SJAA EPHEMERIS

SJAA Activities Calendar

Jim Van Nuland

April

1 Fremont Peak star party. Sunset 6:29 p.m., 8% moon rises 5:02 a.m.

2 DST start; advance clock by 1 hour at 2 a.m.

8 **Astronomy Day!** Observational Astronomy class, Houge Park, 8 p.m.

14 Houge Park star party. Sunset 7:42 p.m., 86% moon sets 5:13 a.m.

15 General Meeting. Swap/Auction at Houge Park, from Noon.

17 TAX day - Monday

23 Easter (school vacations before/ after)

28 Houge Park star party. Sunset 7:55 p.m., 28% moon rises 4:01 a.m.

29 Fremont Peak star party. Sunset 7:53 p.m., 19% moon rises 4:31 a.m.

30-May 7 Texas Star Party

May

6 Star parties at Fremont Peak and Henry Coe. Sunset 8:05 p.m., 13% moon sets 11:13 p.m.

12 Houge Park star party. Sunset 8:11 p.m., 58% moon set 3:18 a.m.

13 Observational Astronomy Class at Houge Park, 8 p.m.

20 General Meeting, Houge Park, 8 p.m.

26 Houge Park star party. Sunset 8:23 p.m., 58% moon rises 2:02 a.m.

27 Fremont Peak star party. 46% moon rises 2:34 a.m.

26-29 Riverside Telescope Makers Conference. www.rtmc-inc.org

Star Fingerprints

Jane Houston Jones

Whenever I take my Star Spectroscope out for a little stellar spin through the universe, I salute our trailblazing women scientists from the last century before I begin my observing session. Williamina Paton Fleming (1857-1911) led a team of women assistants who looked at thousands of individual spectrograms and classified each star in classes labeled A to N at Harvard College Observatory. Annie Jump Cannon (1863-1941) joined Harvard College Observatory in 1896 and classified 250,000 stars, and discovered the smooth consistent sequence from one classification to the next and rearranged the original alphabetical listing to the OBAFGKM - N arrangement used today. Be sure to read all the way to the end of this long report for the easy way to remember this classification order with a catchy well-worn phrase, which I have slightly updated to include our modern permissive societal mores as well as the new spectral subclassifications. No peeking ahead allowed! I think Williamina and Annie, were they alive today, would approve!

When a star is brought into the field of view through the spectroscope you see a beautiful spectrum with the colors of the rainbow spread out along its length — a chunky band of color five times longer in length than width. Depending on the spectral type and luminosity class of the star, you may see hydrogen lines cutting perpendicular across the spectrum, or many fine lines of metals (this is the fancy astronomers term for most elements that are not hydrogen and helium), or wide bands of molecules. Some are easy and some are difficult to see, depending on our usual variables such as magnitude, aperture, seeing and experience. The star spectroscope is a grating cell which screws onto the bottom of the eyepiece. It contains a glass blazed diffraction grating protected by a second glass disk. The lens cell provides spectrum widening auxiliary optics and is secured to the top of the eyepiece by nylon thumbscrews. Sometimes the spectrum is clearer without the lens cell. This instrument may be used to photograph spectra, and is particularly well adapted for use with SCTs.

Here are some of the stars I've

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Welcome to newest SJAA board member Gary Mitchell, wb6yru@aenet.com

24 Hour News and Information Hotline: (408) 559-1221
www.sjaa.net

Star Fingerprints

Continued from front page

observed and a description of their spectra. This is a fascinating observational project, and a nice change of pace. Spectral lines are formed by electrons jumping between different energy levels in the atoms in the star's outer layers. Enough electrons jumping between any two energy levels of a given element will result in a spectral emission or absorption line at a characteristic wavelength. Cool stars have fewer atomic collisions and have weaker absorption lines. Hot stars are hopping with frequent atomic collisions which prevent stable molecules, and thus prevent the dark molecular bands. My two word summary of this topic: fusion happens!

