A S T R O N O M Y

Rochester Skies

Outreach ✶ Call for Observations ✶ the Moon ✶ Astro-Fun

Rochester Astronomy Club Newsletter Issue #7 Q3 '07

A NIGHT AT THE CIVIC CENTER

By Randy Hemann

Some members of the RAC received an extra treat last October 7th, when Mannheim Steamroller performed "The Music of the Spheres" at the Mayo Civic Center. Mannheim Steamroller (MS) contacted our club a couple weeks before their show in Rochester, inviting us to be entertained with a pre-show private audience hosted by Jim Kennedy, former head of the Kennedy Space Center.

Contents

RAC Rochester Astronomy Club — *Come Experience the Universe*

The tour resulted from band founder Chip Davis and his efforts collaborating with NASA and The Space Foundation, to "bring the excitement of space travel back to people." An hour before the show a group of about 15 of us were escorted into a suite and were entertained with a Q&A session about experiences Mr. Kennedy had in his role as director. It was quite clear from the start that he was and still is passionate about his former work, and now is quite energized about his new "mission" with the band. (He tells his grandkids that now he is a rock star.)

After about 40 minutes with us, Jim was hustled off to the concert and we then made our way over to Taylor Arena. As we entered we heard the booming voice of a NASA official reviewing a countdown checklist. In front of the stage was a 20 by 40 foot screen projecting a video of an impending Space Shuttle launch. Then, at t-minus 10 seconds the crowd joined in on the countdown. With liftoff the sound board knobs were cranked clockwise, and Chip Davis' "sonic hologram" of a real Shuttle launch took off.

The sharp sound of crackling shuttle engines pierced the air but most impressive was the deep bass of the engine's roar that literally caused the arena and our bodies, to vibrate in unison with, I'm sure, at least several dozen woofer cones. As the Shuttle left Earth's view, the video screen dropped and the band took off with a fast-paced piece of music called "Escape from the Atmosphere."

We started the rest of the concert with Chip Davis introducing himself and band members, plus their accompanying string and horn sections. Jim Kennedy came on stage and in front of a subdued back drop of Mannheim music and a video review of past space missions and some of Hubble's best, exhorted the crowd to get energized and support present and future space travel endeavors.

The concert moved fast, with a wide variety of music including their renditions of Holst's Mars and Neptune, numerous selections from their Fresh Aire albums, five se-

lections from their new album, "The Music of the Spheres," and finally, a sonic hologram of a Space Shuttle landing.

It was a great time and I think the crowd, I estimate 3000, thought so too. As Chip Davis is known to be an avid amateur astronomer himself, we planned on setting up our telescopes outside the Civic Center for the exiting crowd to enjoy. But alas, we live in Minnesota and that wasn't in the stars. Nevertheless, this new concert series, which will resume next year following their Christmas tour, obviously has an agenda, and it may get more people thinking about such things again, and looking up. And that's not so bad. RAC

RAC-SHOTS

Upper Left: Jerome, Jillissa and Joshua Taubel at Eagle Bluff Star Party. Glorious night for astronomy! Sept-14-07

Upper Right: Larry Mascotti presenting, "Mars, a Mixed Blessing" at monthly meeting Sept-11-07

Lower Right: Jack Wiltsie presenting Saturn/Cassini update at monthly meeting Oct-9-07

Camping under the STARS

By SCOTT Regener

Labor Day weekend found my family camping at our favorite campground, Dunromin' Park Campground, located about six miles south of Caledonia in extreme southeastern Minnesota. By an arrangement with the owners, I agreed to provide public viewings on Friday and Saturday night—weather permitting—in a field just east of the campers.

Friday night proved clear, and I set up my 10" Orion XTi at dusk, and waited for it to cool down. I powered up the computer, something I rarely use when viewing by myself, and went through the alignment procedure. Everything seemed to be working perfectly, as a quick test of M27, the Dumbbell Nebula proved.

