The Spectrogram

Newsletter for the Society for Telescopy, Astronomy, and Radio

April 2005

Inside this Issue

S*T*A*R
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April's Meeting

The next meeting of S*T*A*R will be Thursday, April 7th.

Carter Emmart, Director of Astrovisualization for the Rose Center for Earth and Space, will speak on "Digital Universe".

The meeting will begin promptly at 8:00pm at the King of Kings Lutheran Church, 250 Harmony Road, Middletown.

Thanks to Contributors!

Thanks to all this month's contributors to the *Spectrogram* (Steve Walters, Ernie Rossi, Steve Fedor, Randy Walton, Mike Lindner, Greg Crinklaw). If you'd like to follow in their footsteps, **the deadline for the next edition of the *Spectrogram* is Friday April 29th**. Please email any contributions to gwarnes1@comcast.net.

Calendar

September 2, 2004
History of the Telescopes
Ernie Rossi

October 7, 2004
Constellation Myths
Dr Hank Bartol, Newark Academy

November 4, 2004
X-Raying the Hearts of Supernova Remnants
Jeremy Carlo, Columbia University

December 2, 2004
Eclipse!
Ken Legal

January 6, 2005
Business Meeting on Telescope Purchase

February 3, 2005
Imaging by the S*T*A*Rs

March 3, 2005
Astronomy & Astrology in Mesopotamia
Dr. Ron Wallenfels

April 7, 2005
Digital Universe
Carter Emmart, Rose Center

May 5, 2005
Cassini Mission to Saturn
George Lewycky

June 2, 2005
AGM

President's Corner

By Steve Walters

April, the month of spring! Flowers are blooming, birds are chirping, crickets are a'crickin'….time for you to dust off the old telescope and get out there! If you're an old hand, get out and look at some galaxies, this is the season for them. If you're just starting out or are a bit rusty, try romping through either the "STAR Introductory List" (http://www.starastronomy.org/Observing/StarIntroductoryList.pdf) or the "STAR 100 List" (http://www.starastronomy.org/Observing/brightstartext.html) on our discussion board.

Next weekend, April 9, is the S*T*A*R campout at Allaire State Park. This is a great chance to start your spring observing program. Come on down, bring your family, and observe for a while. If you have camping gear, set up and spend the night. This is a lot of fun for youngsters, they can have a great time looking through telescopes and sleeping in the outdoors. Tim Tierney has a thread started on our discussion board about this event, check it out and come on down!

Our 25" Obsession should be at Allaire, the ladder is ordered and hopefully will arrive soon. Much of the work on the dew heaters and fan system has been completed by Steve Fedor (Thanks Steve!). I hope we will be able to start using this scope on a regular basis now. There will be another Qualified Operator training session soon so let Dennis O'Leary know of your interest. We could use a few more QOs to operate and transport the scope.

We have some excellent programs planned for April and May. On April 7, Carter Emmart from the Rose center in NYC will present "Digital Universe"; and on May 5, George Lewycky will tell us about the Cassini mission to Saturn. I'm looking forward to these programs and I hope to see you at the meetings!

Clear Skies!

Steve…

March Meeting Minutes

By Steve Fedor

The March 2005 meeting of S*T*A*R Astronomy was attended by 32 members and non-members. At 8:10pm president Steve Walters called the meeting to order. Steve began by welcoming new members Howard and Colleen. Steve also noted that a nominating committee needs to be formed for the election of club officers before the June business meeting.

Paulette Huddock of Project Astro Nova gave a sincere thanks to all S*T*A*R members who have participated in various the various star parties she has been involved with. A special thanks was given to S*T*A*R member Ken Legal for his untiring efforts to promote astronomy. Paulette also read some of the many thank you cards written to the star party volunteers by elementary school children.

At 8:27 Dr. Ron Wallenfels began the evening's presentation, which was "Mesopotamian Astronomy." The lecture included detailed insights into one of the earliest stages of astronomy and various facets of Mesopotamian history. The talk concluded at 9:27 at which time coffee break began.

Coffee break "Scope and Tell" was by S*T*A*R's V.P. Dennis O'leary who had his 11" Celestron SCT set up for display. At 9:48 Jordan Feder began his monthly "Object of the Month" presentation. This month's objects were Mercury, the Leo Trio galaxies and Hubble's Variable Nebula. As usual, Jordan had high quality astrophotos to illustrate the objects and gave due credit to the astrophotographer.

Announcements:

Dave Britz announced a star party at the Neptune Middle School on 4/18.

Dave also requested a separate section of the discussion board be created for star party information. The idea will be taken into consideration by the BOT.

Tim Tierney began a discussion of the upcoming Messier Marathon which was to be held March 12th at Coyle Field. However at the time of this writing the marathon is being postponed due to weather.

Tim also reminded the membership that S*T*A*R will be hosting a public star party at Allaire State Park on 4/15 and in return S*T*A*R will have the private use of Allaire on 4/9 the entire evening.

Larry Cambell thanked members Rob Nun, Dave Nelson, Frank Loso, Ken Legal, Russ Drum, Ed Collett, Joe Casella, Dave Britz, Rob O'Niel for their efforts at the Holmdel Middle School star party.

Imaging – Steve Walters reported there will an imaging SIG meeting on 2/17.

Beginner's – Nancy McGuire indicated she is working with new members and has a 6 inch reflector to loan but it needs a dob mount. She also inquired if the club would purchase a Telrad for it. Nancy also asked for eyepiece donations.

Observing. – Tim Tierne indicated that the first outing with the 25 inch dob would be held the upcoming weekend which was 2/5 at John H.'s house. Gavin Warnes indicated the 25 inch scope would be on display for the Turkey Swamp event in May as well as Earth Day in Manasquan in April. Mike

Lindner asked if there were any plans for Astronomy Day. At this time there are no plans.

Larry Campell thanked the various members who assisted at the star party for the Holmdel elementary school on Feb. 15.

Dennis O'leary announced that training would be held soon for those wishing to become Qualified Operators (Q.O.'s) for the club's 25 inch Obsession.

