

EPHEMERIS

Vol. 2 No. 5

Official Publication of the San Jose Astronomical Association

JUNE, 1990

FIELD OF VIEW

-JOHN GLEASON

By all reports, the 10th annual Bay-Area Auction was a resounding success. Many hundreds of items found new owners and the SJAA proceeds were about \$850. That should certainly cover the costs of this month's bulletin!

The swap meet was also very successful. I talked to a few of the sellers who indicated that sales were brisk. About 150 people attended both the swap and the auction, with a good time had by all. Special thanks to everyone who helped. By the way....if you missed this years auction, don't fret. Most of the items will probably reappear next year! Didn't I see that same 4-inch fluorite refractor there last year? My wallet twitched briefly!

Comet Austin continues to fade from the media hype it received in the months prior to its rounding of the Sun into the morning sky. My most recent observations with 7 X 50 binoculars and 5-inch refractor revealed a 4.5 magnitude condensed coma with a 2 to 3 degree tail. This observation was made from Fremont Peak one very clear morning.

At this month's General Meeting, we are pleased to have Dr. Dale Kruichshank speak on meteors and near-Earth asteroids. I highly suggest reading David Morrison's article entitled "Target Earth: It Will Happen" in the March 1990 *Sky & Telescope* prior to the June 2nd event.

Don't forget that there are two star parties scheduled this month. On June 16, the SJAA and the Halls Valley Group will host a joint event in Grant Ranch Park. Please contact Tom Ahl for more details. On June 23, the SJAA moves to Henry Coe State Park for its annual summer Milky Way observing festival.

Jim Van Nuland reminds me to ask everyone going to Yosemite in July to contact him if you make any last minute changes to your attendance plans. This will help out those who are on the standby list.

To all members, please read the article from Del Johnson this month about the Lockheed offer of two very large "professional" telescope mountings. The SJAA board has mulled over a number of suggested proposals for the telescope mounts which are available to us as long as a proposal is submitted and accepted by Lockheed. The Hall's Valley Group has shown an interest in a joint venture with the SJAA in establishing an observatory at Grant Ranch Park. This would be perfect for club activities.

The eye's have it! There are two very interesting articles in this month's Ephemeris concerning our most important visual observing system - the ol' Mk. 1 eyeball. Paul Summers describes his experience with Orthokeratology, a new way to surgically treat the cornea to reduce myopia and astigmatism. In another article, Stephen Waldee writes about the eye's ability to view dim celestial objects.

Finally, there is a brief report on an astrophotography breakthrough that is certain to change the life of every amateur astrophotographer forever.

For your information I have begun listing our contributors names and telephone numbers in the same box that lists our officers and board members. Readers who have questions or need more information are encouraged to give the writer a call.

MEMBERSHIP RENEWALS

Members who receive *Sky & Telescope* as part of their SJAA membership are already receiving magazine renewal notices. Please use the handy membership application on the back of the Ephemeris to renew your membership and mail it to Jack Peterson our Treasurer. The same goes for those of you who are membership only. It is best to get your renewals in early, as you don't want to miss future exciting issues of your favorite monthly newsletter. Where else can you read about bones being found on the Moon! (Other than the supermarket check-out that is.)

ANNUAL PICNIC

The Annual Picnic and Installation of Officers will be held July 7 at Grant Ranch County Park, 1:00 pm to dark, in the Rose Garden picnic area. Burgers and dogs will be provided; bring dessert, table ware, and a Frisbee. Since there's a full Moon, a star party is not planned. Sun telescopes are welcome during the day! Please contact Tom Ahl for more information.

BRANHAM LANE EVENTS

Don't forget that the SJAA is holding public star parties on the following Fridays. Here are the upcoming dates: June 1, June 29, July 27,

JUNE 2ND
DR. DALE KRUICHSHANK
METEORS AND NEAR
EARTH ASTEROIDS
8 PM

JUNE 1: (FRIDAY) PUBLIC STAR PARTY AT
BRANHAM LANE PARK. STARTS AT DUSK

JUNE 2: GENERAL MEETING, 8 PM
DR. DALE KRUICHSHANK - "METEORS
AND NEAR-EARTH ASTEROIDS"

JUNE 9: SJAA BOARD MEETING AT THE
RED CROSS, 6:30 PM, FOLLOWED BY THE
INTRODUCTORY ASTRONOMY CLASS AT
8 PM.

JUNE 16: SJAA/HVG STAR PARTY AND
ASTRO CLASS AT GRANT RANCH PARK.

JUNE 23: SJAA STAR PARTY AT HENRY
COE STATE PARK. DUSK TILL DAWN!

JUNE 29: BRANHAM LANE PUBLIC STAR
PARTY. STARTS AT DUSK

JULY 7: SJAA ANNUAL PICNIC AT GRANT
RANCH COUNTY PARK. 1:00 PM TO DARK.
IN THE ROSE GARDEN PICNIC AREA.