As it grew dark, a tree blocked Jupiter, so I began the evening's tour with M57—the Ring Nebula in Lyra. For public events, selecting brighter objects that are distinctive can be a real help, as inexperienced eyes simply cannot detect the dim objects or discern fine details. About a dozen people showed up and I explained that a planetary nebula like M57 formed from the explosive shedding of the outer portion of a dying star.

After that, we moved on to Jupiter, which, though low, cleared a nearby tree. In spite of the poor seeing, everyone was duly impressed with the view.

We moved on to the fabulous Wild Duck Cluster, M11, and the excitement was palpable. Everyone could immediately appreciate the view and stared up in the sky, trying to find the bright object they'd spotted in the telescope.

I drifted through several other objects, including M13 and M27. I concluded the night with Alberio, the blue-yellow double star in Cygnus. I decided to test their observation skills by asking them what colors they saw. After the first viewer reported green and yellow, nearly everyone else agreed with their assessment. One of the children finally corrected them by announcing that one star was, in fact, blue. I used the opportunity to explain the problem of expectations in observing—how what we expect to see influences how we describe what we see. Especially in a field like astronomy, the mind can play tricks on the eyes, rather than the other way around.

Saturday, a few people thanked me during the day for my efforts, but I held out little hope that many would show up after the paltry showing on Friday night. I was grateful the numbers weren't higher, as moving a dozen people through to view objects required some patience. A Dobsonian is an easy-to-use instrument, but it does require constant re-aiming.

At dusk, I set up out in the field and waited for dark. Once I had everything set up and in place, I took some time to look at a few things myself, including checking out M52 in Cassiopeia.

As soon as darkness fell, an explosion shocked me to my feet. Someone set off fireworks less than fifty feet from my exposed telescope. I scrambled to cover the telescope and eyepieces and waited for it all to end. After a minute, it did, and the falling debris ceased as well. Ten minutes later, a second round of explosions left me no time to cover the telescope and I ended up shielding it with my back. I nearly packed up and called it a night, upset and concerned about the condition of my mirrors.

A rush of people appeared a minute later, though, and I decided to stick it out and show them what they came for. Over the course of the next two hours, I led thirty people around the sky, hitting all the highlights of the night before and adding a few extras for those who asked. The waits were long, but most of the people were patient. One girl who had to be four or five kept asking for Jupiter over and over again, and her tired parents trotted her off to bed. Clearly, Jupiter had made a serious impression.

Just as I was about to pack up, a group of people came rushing back from the campers to ask to see the Moon. I looked up and saw the Moon through the trees at the far end of the field. Wasting no time, I hooked the telescope up to my hand truck and carted it across the field to a better spot for the Moon. As expected, the Moon stole the show. Everyone thought it was the most exciting thing to see the Moon up close and personal.

Once home, I ended up rinsing my primary mirror to remove a few black spots, and everything appears to be fine. I was fortunate not to have any real damage to the coating.

Since returning home, the owners have told me that they're already receiving calls asking about when "that star guy" will be back next year. As much as I'd love to do it again, I don't think I can commit to it without a few extra scopes and talented hands on site to handle the large number of people who showed up. The passion for seeing the night sky those nights was invigorating and I hope the Rochester Astronomy Club can conduct more similar public outreaches in the future.

RAC

The Looking Glass

by Duane Deal

While lots of articles have been written on different telescope designs, few give much attention to where all that light comes to focus: the eyepiece. This is a field guide to the various sorts you'll find at a star party or scope store.

Eyepieces, also known as oculars, are made up of pieces of glass called elements. Even when jammed together in twos or threes (doublets and triplets) they are still counted individually. Eyepieces of a particular type generally require a particular type of glass, which goes a long way in determining price and quality.