Steve Walters announced that 4/16 will be Astronomy Day. Steve asked if there were any members interested in leading an organized effort by S*T*A*R to promote astronomy to the public on that day and noted that S&T has free literature available that would assist us. There were no members interested but Steve indicated he will obtain the S&T literature anyway and ask again on the discussion board.

SIG Reports:

ATM – no report

Imaging – There will be a meeting at Steve Walter's house on 3/17.

Beginners – Nancy McGuire indicated she will check with Gordon about the status of the club's new loaner scope.

Observing – Messier Marathon was discussed earlier in the meeting.

Outreach – No report.

The 50/50 was drawn for a prize of $13.50.

Minimal observing took place afterwards due to the frigid temperatures.

Allaire Park Star Party April 9th & 15th

On Saturday April 9th, S*T*A*R will be holding its spring overnight star party at Allaire State Park. Whether you plan to camp overnight, observe all night (bet you can still get 100 Messier's), or show up and leave after a couple hours of observing, make your plans to be there. Bring the family!

The following Friday April 15th, Allaire State Park is sponsoring a Public Star Party hosted by S*T*A*R. Your participation is greatly appreciated. This will be advertised in the newspapers. If you can help out, please contact Tim Tierney at ttierney@optonline.net.

Star Watch at Cheesequake State Park April 16th

Cheesequake State Park will be holding a public observing night at 8.00pm on Saturday April 16th. This event provides another opportunity to publicize the club and attract new members. STAR members are invited to come along and show the general public objects through their telescopes. The event is held at a large field in front of the main entrance to the park in Matawan. The event won't be cancelled if it's cloudy, so we'll can do a planet walk and talk about the club if we can't observe. If you would like to help out, please contact Gavin Warnes at gwarnes1@comcast.net.

Solar Observing at NEAF April 16th-17th

The Rockland Astronomy Club is hosting the second annual NEAF Solar Star Party at Rockland Community College in Suffern, NY, on April 16th & 17th. NEAF attendees are invited to observe the Sun through a variety of Hydrogen-alpha and sunspot solar filters. No star party entrance fee or registration required. Pictures from last years event plus fantastic solar images can be found at http://www.sungazer.net/field.html.

Earth Day Celebration April 17th

S*T*A*R is participating at the Earth Day Celebration at Manasquan Reservoir Environmental Center, 331 Georgia Tavern Road in Howell on April 7th from noon-5pm. About 600 people are expected to attend this event. The plan is to demonstrate solar observing/projection and distribute flyers to interested members of the public. If you would like to participate, please contact Gavin at gwarnesl@comcast.net.

Neptune Middle School Star Party April 19th

Dave Britz is holding a star party on April19th at Neptune Middle School He would like some help operating the 25" and/or members to bring their own scopes. If you can help out, contact Dave at briswold@aol.com.

Almost Heaven Star Party June 2nd-5th

NOVAC is pleased to announce that it will be holding its first regional Star Party at Spruce Knob, West Virginia on June 2-5, 2005. The event will be held at The Mountain Institute in one of the darkest areas on the east coast and is at an elevation of about 4200 feet. Please check the following web site for more information http://www.novac.com/AHSP/index.php.

Registration is now open and there is an automated process so that it can be done completely on-line. If you have questions please send an email to AHSP@NOVAC.COM.

All proceeds from this event will go to the Virginia Outdoor Lighting Taskforce - VOLT.ORG to support their efforts to fight light pollution.

A Sidewalk Astronomer – A New Film About John Dobson

New York's Tribeca Film Festival has announced screenings of a new feature-length documentary on the famous telescope designer, cosmologist and former Vedanta monk, John Dobson.

A Sidewalk Astronomer
A film about astronomy, cosmology and John Dobson
(78 minutes; photographed, produced & directed by Jeffrey Fox Jacobs)

On any given night around the world, thousands of people peer into deep space because of John Dobson. An 89-year old with a white ponytail and a knack for comedy, John Dobson revolutionized astronomy. Possessing a quicksilver wit, a gift for turning a phrase that makes scientific concepts accessible, and an energy that belies his nearly 90 cycles around the sun, Mr. Dobson is one of history's greatest popularizers of science (Wall Street Journal 9/1/04).
He is the inventor of the Dobsonian telescope mount, which changed the field of astronomy dramatically, making telescopes accessible to the public on every continent. A former Vedanta monk of the Ramakrishna Order, he is a co-founder of Sidewalk Astronomers, an organization that encourages amateurs to share their telescopes and knowledge with others on busy city streets and in national parks. As John says, the Universe is bigger than the Earth; it's bigger than the solar system; it's bigger than our galaxy and we owe it to ourselves to notice it. The film follows John as he tours the country from the sidewalks of San Francisco to colleges, universities, astronomy clubs, star parties and to Stellafane, a convention of telescope makers in Vermont. It features sequences on Vedanta, sidewalk astronomy, telescope making, the Moon, Sun, major planets, galaxies, Big Bang Theory, and the nature of time and space. We also get to know John Dobson, a fascinating thinker, philosopher, teacher, and inventor who encourages us to think about the Universe. This spiritual, astronomical and cosmological journey is illustrated with actual photos and footage of space shots from satellites and spacecraft as well as animation courtesy of NASA, the Jet Propulsion Laboratory, the Goddard Space Flight Center and the Hubble Space Telescope Institute.

The Tribeca Film Festival screening dates for "A Sidewalk Astronomer" have been set. They are:

Friday, April 22, 5:30pm, Regal Battery Park, Screen 3
Sunday, April 24, 4:30pm, Regal Battery Park, Screen 7
Tuesday, April 26, 9:30pm, Tribeca Cinemas, Screen 2

Tickets cost $10. More details are available at http://www.tribecafilmfestival.org.