O stars — sorry, no hot hot blue stars of significant magnitude were visible or of a high enough magnitude for spectral detection these nights. The three Orion belt stars are O class, so we'll observe them later in the year. What we would see if we could is ionized helium and the hydrogen lines weak but still prominent.

B stars — Zeta Sco (Dschubba), Alpha Virginis (Spica), Alpha Sag (Nunki — chunky monkey — ok I'm writing this instead of having lunch!), Eta Uma (Alkaid), Beta Lib (Zuben Eschamali), Beta and Gamma Lyra. I wanted to do Gamma Sco (Shaula) but it was too low. The observatory side of Fremont Peak will be a better locale with that nice southern horizon! Neutral helium, with stronger hydrogen lines are present.

A stars — 4 hydrogen absorption lines (Balmer series Alpha to Delta) dominate in this class. Hydrogen beta and gamma are easy to see on both sides of the blue part. Alpha and Delta are harder to see in the red and violet part. Vega, being a hot main sequence star gives the strongest H Beta line in the blue green — a dark absorption line resulting from electron jumps from the second to fourth energy level of the neutral hydrogen atom — a.k.a. hydrogen beta. A thin magnesium line

The Star Spectroscope from Rainbow Optics installed on a 6" f/5 Newtonian.

in the green part is the most distinctive of the metals, harder to see are the H and K lines of calcium in the deep purple haze of the rainbow. Vega also shows water vapor (H2O) and oxygen (O2) molecular bands in the red end of the spectrum. Epsilon and Beta UMA (Alioth and Merak), Alpha Cyg (Deneb), Xi Uma (Mizar) Alpha Libra (Zuben El Genubi), Alpha Aqu (Altair) were also observed.

F stars — Gamma Cygni (Sadr) and Eta Sco were observed. The hydrogen lines are weaker by half of the A star strength. Heavy metals are stronger — particularly ionized calcium lines at the far far end of the purple and hard to see. Iron lines show at the green/yellow border of the spectrum. Star stuff is being created!

G stars — molecular G band, B magnesium triplet and D sodium doublet. Muphred and Nekkar (Eta and Beta Boo) were the G stars observed. Well, some of us observed the setting of our own G star. A few more of us witnessed magnificent sunrise of that same GV2 in the morning — our reward for staying up all night.

K stars — Hydrogen lines are almost gone. Calcium line is strong. Some of the metal lines are very prominent. That dark thick titanium oxide band in the red is beginning to show in this class. Arcturus, a.k.a. Alpha Boo, Beta Cyg (Albireo), Dubhe in UMA

M stars — wide black titanium oxide molecular bands — Antares, a.k.a. Alpha Sco, Alpha Herc (Ras Algethi was too dim in the spectroscope to identify lines) Sigma Libra, Delta Lyra, Delta Ophiuchus. Rare S type subclass stars show strong bands of zirconium oxide and lanthanum oxide instead. Think of the planets around an S star bathed in chemically peculiar stellar winds and encrusted with cubic zirconia gems.

C subclass (including N and R) are carbon stars. Gamma Canum Venaticorum, a.k.a. La Superba, was

Continued on next page

Loaner Program to Include Spectrograph

The SJAA loaner program will soon add a Rainbow optics Star Spectroscope to its arsenal of startools.

This nifty little gadget is easy and fun to use. The star spectroscope itself consists of two nicely machined parts: a blazed diffraction grating in a protective cell that spreads starlight into a spectrum of colors, and a lens cell that contains optics to widen that spectrum and make the dark absorption lines easier to see. The grating cell screws into the end of an 1.25 inch eyepiece just like a filter. (A medium power eyepiece generally works best, depending on the focal ratio of your scope.) The lens cell fits over the top of the eyepiece and is held in place by three nylon thumbscrews.

Using the spectroscope is easy. Simply screw in the diffraction grating and adjust the focus until the spectrum is as narrow as possible. Then slip the lens cell over the eyepiece and turn it to widen the band of colors. Refocus slightly to bring the absorption lines into sharp focus. It's that simple, although you may want to tinker around a bit to optimize your setup. (Complete instructions are included in the owner's manual.)