Eyepieces are identified by their **focal length** in millimeters, the distance between the eyepiece's principle plane (a single lens' principle plane is its center) and the point where the light converges, which is called focus. Magnification is found by dividing the telescope's focal length with the eyepiece's.

Field of View (FOV) is how much sky can be seen in angular degrees. FOV changes when coupled with different scopes. When FOV is given for an eyepiece, it's called the *apparent FOV*. From this value the actual field of view when coupled with a given telescope can be calculated.

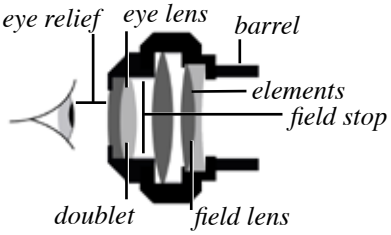
A specification all too often overlooked, is **exit pupil**. Exit pupil is the diameter of the focused image that exits the eyepiece. If the exit pupil is larger than the diameter of your dark-adapted pupil, light will be lost and the view will be dimmer. A young adult's dark adapted pupil will approach 7mm, but with age, this shrinks to about 5mm. An ideal exit pupil for light gathering matches the observers pupil (spreading the light over more retina without losing any). As magnification increases the exit pupil shrinks. Brightness and resolution are maintained, contrast is increased, but the image fills a smaller portion of your retina. With good optics, good eyes, and a steady sky, an exit pupil down to 1mm works well. Beyond that point "floaters" in the vitreous of the eye begin to obstruct the tiny image.

Eye relief is the maximum distance the eye can be from the lens and still see the entire FOV. Limited eye relief can make viewing uncomfortable and in many instances impossible for eyeglass wearers. Eye relief is inherent to the design of an eyepiece and can become a major problem at 10mm or less.

$$\text{Mag.} = \frac{\text{Telescope Focal Length}}{\text{Eyepiece Focal Length}}$$

$$\text{Actual FOV} = \frac{\text{Apparent FOV}}{\text{Mag.}}$$

$$\text{Exit Pupil} = \frac{\text{Eyepiece Focal Length}}{\text{Telescope Focal Ratio}}$$



GLASS

There are many popular brands of eyepieces that won't break the bank. Store brand oculars start at around $40 and escalate to $200 or more.

Generic eyepieces will satisfy the most frugal observer. You'll hear amateur astronomers use the acronym GSO when referring to no-name eyepieces. It stands for Guan Sheng Optical, a manufacturer of eyepieces and lenses. Their elements can be found in both generic and brand name equipment.

Fast scopes (*f*/6 or less) are less forgiving than slower scopes (such as *f*/10). Fast scopes generally require high-end eyepieces for a good image to the edge of the FOV.

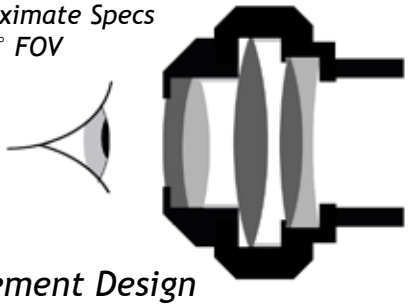
The old saying, *you get what you pay for*, holds true when it comes to eyepieces. However, it is not a linear relationship. On the high end, you need to spend a lot more money to gain a little more performance. It will cost you if you want the very best.

You can add quality eyepieces without blowing your savings by buying used. Amateur astronomers are always making room for new equipment and one scope's flint glass is another's lanthanum crown.

ERFLE

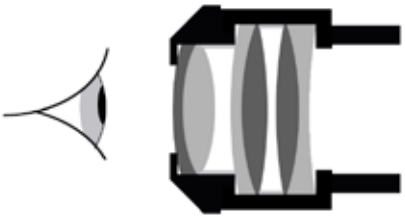
The Erfle eyepiece, invented in 1917 by Heinrich Valentin Erfle (1884-1923), uses 5 or 6 elements. They have low distortions, wide FOV and flat fields (no curvature due to the lens). However, the image suffers from off axis astigmatism (comes to focus unevenly) as magnification is increased.