Ernie's Telescope Corner

By Ernie Rossi

Eyepieces

The second most important part of a telescope is eyepieces. However, eyepieces come in many sizes, types, quality and price. So how does someone choose what eyepieces he or she will need, and how many? The telescope owner needs to first know something about his telescope and about eyepieces. Not all telescopes are the same and that goes for eyepieces too. Eyepieces come in three different sizes to fit your telescopes focuser. You will find the size .965" on many small telescopes and especially department store models. The normal size eyepieces for most amateur size telescopes up to 8 to 10" is the 1.25" diameter eyepiece. The largest eyepiece comes in a 2" barrel and you will find them on large aperture telescopes, and some of the more expensive smaller aperture telescopes. The 2" focus models usually comes with a 1.25" adapter for regular size eyepieces.

One of the most important things you need to know is part of the eyepiece nomenclature, and that is the lens element closest to the observers eye is always referred to as the eye lens, while the lens element furthest from the eye and facing the telescope is called the field lens. A field stop is usually mounted just beyond the field lens at the focus of the eyepiece, giving a sharp edge to the field of view. The larger eyepieces have a larger diameter field stop so they give a wider field of view.

Probably the most important thing to the person new to astronomy and thinking of purchasing a telescope for the first time, is how much magnification does it have, and how

important is it when purchasing a telescope. Aperture is the most important thing provided the telescope has quality optics. Any telescope can be made to magnify even to a thousand power just by adding barlow lens but that doesn't mean you will see anything. Eyepieces come in various focal lengths and given in millimeters (mm). I've seen eyepieces listed at 55 mm, to as small as 2.5 mm focal length (fl). The longer focal length of a given telescope, the higher the magnification with a given eyepiece. Let me give you an example of how this works. Let's take two telescopes each 6" in diameter, one with a focal ratio of f/8 (8 times the length of the objective) giving a focal length of 6x8=48" or 1219 mm (1" = 25.4 millimeters), and f/6 (6 times the length of the objective) 6x6=36" or 914 mm. If we were using the same eyepiece of 10 mm the telescope with the f/8 focal ratio would have a magnification of 122 x, while the f/6 version would magnify 91 x. You divide the eyepiece focal length into the focal length of the telescope. For example 10 divided into 1219 = 122.

Eyepiece design has come a long way from Galileo's telescope. Galileo's eyepiece had only one convex lens which resulted in a very narrow field of view plus distortion due to chromatic aberration. Today some eyepieces may have as many as 8 lenses and be made of special low dispersion glass. Since Galileo there have been many designs to improve image quality, contrast, field of view, and eye relief. Images in more expensive eyepieces are extremely sharp in even low ratio telescope of F/5 or less. Wide field eyepieces now cover more than an apparent field of view of 80 degrees where some of the cheaper eyepieces cover 30 degrees or less. Instead of just tiny pin holes in small millimeter eyepieces, higher price models have eye lenses the size of a quarter, or larger.

For those of you who have the .965 mm eyepiece and want to upgrade to a better eyepiece without changing the focuser, you can purchase an adapter for 1.25" eyepieces that will fit in your focuser. Better quality eyepieces are usually more expensive since they incorporate all the features I previously mentioned. You may hear names such as Huygens (named after Christiaan Huygens who invented the first compound eyepiece in the late 1660's), Ramsden, Kellner, RKE, Orthoscopic, Erfle, Zoom, Plossl, Nagler and the list goes on. The early eyepieces like Huygens, Ramsdens, Kellners are for longer focal length telescopes since refractors had very long focal lengths and these eyepieces don't work to well with shorter focal length telescopes causing problems like spherical and chromatic aberration as well as image curvature and lack of sharpness.

During the 1960-1970's eyepieces improved somewhat due to enhancements in coatings and edge blackening on some of the older Orthoscopic, Plossl, and Erfle designs. However, in the 1980's, an optician and manufacturer by the name of Al Nagler changed the design of eyepieces and eyepiece technology really took off. Al Nagler was manufacturing high quality 1.25 mm Plossl eyepieces but came out with a revolutionary new super size design and called it the Nagler. This was a colossal size eyepiece of 13 mm in focal length that fit either 1.25 or 2" focusers and had an unheard of 82degree apparent field of view while most premium eyepieces only had an apparent field of 50 degrees. At this time quality eyepieces cost around $50-60, but this new eyepiece was $230-250. Would any amateur buy it?

Today any serious observer has many of these giant eyepieces in his or her collection and some of the prices are over $600. In today's market you can buy an eyepiece for $25, or spend over $600. As the saying goes, you pay for what you get, However, do you need such an eyepiece? Probably not, it depends on your telescope and your pocket book. For the avid observer with a large aperture telescope who has deep pockets and wants nothing but the best, these super size eyepieces are worth every penny.

"How many eyepieces do I need?" many observers and new comers will ask me, and the answer may vary depending on your telescope and what your most interested in looking at. The answer is usually 3-5 eyepieces and maybe a 2 x Barlow lens. A Barlow lens will of increase magnification of a given eyepiece by 2-5 times. It does this by increasing the focal length of your telescope which increases your magnification with a given eyepiece. The average observer with a telescope in the range of 3-6" and can only afford normal size moderate priced eyepieces should include a 25-30 mm for wide field low power, 12-15 mm for medium power, and 6-8 mm for high magnification. If you add a Barlow lens it would be equivalent to adding three (3) more eyepieces for the price of one. For those individuals with large telescopes and deep pockets you may want to go with the super size eyepieces with the 82 degree apparent field of view. An example would be the Nagler 31, 22, 17, 12, & 9 mm eyepieces, and maybe a 2" 2 x Barlow. There are other manufacturers that carry large eyepieces too, like Meade, Pentax, as well as several others. Many of the larger eyepieces are heavier and you must be able to balance this extra weight, but if you should buy one you will never go back to the regular eyepieces again.

"I see an advertisement that has a telescope with over 500 x. Are they telling me the truth?", "How much magnification can I use in my scope and will I be able to see more?". These are some of the questions beginners will ask. A good rule of thumb is to use the maximum magnification you see that particular object best with. This could be low power looking at an open cluster, or high power trying to split double stars as long as the image is sharp and not degraded. Another rule is that you shouldn't exceed 50-60 x per inch of aperture. If you have a 4" telescope 200-240 x should be maximum under very steady atmospheric conditions. Does that mean a 20" telescope you can use 1,000 x or even more? The answer is most of the time no matter how large your telescope is, around 300 magnification is maximum except on nights when atmospheric conditions are extremely steady. If you tried to use extremely high

magnification like 500 power in a 60 mm telescope the object would be extremely dim and distorted.