The spectroscope is slitless and thus does not work on extended objects such as nebulae. But it is helpful in identifying stellar planetaries and has been successfully used for CCD imaging.

You'll need to contact Mike Koop, the SJAA Loaner Program director (loaner@sjaa.net) for information about loans of the club star spectrograph.

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not superb in either the eyepiece or the spectroscope, try though we might, and believe me, we tried and tried — right Akkana??! 19 Piscium — I think we were looking for 19 Virginis instead — are you as confused as I was? These have masses of overlapping spectral lines blanketing the blue end of the spectrum. A carbon star's atmosphere is a red filter!

Wolf-Rayet stars V1770 Cyg at 7.47 was visually observed, but too dim for the spectroscope to pick up (this is the star in the Crescent Neb). Hot and blue, yet show strong emission lines of nitrogen, carbon and oxygen indicating a large thich shroud of hot gas surrounding the star.

The little updated phrase? Oh Be A Fine Guy (ok, or Girl), Kiss Me! Come-on! Now! Ready? Smooch!

Or in honor of Annie and Williamina: Only Boys Accepting Feminism Get Kissed Meaningfully. Take your pick! Oh, and I didn't make this up. It was published in ASP's Mercury magazine years back!

Rainbow Optics Star Spectroscope is available from: Rainbow Optics, Jim Badura 1593 E Street Hayward, CA 94541 (510) 581-8266

CEO Ed Erbeck of Crazy Ed Optical says "I'm crazy, not stupid!" SJAA wishes Ed our fondest farewells as he departs for the clear dark skies of Arizona.

Star Spectra in Orion

The constellation of Orion and its neighbors contain what is called the Winter Circle of Stars. Look on any star chart and find Orion, Canis Major, Canis Minor, Gemini, Auriga and Taurus, circling westward as winter ends. These six constellations contain a visible "circle" of very bright and colorful stars. If you can imagine the circle as a clock, we'll begin with Capella, yellow like our sun in the one o'clock position. Capella is the bright yellow star in the constellation Auriga, found above the shoulders of Orion. Red Aldebaran, the eye of the bull Taurus is at the three o'clock position. Red stars are the oldest and coolest. At five o'clock, stands Rigel, the brilliant blue knee of Orion, the hunter. Rigel is young and very hot! Diamond white Sirius, the brightest star in the sky, is below Orion in the constellation Canis Major, the great dog. It fills the seven o'clock position. At nine o'clock is Procyon, another yellow star like our sun, in the constellation Canis Minor. The Gemini Twins, Castor and Pollux complete the circle at eleven o'clock. Castor is white and Pollux (the brighter of the twins) is red. Within the circle are red Betelgeuse, the shoulder of Orion, and blue/purple stars Alnitak and Mintaka, the pretty belt stars of the constellation Orion.

Through a spectroscope these stars give away many secrets. The observer sees the color spread out in a bar shaped spectrograph. The bar is broken into the colors of the rainbow, purple at one end and moving through the spectrum of blue, green, yellow, orange and red. The observer can take the temperature of the star, and tell you its age from the information on the spectrogram! Bars of shadow called absorption lines and bars of concentrated illumination called emission lines are the main indicators of age and temperature.

That's a pretty interesting observation to share at a star party!

Mooning

Dark Side Of The Moon

Dave North

We're always talking about the terminator (where light meets dark) with an eye toward what's on the lit side. And that would be perfectly normal this month, when the first quarter Moon is highest for the year.

So look at the first quarter Moon! Start around the 7th and pay special attention over the next week.

But while you're looking, don't forget there's another side to the Moon... and that should be particularly obvious in the days before full.

Usually, however, the dark side isn't dark.

Since the Moon will be riding high, you'll be able to see the most commonly known (and beautiful) of the dark side phenomena: earthshine.

Earthshine is at its best right at newmoon, but you generally can't see it then.

That's when the unlit portion of the Moon is visible as a ghost image, due sunlight reflecting off us (primarily the clouds).

The notso-darkside.