Approximate Specs
60-70° FOV



5 Element Design

Double Extra Dense Flint
Dense Barium Crown
Lanthanum Crown
Titanium Crown



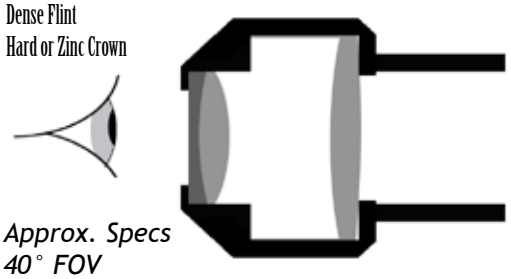
6 Element Design

Extra Dense Barium Crown
Dense Barium Crown
Extra Dense Flint

Kellner

In 1849 Carl Kellner (1826-1855) developed this eyepiece with 3 elements. A sharp, bright eyepiece with good eye relief (lower eye relief at higher powers), but plagued by inherent internal reflection problems and limited FOV. Modern coatings help overcome this problem and have made Kellners a decent eyepiece at a low price.

Dense Flint
Hard or Zinc Crown

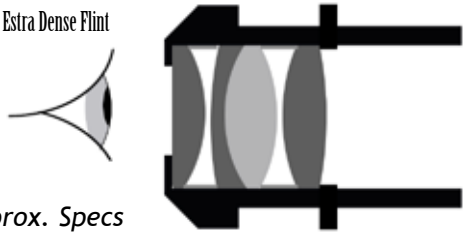


Approx. Specs
40° FOV
Eye-relief = Focal Length x .5

Konig (Koenig)

Albert Koenig (1871-1946) was a lens designer for Carl Zeiss. He created a 3 element design similar to the performance of a Plossl but with one less lens. Modern eyepieces that bear his name have progressed to four elements (the most popular being a single-doublet-single configuration as shown). Konigs have good eye-relief, and good FOV but suffer from fuzzy edges in fast scopes.

Borosilicate Crown
Double Estra Dense Flint

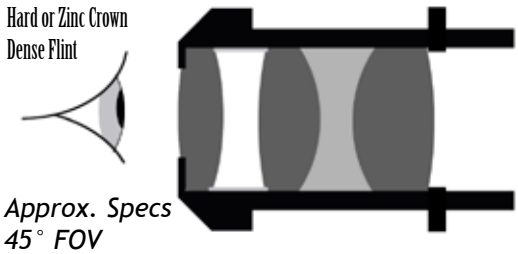


Approx. Specs
Up to 70° FOV.

Ortho

The Orthoscopic eyepiece was invented in 1880 by Ernst Abbe (1840-1905) while working at Zeiss where he later became proprietor after the death of Carl Zeiss. The ortho is a 4 element ocular with no image distortion, good contrast and color, and adequate eye-relief. It's only drawback is its limited field of view. It is the perfect eyepiece for planetary viewing or other objects of small angular size.

Dense Barium Crown
Hard or Zinc Crown
Dense Flint

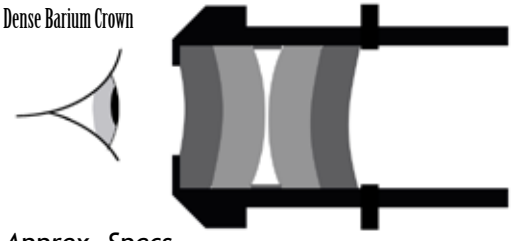


Approx. Specs
45° FOV
Eye-relief = Focal Length x 1.1 to 1.3

Plossl

The work horse of the modern eyepiece arsenal is the Plossl, created by Georg Simon Plossl (1794-1868) in 1860. It generally has 4 elements and produces pinpoint images with good contrast and FOV. Its main drawback is relatively short eye-relief. Plossl eyepieces require good glass and precision engineering. This translates into a vast range in performance between those made cheaply and those made with care and at a higher cost.