What's the difference between an eyepiece of the same focal length of say 10 mm with an apparent field of view of 50 degrees opposed to a eyepiece with an apparent field of view of 82 degrees? If that particular telescope with that eyepiece size gave a magnification of 100 x, the eyepiece with the apparent field of view of 50 degrees would show a patch of sky .50 or ½ of a degree, or just encompass the full disk of the moon. However, with the eyepiece of 82 degrees, the patch of sky would be .82 of a degree and show almost 2 full moon diameters of sky, or around 2 ½ x more area.

Another important thing to take into account is the exit pupil. A young person's pupil can dilate when dark adapted to around 7 mm, while an older person's pupil may only dilate to 5 mm. If the cone of light is greater than 7 mm you're wasting light, and if it's smaller than 0.5 there isn't enough light. We have a simple formula that gives you your exit pupil so you can stay within these boundries as well as the other ones previously described.

Exit pupil = D/M or Fe/F

where D is the diameter of the telescope's objective lens or primary mirror in millimeters, M is the magnification, Fe = the focal length of the eyepiece in millimeters and F = the telescope's focal ratio (it's f-number).

Let's take two telescopes, one is a 6" f/8 and the other one is a 10" f/5 or 1219 mm fl and 1272 mm fl respectively (i.e. not much difference). Using the first formula, the 6" telescope (150mm diameter) at a magnification of 30 would give an exit pupil of 5mm. Using the same formula but with a 10" telescope (250 mm in diameter) and an exit pupil of 5mm gives a magnification of 50. So in larger aperture telescopes, that normally have lower focal ratios, you have to use higher magnification to get the same exit pupil size, provided the seeing (atmospheric steadiness) can support it.

So is it necessary to own colossal eyepieces that may be more expensive than your telescope? The answer is no, unless you can afford it. Good quality lower price eyepieces can work almost as well depending on what you're looking at and give you many hours of enjoyment without breaking your bank account. There are many amateur websites that explain the performance of many different types of eyepieces and two of them are www.cloudynights.com and www.scopereviews.com.

I hope I have answered most of the questions on eyepieces, so now you have a better idea of what will be the best eyepieces for your telescope as well as what you can afford. Getting the maximum performance out of one's telescope will extend your interest and your knowledge in astronomy.

Messier Objects - April

By Greg Cantrell (reproduced from a prior edition)

April is Messier Marathon season and offers another opportunity to attempt to find your way through the Virgo/Coma cluster of galaxies. The following excerpt from Robert Garfinkle's excellent book, *Star Hopping*, suggests a path through this challenging galaxy cluster.

"From Denebola, move about 6 degrees eastward to locate the whitish mag 5.1 star 6 Comae, a main sequence star of spectral type A2V. Edge on spiral galaxy **M98** should be visible in the same low power field to the north west. Face on **M99**, the Coma Pinwheel, is located about 1 degree east southeast of 6 Comae. Two 5th to 6th mag stars east northeast of 6 Comae point the way to the magnificent spiral **M100** – of which the amateur with a small scope will see the bright central region and fainter surroundings, perhaps with hints of the spiral arms. About 1.75 deg north of M100 is the double star 11 Comae (ADS 8521) of yellow spectral type G8 III and mag 4.8 which leads to S0 galaxy **M85** 1 degree northeast of it. **M88** and **M91** are found the easiest way from M99 as they have about the same declination. They are about 4 deg east of M99 in the same low power field together with NGC4571.

From Vindemiatrix, hop 1 deg north and 3.5 deg west to double star 34 Vir (mag 6.1 and 9.3, separated by 139.4 arc sec). About 1 deg southwest of it is **M60** with NGC4647. **M59** is in the same wide field eyepiece roughly 20' to the west northwest, and **M58** is just 1 degree from this one to the northwest. **M89** is roughly 1 deg to the west northwest, and from this it is about 0.75 deg north to **M90**. 1 deg southwest of from M90 and 0.75 deg west northwest of M89 is the famous bright **M87**, and another deg northwest is the **M84/M86** pair. 5 deg south and slightly west of M87 is **M49**. About 3 deg south southwest is double star 17 Vir (mag 6.6 yellow primary and mag 9.3 orange secondary at 20 arc sec to the north east), and a half degree south of this one is, finally, the face on spiral **M61**. This one, on the other hand, is almost exactly 5 deg north and slightly east of Eta Virginis, Zaniah."

(Maps of the Virgo super cluster are shown at the end of this newsletter)

Moon Phases

Apr 8 **Feb 16** **Feb 24** **May 1**

May 8 **May 16** **May 23** **May 30**

Utterly Alien

by Dr. Tony Phillips

There's a planet in our solar system so cold that in winter its nitrogen atmosphere freezes and falls to the ground. The empty sky becomes perfectly clear, jet-black even at noontime. You can see thousands of stars. Not one twinkles.

The brightest star in the sky is the Sun, so distant and tiny you could eclipse it with the head of a pin. There's a moon, too, so big you couldn't blot it out with your entire hand. Together, moonlight and sunshine cast a twilight glow across the icy landscape revealing . . . what? twisted spires, craggy mountains, frozen volcanoes?

No one knows, because no one has ever been to Pluto.

"Pluto is an alien world," says Alan Stern of the Southwest Research Institute in Colorado. "It's the only planet never visited or photographed by NASA space probes."

That's about to change. A robot-ship called New Horizons is scheduled to blast off for Pluto in January 2006. It's a long journey: More than 6 billion kilometers (about 3.7 billion miles). New Horizons won't arrive until 2015.

"I hope we get there before the atmosphere collapses," says Stern, the mission's principal investigator. Winter is coming, and while it's warm enough now for Pluto's air to float, it won't be for long. Imagine seeing a planet's atmosphere collapse. New Horizons might!

"This is a flyby mission," notes Stern. "Slowing the spacecraft down to orbit Pluto would burn more fuel than we can carry." New Horizons will glide past the planet furiously snapping pictures. "Our best images will resolve features the size of a house," Stern says.