Earthshine is at its best right at new moon, but unfortunately you generally can't see it then because of the glare of the sun. So the best date in any lunation is a factor of elevation, elongation and atmospheric conditions on the other side of the planet (and this side too) ... which means I can't say which day will be best. Just look!

Okay, what's next?

When there is a substantial dark side, whether there's earthshine or not, you'll still be able to make out some features.

If the east is lit, look especially for Aristarchus: the brightest spot on the moon. Even when there is only the slightest light, you can often spot it.

On the other hand, when earthshine is strong on the west, you'll find Grimaldi obvious as a dark spot.

Sometimes you can see slight rays from Tycho, and usually the larger maria can be made out, contrasted against the softly brighter highlands.

But what if the dark side really is so dark you can't see it?

That usually means it's small, and the bright side is washing it out. But there will still (usually) be something to see "over the terminator."

High spots.

In fact, some of the most spectacular views of the moon require a high feature on the far side of the terminator, barely lit by grazing sunlight.

You can see distended "horns" at the tips of the moon now and then, or more typically a mountain or the rim of a crater just off the terminator, making a dot or smile in the darkness.

And not to be missed is the every-other-month Sinus Iridum hanging off the edge: its rim is tall enough that it becomes a huge semicircle cutting into the darkside, with an amazingly complex floor drifting off into night.

There are, of course, other things to see on the Dark Side Of The Moon, and if you take some time to look at it, you'll find 'em.

Oh, and there is one bright-side thing I'd like to mention (other than — to repeat — the wonderful first quarter views we might get). On the 17th, the eastern limb (Crisium) will be strongly liberated toward us, just before full moon.

This is a good opportunity to see the eastern Maria. Not much rim wall detail will be visible, as the light will be too high. But the contrast of light to dark should be fairly good, so the maria will stand out nicely.

The next night (if my numbers are right) the terminator will be slightly on the area you were looking at, and you might get a look at some very amazing rim walls: this should be a fascinating comparison with the view the night before.

Meteors

The Lurid Lyrids of April and Other Showers

Jane Houston Jones

Duration - April 16-25
Maximum - April 21-22
Hourly Rate 10*
Radiant RA=18.1 hours DECL=+33 degrees
*On several occasions this stream will unexpectedly produce hourly rates of over 100 meteors per hour.
Solar Longitude at Maximum 32.1 degrees
Atmospheric Velocity 49km per second
Average Magnitude 2.4
Persistent Trains 15%
Radiant Drift RA =+1.1 DECL=0 deg.

The point from where the Lyrid meteors appear to radiate is located east of the constellation Lyra and is referred to as the radiant.

The Lyrids are visible through most of the night, with the radiant rising around 9 p.m. (local time). This year, a bright 85-90% moon just past full will illuminate the sky. Not the best meteor observing conditions, unfortunately. The radiant is located high in the morning sky around 4:00 a.m., with an altitude of about 75 degrees. The chart shows Cygnus and Lyra and the bright stars Altair, Lyra and Deneb, our herald of the summer yet to come. Although Cygnus is the more prominent and well-known of the two constellations, Lyra contains the bright star Vega, which outshines all other stars in that area of the sky.

To best observe the Lyrids wear appropriate clothing for the weather and lay outside in a reclining lawn chair for best, comfortable viewing. Late in the evening it would be best to lay with your feet pointing towards the east and look straight up. During the morning hours, as the radiant gets higher, you could point your feet towards the north, west, or south and adjust your line of sight to about 50 to 60 degrees above the horizon. It is generally not advised to look directly at the radiant, because

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meteors will not move much and fainter ones might be missed.

When you see a meteor mentally trace it backwards and if you arrive near Lyra it is probably a Lyrid. Meteor observing is great fun in groups. Try arranging a group of lawn chairs and have each observer observe a different quadrant of the sky. This will be great practice for the Perseid Shower in August.