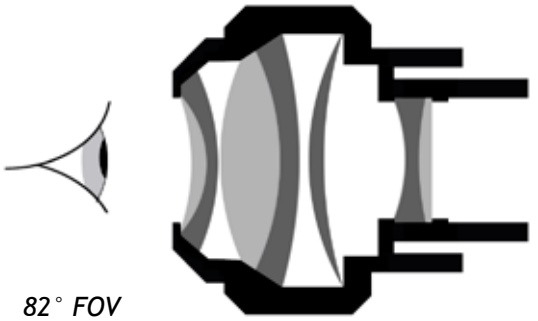
Extra Dense Flint
Dense Barium Crown



Approx. Specs
50° FOV
Eye-relief = Focal Length x.7

Nagler T1

The Nagler has 6-8 elements. Albert Nagler set out and created eyepieces with previously unreachable specifications. Technically, the elements in a Nagler equate to a very nice lower power eyepiece coupled with a high quality barlow lens to increase the magnification, but this is all in one eyepiece. The result is a great image with an incredible FOV. The only draw back is the size and weight of the eyepiece itself. Naglers contain no aspheric lenses, which simplifies the manufacturing process. I'd hate to see what they'd cost otherwise!



There are plenty of eyepieces on the market today with a vast range of configurations that are placed in a category called Ultra-Wide. They generally contain 6-8 elements with FOV of up to 85° and varying specifications. These eyepieces should be graded on a case by case basis.

With so many eyepieces, how do you choose? Do some reading online to find out how a particular eyepiece performs. Cloudy Nights (www.cloudynights.com) has many reviews on various eyepieces. If you can't find a review for a particular eyepiece, ask about it in a forum. Most importantly, attend a star party and look through as many eyepieces as you can. Ask to try them out on your telescope. There is no substitute for looking through it with your own eyes.

Eye-Testing Oculars

Avoid eyepieces with a small hole to view through. Those tiny holes are referred to as keyholes and make viewing uncomfortable.

Is the image flat? Pan the scope while observing. If the stars maintain their shape and position, the image is flat.

Check the eye relief by placing your eye where you can see the crisp edge of the field stop (the portion of the ocular that limits FOV). If this is impossible or uncomfortable, you won't be able to utilize the full FOV.

Stars should be nice, round points across the entire field. Observing tight double stars under a stable sky will help discern good oculars from bad.

Compare brightness and contrast between similar eyepieces.

Focus and de-focus the image to see if stars maintain their shape and make sure the FOV comes to focus simultaneously.

Watch for unwanted reflections or fringes while viewing bright objects (Vega, Venus, Mercury or the Moon). Also check that objects maintain their natural color across the entire field.

Keep in mind, the atmosphere can cause issues, so don't use an object that is near the horizon. The telescope could also cause some of these symptoms.

When buying used eyepieces, make sure the glass is free of damage. Check recently sold eyepieces on www.astromart.com to help estimate an eyepiece's value.

No eyepiece is perfect and all these specifications and properties are often a trade off. Choose eyepieces based upon your needs and don't go overboard. If you plan your purchases appropriately, you'll only need a few good eyepieces for all your needs.

Complementary Eyepiece Plan

12mm Ortho, Plossl, Nagler, or Radian—high power eyepiece for planetary, lunar and double stars.

40mm Erfle, Konig, Nagler, or various ultra-wide—low power eyepiece with a wide FOV for locating objects, viewing extended objects or multiple objects in the same field, or observing objects in the context of their surroundings.

30mm Kellner—for locating and observing dim objects.

2x barlow—Coupled with the eyepieces above effectively doubles your eyepieces range with a total of six focal lengths (6mm, 12mm, 15mm, 20mm, 30mm and 40mm)

Regardless of what eyepieces you have, take them out often, train them on the sky and feed them plenty of star-light!