The cameras will also target Pluto's moon, Charon. Charon is more than half the size of Pluto, and the two circle one another only 19,200 kilometers (12,000 miles) apart. (For comparison, the Moon is 382,400 kilometers [239,000 miles] from Earth.) No wonder some astronomers call the pair a "double planet."

Researchers believe that Pluto and Charon were created billions of years ago by some terrific impact, which split a bigger planet into two smaller ones. This idea is supported by the fact that Pluto and Charon spin on their sides like sibling worlds knocked askew.

Yet there are some curious differences: Pluto is bright; Charon is darker. Pluto is covered with frozen nitrogen; Charon by frozen water. Pluto has an atmosphere; Charon might not. "These are things we plan to investigate," says Stern.

Two worlds. So alike, yet so different. So utterly alien. Stay tuned for New Horizons.

Find out more about the New Horizons mission at pluto.jhuapl.edu/. Kids can learn amazing facts about Pluto at spaceplace.nasa.gov/en/kids/pluto.

New Horizons spacecraft will get a gravity assist from Jupiter on its long journey to Pluto-Charon. Credit: Southwest Research Institute (Dan Durda)/Johns Hopkins University Applied Physics Laboratory (Ken Moscati).

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

Are you a S*T*A*R Member?

S*T*A*R is a member of United Astronomy Clubs of New Jersey (UACNJ) and the International Dark Sky Association (IDA). Meetings are the first Thursday of each month, except July and August, at 8:00 PM at the King of Kings Lutheran Church, 250 Harmony Rd. in Middletown . Meeting generally consist of lectures and discussion by members or guest speakers on a variety of interesting astronomical topics.

Memberships: ( )Individual....$25
( ) Family...$35 ( ) Institutional $25

Name_____

Address_____

City_____State___Zip_____

Phone_____

Email_____

Make checks payable to: STAR Astronomy Society, Inc. and mail to P.O. Box 863, Red Bank, NJ 07701

April Celestial Events

By Randy Walton

Day	Date	Time (LMT)	Event
Fri	1	01:16	Moon Rise
		02:15	Saturn Sets
		03:10	Mars Rises
		05:25	Mercury Rises
		05:43	Sunrise
		18:24	Sunset
		18:25	Jupiter Rises
		18:26	Venus Sets
		19:50	Last Quarter Moon
Sun	3	02:00	Daylight Saving Time Begins
Fri	8	16:32	New Moon
		16:32	Annular-Total Solar Eclipse
Mon	11	20:00	Moon 1.3 deg. S of Pleiades
Sat	16	02:20	Saturn Sets
		02:44	Moon Sets
		03:45	Mars Rises
		05:30	Mercury Rises
		06:00	Jupiter Sets
		06:20	Sunrise
		10:37	First Quarter Moon
		19:40	Sunset
		20:00	Venus Sets
Fri	22	06:00	Lyrid meteors peak
Sun	24	06:06	Full Moon
		06:08	Moon Sets
Sat	30	01:15	Saturn Sets
		02:03	Moon Sets
		03:15	Mars Rises
		05:00	Jupiter Sets
		05:10	Mercury Rises
		06:20	Sunrise
		19:54	Sunset
		20:30	Venus Sets

Basic Telescope Information

By Randy Walton

Telescope Types (Most Common)

Refractor

This is a telescope that collects light through a lens system. Shape is generally long in length and thin in diameter. May have a diagonal mirror or prism to make usual viewing at the bottom easier. Generally best for bright objects (moon, planets), highest cost per inch of aperture.

Reflector

This is a telescope that collects light through a mirror system. Shape is generally long in length and wide in diameter. Viewing is usually at one side or the other near the top. Generally best for dim objects, lowest cost per inch of aperture.

Catadioptric or Compound

This is a telescope that collects light using a system of both lenses and mirrors. Shape is generally short in length and wide in diameter. May have a diagonal mirror or prism to make usual viewing at the bottom easier. Generally best for portability of long focal length telescopes.

Telescope Mount Types

Altazimuth

A telescope on an altazimuth mount moves up down (altitude) and left right (azimuth). This means that the telescope must be moved in two directions to follow a celestial object, to compensate for the Earth's rotation.

Equatorial

A telescope on an aligned equatorial mount moves in the celestial directions of north south and east west. This means that the telescope must be moved in one direction (to the west) to follow a celestial object, to compensate for the Earth's rotation.

Telescope Fundamentals

Purpose

All telescopes gather light and focus it to form an image. Different astronomical telescope designs make different price/performance compromises for: cost; suitability for type of object to be viewed; image brightness; useful magnification; field of view; portability; ease of setup; ease of tracking objects; and general ease of use.

Aperture (power)

This is the diameter of the main objective lens or mirror of the telescope. It is the most important thing about a telescope because it determines the light-gathering ability (dimmest object that can be seen), useful magnification and maximum resolving ability (finest detail in an image). This is generally marked on the scope in inches or millimeters (mm).

Focal Length

This is the distance from the objective lens or mirror of the telescope to the image that it forms. This is generally marked on the scope in millimeters (mm) or inches.

Focal Ratio or f/number

This is the focal length of the telescope divided by the aperture. Generally a "slow" scope (focal ratio greater then f/6) will give better high-magnification viewing, and a "fast" scope will be shorter and give easier wide-field viewing. This may be marked on the scope as f/ , or given in place of the focal length.

Focuser Diameter

This diameter gives the maximum barrel diameter of eyepieces or accessories that you can put in the focuser of the telescope. The common sizes are 0.965 inch (best eyepieces are no longer readily available in this size), 1.25 inch (today's standard), and 2.0 inch.

Finder

An auxiliary optical device connected to the telescope to help in aiming the telescope toward objects of interest. They are of two types; finder scopes which magnify and brighten objects, and unity finders which do not.

Useful Magnification

This is an objects maximum magnification before the image becomes useless (too dim and/or blurred). This is generally 2 times the aperture if measured in millimeters, or 50 times the aperture if measured in inches. Atmospheric conditions usually set a limit of 400x.