Minor April Shower Activity

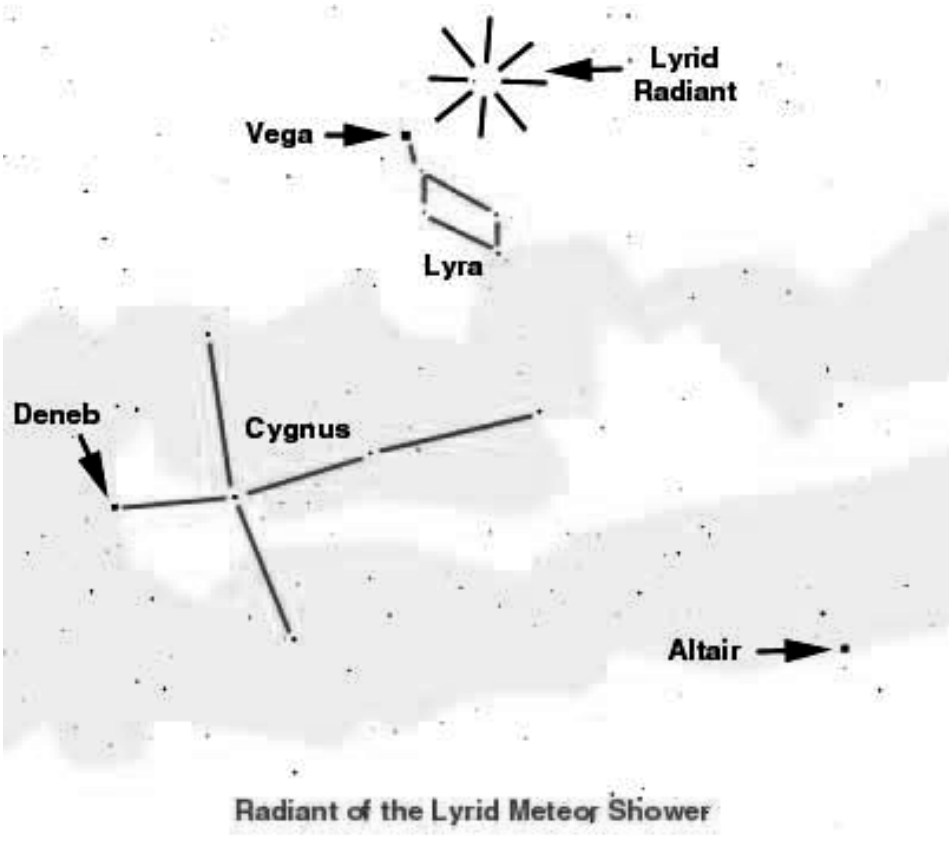
Radiant	Duration	Maximum
Tau Draconids		
	Mar 13-Apr 17	Mar. 31-Apr. 2
Librids		
	Mar 11-May 5	Apr. 17/18
Delta Pavonids		
	Mar 21-Apr 8	Apr. 5/6
Pi Puppids (PPU)		
	April 18-25	Apr. 23/24

The duration of this shower extends from April 18 to April 25. The short-duration maximum occurs during April 23-24, from a radiant of RA=112 deg, DECL=-43 deg. The shower is associated with the periodic comet Grigg-Skjellerup. Although this comet was officially discovered in 1902, it was only recently perturbed by Jupiter into a close-approach orbit with Earth. Activity was first noted in 1972, and visual hourly rates of 18 to 42 meteors per hour were noted during the comet's perihelion returns of 1977 and 1982. Activity levels are typically very low or nonexistent in other years.

April Ursids		
	Mar 18-May 9	Apr 19/20
Alpha Virginids		
	Mar 10-May 6	Apr 7-18

Typical of streams lying near the ecliptic, the Alpha Virginids show evidence of a long duration—spanning from March 10 to May 6—and a diffuse radiant. Maximum hourly rates typically reach between 5 and 10 during April 7 to 18, with the average radiant being RA=204 deg, DECL=-11 deg. The meteors are generally slow.

