomy.net>

<http://registax.astronomy.net>

Simone Bolzoni

As a resident of Italy working in technology information, Simone began astronomy as a child and has spent 20 years observing grandiose astronomical events. Along with his girlfriend, Chiara Riedo, they travel away from light polluted Milan and Turin searching for better skies in the mountains. Simone sketches, photographs and takes webcam images - along with keeping highly accurate reports of astronomical events.

<http://astrosurf.com/sheratan>

Ricardo Borba

Ricardo Borba is an amateur astronomer living in Ottawa, Ontario and a member of the Royal Astronomical Society of Canada. Between observing sessions he is an Application Software Engineer at Natural Convergence.

www.borba.com

Fraser Cain

Fraser is the publisher of Universe Today, a popular Internet website dedicated to news about astronomy and space exploration. The site receives over 600,000 page views a month, and the newsletter edition goes out to 26,000 subscribers every weekday. An accomplished writer, he has written three published books



(GURPS Supporting Cast, Creatures of Earthdawn, Double Exposure), and several magazine articles. Fraser grew up on Hornby Island, a small rock off the coast Western Canada with incredibly dark skies - ideal for amateur astronomy. He currently lives in Courtenay, BC; a small city on Vancouver Island.

I would personally like to thank Fraser for his idea and encouragement to take what was a weekly column and create a book. His faith to turn in a virtual “nobody” into a writer will forever be appreciated.

www.universetoday.com

Chris Cook

The stunning cover photo of the Milky Way rising over Chelly Canyon is the work of Chris Cook. Chris is currently a member of the “Professional Photographers of America” (PPA) and the “Professional Photographers of Cape Cod” (PPOCC). Originally based in Orange County, CA and now in beautiful Cape Cod, Chris offers his clients the utmost in professionalism. Be sure to visit his website!

www.cookphoto.com

Victor DeCristoforo

As a software developer and internet genius, Victor also has a great talent as mirror grinder and telescope maker - designing many of his own personal telescopes. As a veteran star party participant and a member of SETI@Home, he has also many of his photographs featured on various websites. Brille sur, Doc...

R. Jay GaBany

Born at the dawn of the space age, R Jay GaBany has grown up and matured during a time when mankind’s fascination with the great mysteries beyond our home planet has surged. His interest in astronomy started at an early age, sparked by the Apollo Moon Landing program. When Neil Armstrong and Buzz Aldrin were bouncing on the lunar surface, Jay was in his back yard observing the moon through his first small refractor. But it was Carl Sagan’s vision that ignited his adult enthusiasm for astronomy when Cosmos debuted and shortly thereafter he acquired his first 8-inch Schmidt-Cassegrain telescope.

Many other telescopes followed, as did two years learning how to image with a 35mm camera in time for the passing of Halley’s comet in 1986. Family,

kids, career and expenses, however, turned him into a spectator as amateur astronomy converted from film to CCD imagery during the 1990's. Moving from Connecticut to San Jose, California, Jay began designing web-based travel reservation systems during the day but at night began taking deep space pictures, inspired by the work of Robert Gendler. Learning to produce images of the night sky with a CCD camera proved to be the most challenging, rewarding and addictive activity he had ever undertaken. Today, images are taken both from his light-polluted backyard using a portable 12 inch telescope and remotely, using Internet control, with a 20 inch reflector from a dark location in the south-central mountains of New Mexico.

www.cosmotography.com

Wes Higgins

Wes' interest in space and astronomy started when he was in the second grade and watching the first US manned space shot on television. He continued to follow with great interest the NASA space programs all the way through the Apollo moon landings. While growing up, he yearned for a telescope, but the thought lay dormant through college, marriage and starting his own business. Eight years ago his dream came true and as he says, "I am sure that for the rest of my life I will be out observing and imaging every chance I get."

<http://higginsandsons.com/astro/>

International Occultation Timing Association - IOTA

World renowned for their accuracy, the IOTA team provides perfect information for any occultation or grazing event - be it by the Moon, a planet or an asteroid! My appreciation goes to Dr. David Dunham for providing a forward look into the year 2006.

www.lunar-occultations.com

Greg Konkell

Greg has many interests and two of those that occupy a great deal of his time are astronomy and photography. Having recently made the transition from film to digital cameras, he's enthused about the potential of this new technology and has focused his attention lately on integrating these two interests. The purpose of his web site is twofold=85 to, hopefully, make a contribution regarding



the technical issues surrounding digital astrophotography, and to share some of the best images he's acquired - both astronomical and general photographic.

www.nwgis.com/greg

Steve Mandel

Steve Mandel has been an amateur astronomer since the age of 11. Twenty years ago he began taking pictures of the universe and since that time has published his images in books, newspapers, Sky&Telescope and Astronomy magazines and his images have been used eight times for the NASA Astronomy Picture of the Day. He operates a remotely-controlled observatory in New Mexico as well as one at his home in California. He is currently helping professional astronomers gather data on the emission properties of high-latitude dust clouds in the Milky Way Galaxy.

www.galaxyimages.com

Terry Mann

Terry Mann is Vice-President of the Astronomical League, a JPL Solar System Ambassador and served as President and Vice-President of the Miami Valley Astronomical Society. She has received the R.G. Wright Award, the Kepler Award and an Award from the Ohio House of Representatives for her dedicated research and study of the Solar System. She has written articles for the Astronomical League's newsletter, the REFLECTOR, local newspapers, and her astrophotography has appeared in local art galleries, newspapers, and TV newscasts. Her service and dedication to astronomy outreach is beyond compare.