Eyepiece Fundamentals

Purpose

A device composed of lenses, placed in a telescope in order to magnify the telescope's focal point image. Different designs make price/performance compromises for: cost; image brightness; field of view; optical correction; focal length, threaded for filters, and eye relief.

Barrel Diameter

This is the outside diameter of the barrel of an eyepiece. The common sizes are 0.965 inch (best eyepieces are no longer readily available in this size), 1.25 inch (today's standard), and 2.0 inch.

Designs

Eyepieces are generally marked with their design by name or a letter, and their focal length in millimeters (mm).

Huygens (H), Ramsden (R), Kellner (K), and Rank-modified Kellner (RKE) are 2 or 3 lens element eyepieces. They are low-cost, least corrected, narrow field of view, have eye relief about 50% of their focal length, and useful only at low to medium magnification.

Orthoscopic (O), Plössl (P), and Super Plössl (SP) are 4 lens element eyepieces. They are better corrected, have eye relief about 75% of their focal length, and are the most popular because of the performance for cost value.

Erfle (E), Lanthanum, Axiom, Super Wide Angle (SWA), Panoptic, Ultra Wide Angle (UWA), Nagler, and any other colossal are 5 to 8 lens element eyepieces. They are the most costly, best-corrected, widest field of view, and may have special eye relief for their focal length.

Eye Relief

This is the distance from the outer most lens element of the eyepiece to the observer's eye when the entire field of view is seen at once. Longer eye relief is more comfortable up to about 30 mm when it starts to become more difficult to hold your head steadily while observing. To wear eyeglasses when observing, 20 mm of eye relief is recommended.

Field of View

This is the eyepiece's edge-to-edge angular field diameter. This determines how large a swath of sky will fit within an eyepiece's view for a given magnification.

Magnification

This is the increase of the image size as compared to the unaided eye. This is equal to the focal length of the telescope divided by the focal length of the eyepiece. The same eyepiece will have different magnification in telescopes of different focal lengths. Typically a magnification of 40x to 150x is used for most observing. Atmospheric conditions usually set an upper limit of 400x for any telescope.

Getting Started With Your Telescope

1. Practice assembly of the telescope, finder, mount, and support in a comfortable lighted place, so you will be able to do it in the dark outside.
2. Outside in the daylight align the telescope finder.
    a. Put the eyepiece with the longest focal length in the telescope and point the scope at a stationary object about 200 feet away, such as the top of a telephone pole.
    b. Focus and center the object in the eyepiece view.
    c. Note if the image is upside down or reversed left to right. You will need to remember this to move the telescope when you are observing a moving object.
    d. Adjust the finder to center the same object in its view.
    e. Using the finder point the scope at a stationary object 500, or more feet away.
    f. Focus and center the object in the telescope eyepiece view.
    g. Readjust the finder without moving the telescope to center the object in its view, if needed.
    h. From now on, try to store the telescope and finder connected together without changing the finder adjustment.
3. Practice observing the Moon, some bright stars, and planets outside your home. Learn how to use all the features of the telescope. Use this to help make a list of all the telescope parts, accessories, and tools (such as screw driver, red light flashlight, star atlas) you will want to take to your dark observing site.
4. When you get to your dark observing site:
    a. Dress for the weather; if cold you will find it is easier to stay warm then to get warm after being cold.
    b. Avoid looking at bright lights (even the full Moon) to get and keep your eye's dark adaptation (about 15 minutes after seeing a bright light).
    c. Setup the telescope and any other equipment you need.
    d. Use your red light to read your star maps. Select the object you want to observe.
    e. Use the telescope finder, setting circles, or any goto feature of the telescope to point the telescope at the object of interest.
    f. Generally start at low magnification (eyepiece with longest focal length) to observe.
    g. Change to higher magnification if needed.

h. Take your time to observe the object. For items like the Moon, planets, double stars, or dim objects the view may change every 10 to 30 seconds because of atmospheric conditions. You do not want to miss the color bands on Jupiter or Saturn, or the colors of double stars. For small features on the Moon or dim objects, they may come in and out of view as you observe. Also for dim objects, sometimes it helps to look to the side of the eyepiece view.

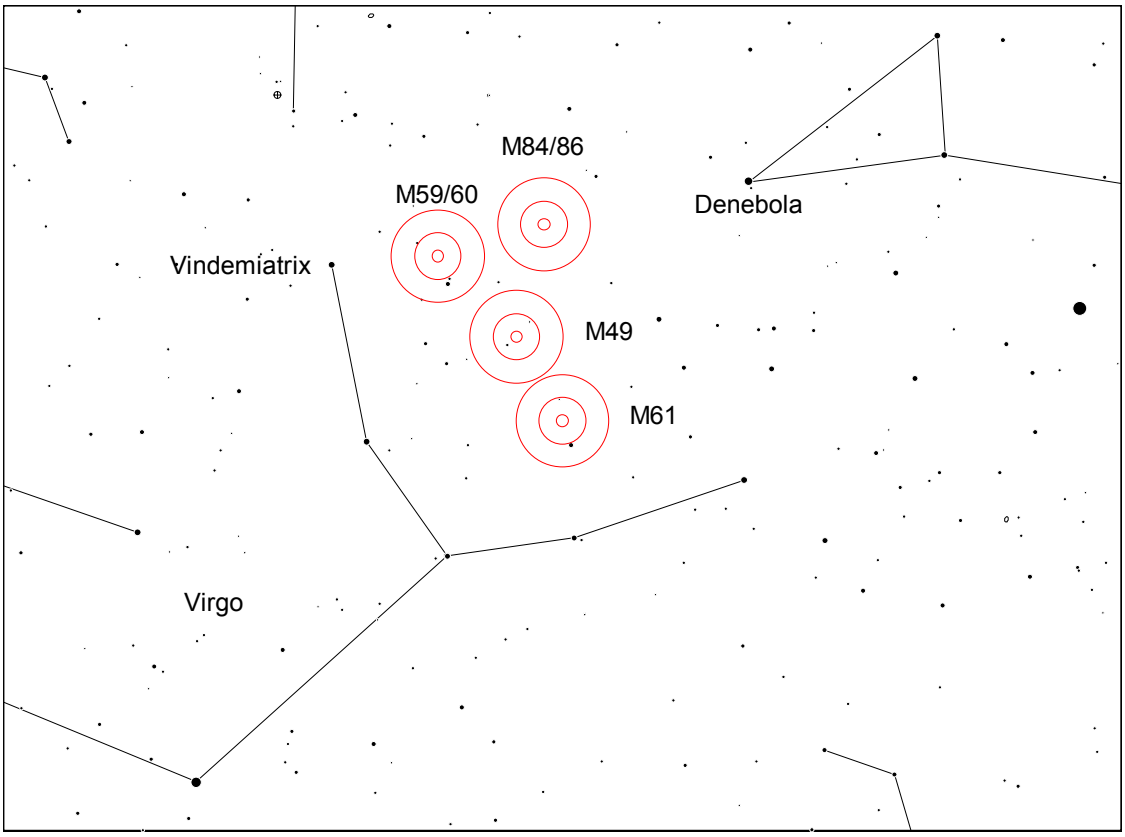
5. When you are getting ready to leave your observing site; check your list of telescope parts, accessories, and tools to be sure you packed every thing before leaving.