April Virginids		
	April 1-16	Apr. 7/8
Gamma Virginids		
	April 5-21	Apr. 14/15



Radiant of the Lyrid Meteor Shower

Image produced by Gary Kronk using Starry Night 2.0 and Adobe Photoshop 5.0. It represents the view from mid-northern latitudes at about 4:30 a.m. local time around April 23.

Shallow Sky

Uranus Jokes Banned

Akkana Peck

April is a slow time for planet watchers.

Jupiter, at magnitude -3, is in Aries, low in the western sky at sunset. I don't predict any good double shadow transits this month, but it's always fun to get a look at the giant and watch the galilean ballet. Saturn, fainter at magnitude .36, follows Jupiter by about twenty minutes.

Uranus is magnitude 5.84, right next to the 4th magnitude star theta Capricorni. It rises in late evening and is observable the rest of the night. Eighth magnitude Neptune is nearby, rising about half an hour earlier. Pluto is too close to the sun for this tiny 14th magnitude planet to be observable this month.

Venus is in Ophiuchus, in the evening sky and setting around midnight PDT. The magnitude -3.5 planet's phase goes from gibbous to slightly crescent during the month of April.

Earth is in Libra, too near the sun right now to be readily observable. But dedicated Earth-watchers can content themselves with watching the antics of our two moons, Phobos and Deimos, from our lovely red planet on this April 1st.

Comet Comments for April 2000

Don Machholz

Images from the solar-observing SOHO satellite have been searched for comets recently, yielding many comets. The LINEAR and the CATALINA programs found a few comets too. Meanwhile, Comet LINEAR (1999 S4) is at magnitude 13, if it stays on this magnitude curve it should reach the brightness of the Andromeda Galaxy in July.

SOHO images five comets during Feb. 3-9. Three more were found a few weeks later. Searching through the SOHO archives brought out ten more comets. These 18 comets were found by T. Lovejoy, D. Biesecker, M Meyer, M. Oates, D. Lewis, K Cernis, M. Boschet, T. Harincar, D. Lewis and K. Schenk. Discoverers who found these comets on these SOHO images do not get their name on the comets, nor are they eligible for the Wilson Comet award since they were not using amateur equipment.

The LINEAR and CATALINA search programs found four comets, all of them were first thought to be asteroids until further investigation found they were tiny comets. Three showed tails from 10 to 16 arcseconds. One was declared a comet based upon it showing a "soft" image, "slightly larger than star images" through a 72-inch telescope with a CCD. Many LINEAR comets are first thought to be asteroids.

Comet Hunting Notes: Unlike the LINEAR comets, visually-found comets show a definite size. The average comet found visually by amateurs is about three arcminutes in size. They range from two to ten arcminutes.

Don Machholz, (530) 346-8963,
DonM353259@aol.com

Dr. Jeff Moore (left) receives congratulations from SJAA President Dave North after his February meeting presentation on the latest stunning results from the Galileo spacecraft in the Jovian moon system, and the latest information on the failure of Mars Polar Lander.

Celestial Calendar April 2000

Richard Stanton

Lunar Phases:		Date	Rise	Trans	Set
NM	11:12 PDT	04	06:09	12:23	18:45
FQ	06:30 PDT	11	12:31	19:54	02:19
FM	10:42 PDT	18	19:57	00:57	06:50
LQ	12:30 PDT	26	02:10	07:15	12:24

Nearer Planets:				R.A.	Dec.
Mercury, 1.16 A.U., Mag. -1.9					
07	05:51	11:39	17:27	23:33.7	-05:26
17	05:48	11:55	18:02	00:28.7	+00:21
27	05:50	12:20	18:52	01:33.1	+07:47
Venus, 1.65 A.U., Mag. -3.9					
07	06:08	12:09	18:11	00:04.7	-01:07
17	05:59	12:15	18:32	00:50.0	+03:45
27	05:50	12:21	18:54	01:35.7	+08:31
Mars, 2.39 A.U., Mag. +1.3					
07	07:45	14:38	21:32	02:34.5	+15:18
17	07:26	14:27	21:29	05:03.1	+17:31
27	07:08	14:17	21:26	03:31.9	+19:27
Jupiter, 5.94 A.U., Mag. -2.0					
07	07:47	14:36	21:25	02:33.9	+14:09
17	07:15	14:06	20:58	02:43.0	+14:52
27	06:42	13:36	20:30	02:52.3	+15:35
Saturn, 10.0 A.U., Mag. +1.0					
07	08:09	15:00	21:51	02:57.6	+14:44
17	07:33	14:25	21:27	03:02.4	+15:06
27	06:58	13:51	20:44	03:07.4	+15:28

SOL Star Type G2V Intelligent Life in System ?