RAC

Call for Observations

SCOTT
REGENER

A regular feature in the RAC newsletter, this column calls for observations of specific targets over the course of the next quarter. Individual observations that are given in response will appear in future editions of the newsletter. In time, these observations will also become part of the permanent record on the web site, so amateur astronomers the world over can gain knowledge and understanding as to what deep space objects might look like.

Sketches or photographs are most welcome.

It will be assumed that nights of poor transparency will not be used for creating descriptions. Any level of experience is welcome, and all are called upon to submit their observations, even if only for one of the season's objects.

To be credited, observations must include:

- **Observer name**
- **Date and Time**
- **Location**
- **Aperture (in mm)**
- **Transparency**
- **Magnification**
- **Written description**

It appears that last issue's list proved either too daunting, too complicated, too lengthy or too late, as no one submitted any observations for the targets listed in the Summer newsletter. As such, this issue's list is much smaller, simpler, and to the point. Get your name in print! Contribute to science! Enjoy the excuse to get out under the stars!

This month's target is accessible naked-eye. That means that no one has an excuse for not getting out to see it. The target is: M45 (The Pleiades.) M45 is an open cluster located in Taurus. Sometimes called the "seven sisters," Homer first logged this cluster in 750 B.C. With the naked eye, six stars should be visible from a modest site, and over a dozen are possible under excellent skies. Current estimates state that the cluster is 100 million years old, and has only another 250 million years remaining as a cluster before it disperses.

With binoculars, M45 is a wonder to behold, offering about 100 stars in the 1.5° diameter. In most telescopes, the Pleiades are too large to fit into a single field of view.

Another interesting feature of M45 is the fact that it illuminates a nebula—the Merope (*mer-oh-pee*) nebula, NGC 1435. Seeing the nebula requires very dark skies, and is best seen in a rich-field refractor or large binoculars. The nebula is not part of the cluster, as they have different radial velocities.

Regardless of the instrument, M45 is a must-see object in the heavens, and a showcase for the uninitiated. Observations are called for—nay—demanded, for this fine object. RAC

Greek to Me

Duane **Deal**

Is a star by any other name still a star? Of course it is. Naming the star in a meaningful way is the problem. With 6000 naked eye visible stars in our sky, you can't just call them all by name. Who could remember 6000 names? I have enough trouble remembering relatives names! In 1603 an interesting way to resolve that issue was used while compiling the very first all sky atlas.

Johann Bayer, a lawyer who became the first Astronomer Royal, compiled and called that atlas Uranometria, which means, *Measure the Sky*. That atlas continues to be published today in modern form and Bayer's method for naming the stars continues as well.

His method for naming the stars was to assign Greek letters to them. He would have chosen to name them in order of their brightness, but without the aid of modern instruments the best he could do is to organize them by whole magnitudes. That groups together stars of similar luminosities, but by today's standards it's not very accurate. The order assigned to stars within a magnitude group is a bit more ambiguous. Some were named in the order they would rise. Others were named according to the asterism, head to toe (or tail). Stars that were once bright pole stars get the alpha designation regardless of comparison and in some constellations there seems to be no order at all. To make matters worse, some don't contain an Alpha star at all! Confused yet?

The possessive Latin name of the constellation to which the star belongs is added to the lower case Greek letter. Vega, the brightest star in Lyra, is Alpha Lyrae (or abbreviated α Lyr). A constellation would continue along this convention until using up all 24 letters of the Greek alphabet. I don't know if you've noticed, but there are more than 24 stars in a constellation. To extend his catalog beyond lower case Greek letters, he continued with lower case Latin letters. If he ran out of those in a given constellation he would use upper case Latin letters.