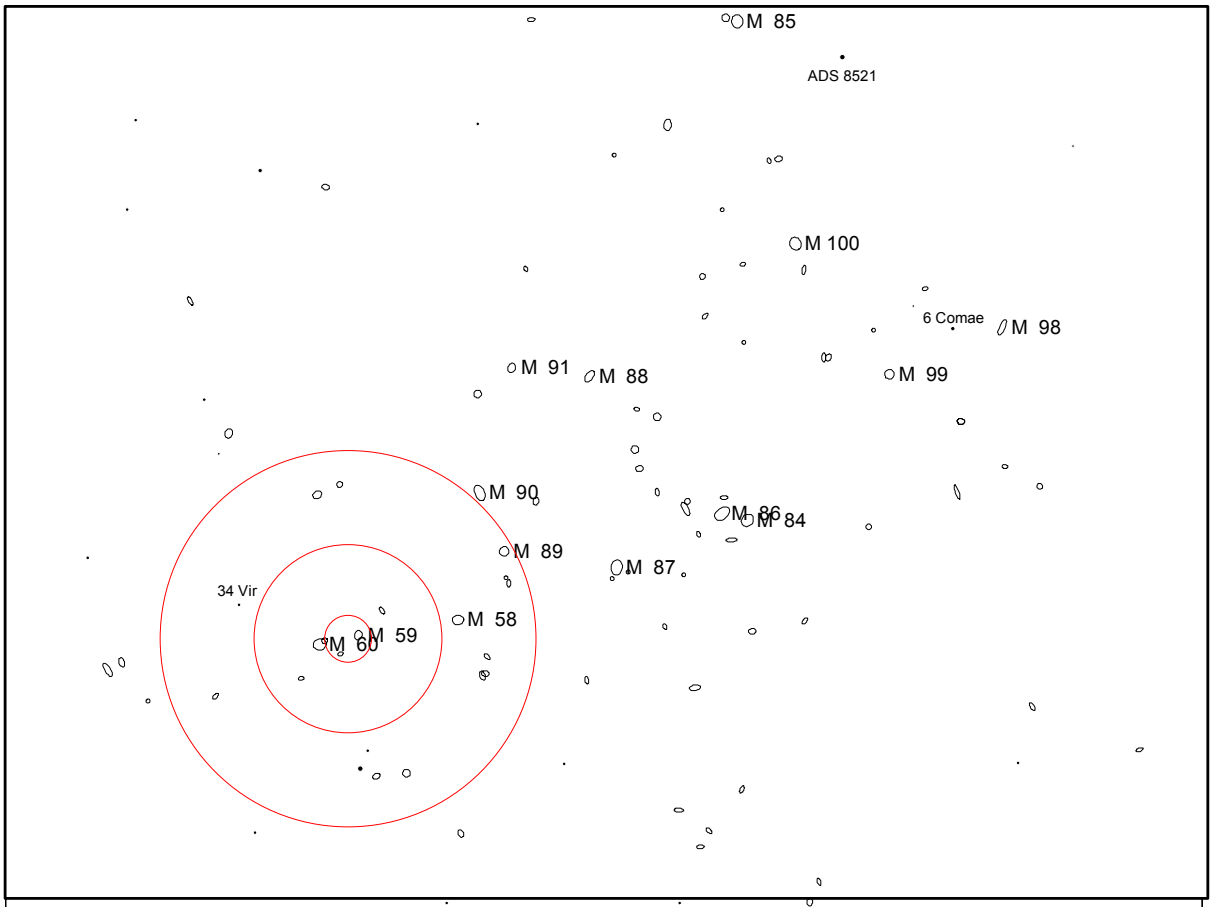
In the Eyepiece

If you are not worn out by all of April's Messier objects, here is a list of more objects for this month. This is reproduced from www.skyhound.com with the kind permission of its creator and author of SkyTools Greg Crinklaw.