					H ours of Darkness	
08:04	07	06:42	13:10	19:38	01:05.5	+06:58
07:34	17	06:28	13:07	19:47	01:42.4	+10:36
07:05	27	06:15	13:05	19:56	02:19.9	+13:57

Astronomical Twilight:

		Begin	End
JD 2,451,641	07	05:12	21:08
651	17	04:55	21:20
661	27	04:38	21:33

Sidereal Time:
Transit Right 07 00:00 = 11:55
Ascension at 17 00:00 = 12:35
Local Midnit 27 00:00 = 13:14

Darkest Saturday Night: 29-April-2000
Sunset 19:58
Twilight End 21:36
Moon Rise 04:01
Dawn Begin 04:35
Hours Dark 06:59

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SJAA Loaner Scope Status

All scopes are available to any SJAA member; contact Mike Koop by email (loaner@sjaa.net) or by phone at work (408) 473-6315 or home (408) 446-0310 (Leave Message).

Available Scopes

These are scopes that are available for immediate loan, stored at other SJAA members homes. If you are interested in borrowing one of these scopes, please contact Mike Koop for a scope pick up at any of the listed SJAA events.

# Scope	Description	Stored by
7	12.5" Dobson	Jeff Crilly
8	14" Dobson	Darryl Lambert
19	6" Newt/P Mount	Dean Sala
23	6" Newt/P Mount	Glenn Yamasaki
24	60mm Refractor	Michael D. Turner
30	7" f/9 Newt/Pipe Mount	Mike Koop
31	8" f/8 Dobson	Lee Barford

Scope Loans

These are scopes that have been recently loaned out. If you are interested in borrowing one of these scopes, you will be placed on the waiting list till the scope becomes available after the due date.

# Scope	Description	Borrower	Due Date
1	4.5" Newt/ P Mount	Esme Wong	3/23/00
3	4" Quantum S/C	Al Kestler	5/12/00
6	8" Celestron S/C	Richard Burks	3/18/00
15	8" Dobson	Gary Strawn	3/17/00
26	11" Dobson	John Templeton	4/14/00
27	13" Dobson	Steve Sergeant	5/12/00
29	C8, Astrophotography	Doug Hendricks	5/3/00
32	6" f/7 Dobson	Rob Dewis	3/18/00

Extended Scope Loans

These are scopes that have had their loan period extended. If you are interested in borrowing one of these scopes, we will contact the current borrower and try to work out a reasonable transfer time for both parties.

# Scope	Description	Borrower	Due Date
2	6" f/9 Dob	John Paul De Silva	?
9	C-11 Compustar	Paul Barton	Indefinite
16	Solar Scope	Michael D. Turner	5/20/00
18	8" Newt/ P Mount	Dave North	Repair
21	10" Dobson	Ralph Seguin	Repair
28	13" Dobson	Bruce Horton	5/14/00

Waiting List

6	8" Celestron S/C	Al Kestler
8	14" Dobson	Gary Strawn
32	6" f/7 Dobson	Gordon A McClellan

Notes:

Do you have some space to store a scope or two? Please email or call me. Thanks!

Submit

Members are encouraged to submit articles for publication in the SJAA Ephemeris. Send articles to the editors via e-mail to ephemeris@sjaa.net.

To subscribe to or unsubscribe from the SJAA Mailing List send email to
sjaa-request@sjaa.net
with a blank subject line followed by a single text line that says "subscribe" or "unsubscribe"

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Make checks payable to "SJAA"

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