National Aeronautics and Space Administration (NASA)

NASA explores. NASA discovers. NASA seeks to understand. But, most of all, NASA shares. We would like to thank those good folks for providing all the wonderful resources available to amateur astronomers and to express my personal thanks for the use of many archival photographs, illustrations and other materials seen here.

NOAO/AURA/NSF

The National Optical Astronomy Observatory was formed in 1982 to consolidate all AURA-managed ground-based astronomical observatories (Kitt Peak National Observatory, Cerro Tololo Inter-American Observatory, and the National Solar Observatory with facilities at Sacramento Peak, New Mexico and Kitt Peak,

Arizona) under a single Director. Today, the National Solar Observatory has its own director. NOAO is funded by the National Science Foundation and operated by the Association of Universities for Research in Astronomy, Inc. NOAO has its headquarters in Tucson, AZ.

NOAO also represents the US astronomical community in the International Gemini Project through its new NOAO Gemini Science Center. NOAO's purpose is to provide the best ground-based astronomical telescopes to the nation's astronomers, to promote public understanding and support of science, and to help advance all aspects of US astronomy. As a national facility, NOAO telescopes are open to all astronomers regardless of institutional affiliation.

Association of Universities for Research in Astronomy, Inc.

AURA is a consortium of universities, and educational and other non-profit institutions, that operates world-class astronomical observatories that we term "centers." Our members are 32 U.S. institutions and 7 international affiliates. We view ourselves as acting on behalf of the science communities that are served by our centers, and as trustees and advocates for the centers' missions.

Their mission statement: "To promote excellence in astronomical research by providing access to state-of-the-art facilities."

The National Science Foundation

The National Science Foundation (NSF) is an independent federal agency created by Congress in 1950 "to promote the progress of science.." They are the funding source for approximately 20 percent of all federally supported basic research conducted by America's colleges and universities. In many fields such as mathematics, computer science and the social sciences,

NSF's task of identifying and funding work at the frontiers of science and engineering is not a "top-down" process. NSF operates from the "bottom up," keeping close track of research around the United States and the world, maintaining constant contact with the research community to identify ever-moving horizons of inquiry, monitoring which areas are most likely to result in spectacular progress and choosing the most promising people to conduct the research.

It is through the wonderful work of these organizations and the people

involved in them that you see many of the outstanding photographs in the pages.

Damian Peach

Inspired as a child by Patrick Moore, Damian has had a life-long interest in astronomy and his growing achievements led him on towards astrophotography. Captivated by the work of Don Parker, he soon learned the art and learned it well.

His achievements include: Being elected An Assistant Director of the BAA Jupiter section, The Assistant Director of the BAA Saturn section, and Assistant Coordinator of the ALPO Jupiter section. Damian appeared three times on the BBC “Sky at Night” program with Sir Patrick Moore, and live on the BBC “All Night Star Party” - as well as imaging Mars live for the program from the observatories in the Canary Islands. He was awarded the ALPO Walter Haas Award for outstanding contributions to Planetary astronomy. Damian has had numerous articles and imagery published in all major amateur publications, and some professional publications. He has been both visitor and observer from the Observatories at Tenerife, La Palma and Paranal.

www.damianpeach.com

Jason Shinn

Jason Shinn has been an amateur astronomer for more than 19 years. An active member of the Astronomy Club of Akron, he has recently joined the Society of Amateur Radio Astronomers (SARA) and is an active participant in the NASA Radio Jove Project.

Sky and Telescope Magazine

I would like to once again extend my thanks to Mr. Rick Fienberg, the editor-in-chief of one of the finest astronomy periodicals available. The use of the monthly sky charts in this publication are deeply appreciated. May we all keep reaching for the stars!

skyandtelescope.com

graciously extended their permission to use a photograph found within these pages. My thanks go to Robin Whitmore for everything.

www.ucolick.org

Ken Vogt

There is no one to whom I owe a deeper debt of gratitude than Ken. By conventional standards, he swears his life has not been that successful - but he's far more talented than he will speak of. Living modestly in southern Indiana, he was able to retire from various menial employments in 1991 at age 45 - but he's far from "retired".

Since that time, Ken pursued his love of music (playing keyboards tolerably badly) and computers; although the bright sky in his home town has prevented any serious sky watching. Ken is also a passionate advocate of Distributed Computing, helping out with the creation of the BAUT BOINC team for projects like Einstein@Home. As he says: "At this stage of life, I'm very happy to help out around the Internet in any way I can."

Ken's "help" has been critical to the publication of this book. He graciously volunteered his time in several ways, and his encouragement through some rough times has been instrumental in its completion. He is truly one of the brightest "stars" in my night sky.

Roger Warner

Roger Warner lives in the UK within a town called Basildon, located in the county of Essex. Both father and grandfather, his interest in astronomy began seven years ago, but the last two years have been dedicated to learning the art of imaging, The Moon and planets were his beginnings - taken with a low cost camera, which is still used to this day.

The Moon became Roger's huge challenge - waiting for the moment of good seeing and grabbing those hidden secrets within. He began to get in close to capture those jaw dropping pictures of the Moons craters, valleys and mountains. With the introduction of a modified webcam, he soon moved on to deep sky - learning the process all over again. His greatest wish is that the images he has produced will inspire others "to progress as well in this wonderful hobby."

www.lupas.pwp.blueyonder.co.uk/rwnewastro/lunar.htm