Object(s)	Class	Con	RA	Dec	Mag
Y CVn	Variable Star	Canes Venatici	12h45m07.8s	+45°26'25"	4.9
Black Eye	Galaxy	Coma Berenices	12h56m43.9s	+21°41'00"	9.3
Sombrero	Galaxy	Virgo	12h39m59.3s	-11°37'22"	9.1
Focus On Downtown Virgo & the M87 Jet!	Galaxy Cluster	Virgo	12h26m12.2s	+12°56'45"	9+
M 106	Galaxy	Canes Venatici	12h18m57.5s	+47°18'14"	9.1
M 108	Galaxy	Ursa Major	11h11m31.3s	+55°40'31"	10.9
M65	Galaxy	Leo	11h18m55.8s	+13°05'32"	10.2
M 66	Galaxy	Leo	11h20m15.1s	+12°59'22"	9.6
Owl	Planetary Nebula	Ursa Major	11h14m46.1s	+55°01'07"	12.0
NGC 4631 (The Whale)	Galaxy	Canes Venatici	12h42m07.8s	+32°32'27"	9.7
NGC 4656	Galaxy	Canes Venatici	12h43m58.2s	+32°10'09"	11.4
NGC 4244	Galaxy	Canes Venatici	12h17m29.5s	+37°48'26"	10.8
NGC 4013	Galaxy	Ursa Major	11h58m31.5s	+43°56'51"	12.3
NGC 4762	Galaxy	Virgo	12h52m55.9s	+11°13'57"	11.3
NGC 4236	Galaxy	Draco	12h16m41.8s	+69°28'10"	10.1
Hickson 61	Galaxy Group	Coma Berenices	12h12m23.9s	+29°10'40"	11.1
NGC 3607	Galaxy	Leo	11h16m54.8s	+18°03'06"	10.9
Focus On Gliese 433.1	White Dwarf Star	Ursa Major	11h37m05.1s	+29°47'58"	12.5

Antennae/Ring Tail	Galaxy	Corvus	12h01m52.8s	-18°51'54"	10.9
NGC 4490	Galaxy	Canes Venatici	12h30m36.7s	+41°38'27"	10.1
NGC 4361	Planetary Nebula	Corvus	12h24m30.8s	-18°47'05"	10.3
NGC 4027	Galaxy	Corvus	11h59m30.1s	-19°16'05"	11.7
NGC 4094	Galaxy	Corvus	12h05m53.9s	-14°31'36"	12.7
NGC 4782 & 4783	Galaxy	Corvus	12h54m35.8s	-12°34'06"	12.4
NGC 4462	Galaxy	Corvus	12h29m21.2s	-23°09'59"	12.8
NGC 3987	Galaxy	Leo	11h57m20.9s	+25°11'42"	13.8
Siamese Twins	Interacting Galaxy Pair	Virgo	12h36m34.4s	+11°14'18"	11.7+12.1
NGC 3628	Galaxy	Leo	11h20m16.9s	+13°35'14"	10.3
NGC 4565	Galaxy	Coma Berenices	12h36m21.1s	+25°59'13"	10.6
Abell Galaxy Cluster 1631	Galaxy	Corvus	12h52m52.6s	-15°24'47"	13.3
Palomar 4	Globular Cluster	Leo	11h29m16.0s	-01°57'51"	14.2
Abell 35	Planetary Nebula	Hydra	12h53m34.2s	-22°52'17"	12.0

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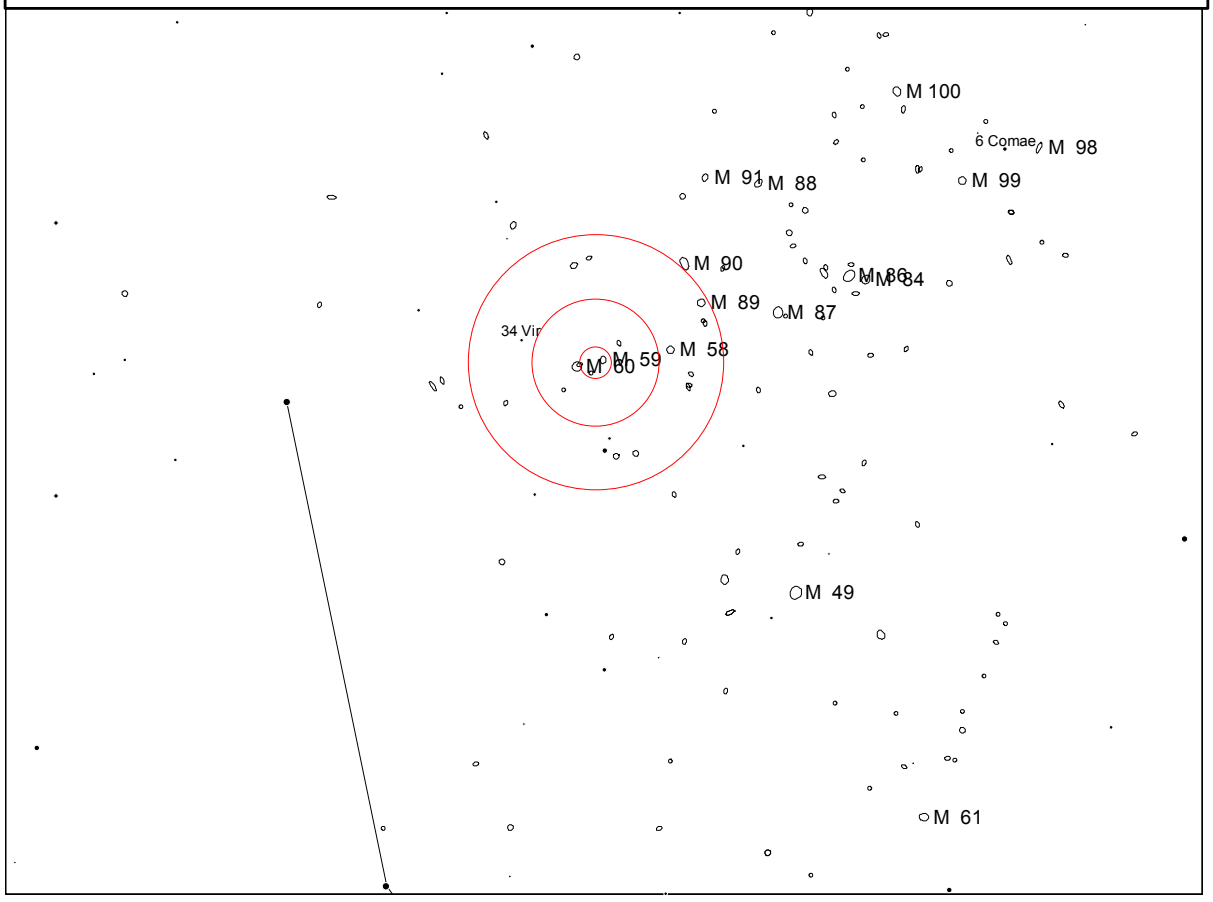
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