Bayer wasn't the last to catalog stars. John Flamsteed got in on the action and was more orderly in doing so. Flamsteed decided to just use numbers and assigned them in order of right ascension. Continuing along the same school of thought as Bayer, he also used the possessive name of the constellation. Unlike Bayer, who sailed the world to catalog and map the entire sky, Flamsteed stayed at home in Great Britain and left many southern constellations uncharted.

Today a combination of these catalogs is used. A Bayer designation is used when it exists and Flamsteed's numbers fill in many more. OK, you got me. It still doesn't cover all 6000 visible stars. There are other catalogs (SAO, USNO, HIP, etc…) covering those along with the rest of the known stars, but as an amateur astronomer, I have enough trouble remembering the Greek ones.

RAC

Alpha	α
Beta	β
Gamma	γ
Delta	δ
Epsilon	ε
Zeta	ζ
Eta	η
Theta	θ
Iota	ι
Kappa	κ
Lambda	λ
Mu	μ
Nu	ν
Xi	ξ
Omicron	ο
Pi	π
Rho	ρ
Sigma	ς
Tau	τ
Upsilon	υ
Phi	φ
Chi	χ
Psi	ψ
Omega	ω

Which Moon Holds The New Moon Better?

Old Moon? Young Moon? You decide!

Randy
Shekeruk

Below, is a photo of each. Both are Crescent Moons (Old Moon waning in the mornings and Young Moon waxing in the evenings). At these stages, the Earth is nearly full as seen from the Moon, and would produce enough light for the Moon's dark portions to reflect back to us here on Earth. Most of this light comes from the Earth's atmosphere, and takes less than 3 seconds to make it to the Moon and back.

New Moon in Young Moon's Arms
(also known as Old Moon in Young Moon's Arms). 2 second exposure by Randy Shekeruk on September 18th 2006

New Moon in Old Moon's Arms
2 second exposure by Randy Shekeruk on May 18th 2007

So, Which Moon holds the New Moon Better?

RAC

Shoot *the* Moon

LEFT: Duane Deal shot a crescent Moon with earthshine on April 27th at 10:15PM with a Canon EOS Digital Rebel ISO 800, 3 seconds, f/10 300mm

Below: Scott Regener shot the Full Moon on May 1st 2007 at 10:24PM with his Canon EOS D60 ISO 200, 1/60 second, f/1.8 at 50mm.

Astro-Fun

It's a Little Known Fact

M15 is a globular cluster in Pegasus, and perhaps the densest glob in our galaxy. This globular is experiencing a core collapse and scientists are not sure if the center contains a thick mass of stars or a super massive black hole. It is moving towards us at 107 km/sec, but at a distance of 33,600 light years away, it won't be here soon. To put that distance in perspective, a light year is 5,878,625,373,183 miles. If a trillion is hard to grasp, try this on for size:

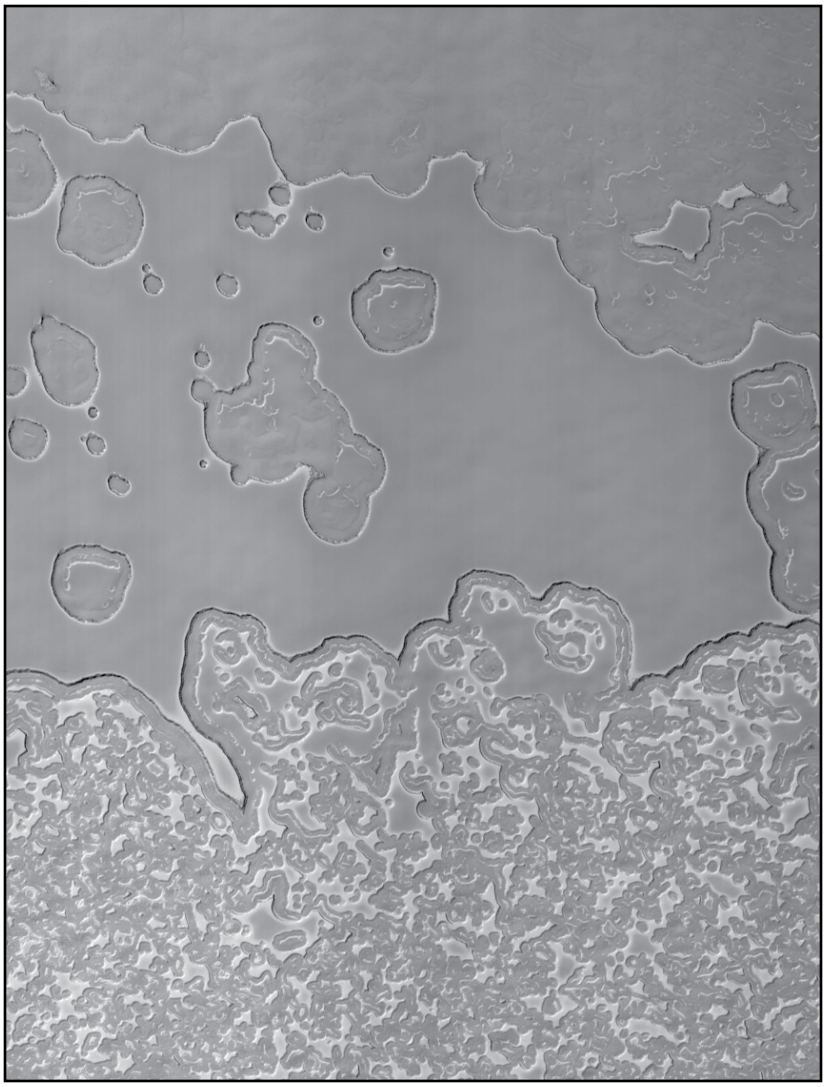
1 million seconds ago = ~ 12 days ago
1 billion seconds ago = ~ 32 years ago
1 trillion seconds ago = ~ 30,000 BC

Now multiply 5.878 trillion miles by 33,600.

M15 is: 197 quadrillion, 521 trillion, 812 billion, 540 million miles away!

What in the Universe Is THAT?

Can you name the object in this image?



Be the first to post your answer at
http://rochesterskies.org/forums/
under the topic **Newsletter / Fun**

Try it on the Sky

In biblical times, the Hebrews didn't know when one month would end and the next month would begin. They knew the month was about 29 days, but they instead based it upon the visible lunar cycle. When two elders confirmed the first sight of a crescent Moon, that day would become the first day of the month. Imagine that here in Minnesota—some months are so cloudy we'd have to skip months! The Hebrews had a holiday that landed on the first day of the month, Yom Teruah, the Feast of Trumpets. They also had an idiom for that holiday, "Feast that no man knows the day or hour," because they didn't know what day it would land on. After new Moon, those elders must have watched intently after (and possibly before) sunset to catch the crescent Moon as soon as possible. This November, the new moon falls on the 9th. How soon do you think you can spot the following waxing crescent? It may be possible after 5:00PM on the 11th, maybe earlier. Keep an eye south of the Sun and let us know in the forum. Maybe you'll see it first!

Rochester Skies

Newsletter of the Rochester Astronomy Club

Upcoming Events

Star Party at Eagle Bluff	**Nov**	**9***
Club Meeting *PlanetariumPalooza—Larry Mascotti*	**Nov**	**13**
Star Party at Eagle Bluff	**Dec**	**7***
Club Meeting *Holiday Party—Officer Elections*	**Dec**	**11**
Star Party at Eagle Bluff	**Jan**	**4***
Club Meeting *Tunguska—Sergei Venyaminov Ph.D.*	**Jan**	**8**

*Events subject to change due to weather. Please check up-to-date resources for details.

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Rochester Astronomy Club
C/O R Bomgaars, Treasurer
820 10$^{1/2}$ St SW
Rochester, MN 55902