JULY 14: BOARD MEETING AT THE RED
CROSS, 6:30 PM, FOLLOWED BY THE
INTRODUCTORY ASTRONOMY CLASS
AT 8 PM.

JULY 20 - 21: SJAA WEEKEND AT
YOSEMITE NATIONAL PARK, WITH
OBSERVING AT GLACIER POINT.

JULY 21: SJAA STAR PARTY AT GRANT
RANCH, A PUBLIC STAR PARTY AND ALSO
PART OF THE ASTRONOMY CLASS.

August 31, September 28, October 26, December 28. Bring a telescope and tell your friends. For more information please contact Tom Ahl or Jim Van Nuland. Their telephone numbers are listed elsewhere in this issue.

ORTHOKERATOLOGY: HOPE FOR THE ASTIGMATIC ASTRONOMER

- PAUL M. SUMMERS

No, it's not a new kind of eyepiece. Orthokeratology is a treatment of the cornea that can significantly reduce myopia and astigmatism.

Orthokeratology, or OK for short, uses a new design of rigid contact lens that applies pressure to the cornea and reshapes it without the use of surgery. The person undergoing this treatment simply wears the contact lenses in the normal way, and the corneas slowly take on a modified shape. Due to this new shape, the cornea functions better as a corrective lens, so that the person's uncorrected vision improves.

As the corneas change, the person may require new lenses to fit the new corneal curvature. The person's vision slowly improves as the amount of reshaping increases, until satisfactory vision has been achieved, and no new lenses are needed. Throughout this process the person will have well corrected vision while wearing the lenses. At the end of the process, the goal is to achieve good or even perfect uncorrected vision. The person will then not need to wear the lenses continuously. The wearing schedule can be reduced, with the lenses acting to hold the corneas in shape similar to the way an orthodontal retainer keeps a person's teeth from shifting once they have been moved into place.

Due to the nature of this treatment, it can only apply pressure to flatten the cornea. This will correct myopia, or nearsightedness, but it can not correct hyperopia, or farsightedness. As a side-effect, it also reduces astigmatism, which is an aspherical aberration of the eye. This is not usually mentioned as an effect of the treatment, but the results of treatment on many people show significant improvement in this area.

I first learned about OK in a newsletter from my eye clinic, Ross, Wan, and Taylor of Campbell. This clinic was offering it as a new treatment to certain patients who fit a particular profile. They had to be able to wear rigid contact lenses, and be myopic without too much astigmatism. The newsletter described OK as a treatment for reducing myopia, and in a final paragraph it also mentioned that it might improve astigmatism.

As both a myopic and astigmatic astronomer, I read that last sentence with great interest. Myopia and presbyopia can be corrected quite easily while observing with small adjustment to the focus knob. In extreme cases the collimation of some telescopes can be adversely affected by large changes in focus, but the myopic and demanding astronomer will correct the telescope's collimation for the required range of focus.

Unfortunately, there is no quick fix for astigmatism. It can only be corrected optically, by compensating for the aspherical aberration of the observer's personal optics (i.e. the observing eye) with an aspheric lens somewhere in the optical path of the telescope, most commonly in the form of eyeglasses. Eyeglasses have their own problems in observing, especially when using eyepieces with short eye relief. I have scratched my glasses on at least one occasion when trying to get close enough to a short focal length orthoscopic eyepiece.

Fortunately, my observing eye is my right eye, having both less myopia and astigmatism. The myopia was never a real problem during observing, except that I always had to keep track of where my glasses were so that I could see the stars naked eye and avoid tripping over things. The astigmatism, however, was significant enough to turn bright stars in the field of view into streaks of light rather than sharp pinpoints. I had pretty much resigned myself to the idea that this was how it would always be for me. I can't observe for any length of time while wearing my contact lenses (dryness and eye fatigue), and I can't get close enough to the eyepiece at high power with my glasses on. I began undergoing OK treatment in November, 1989.

My eyes responded very quickly to the OK lenses. After the first day of wear, I was astounded by the improvement in my vision when I took them off. I took a standard size eyechart and hung it on the far wall of my bedroom, and kept a log of the improvement. My right eye responded faster than the left due to not needing as much correction. I did require a second lens for the right eye. It actually over corrected and went a little farsighted within the span of one week between visits to the clinic. With the new lens it settled down to 20/20 within a few days. The left eye took a little longer, on the order of three weeks, but it too achieved 20/20 vision with the lens on.

The left eye is slightly worse than 20/20, the right is slightly better. I have actually retained a small amount of astigmatism in the right eye, but it is not enough to correct.

My optometrist, Dr. Ross, has explained to

me that the reason for my eyes responding so quickly to the OK lenses was that my corneas are relatively thin. This made the effect of the treatment so dramatic to me, but it also meant that my eyes won't stay at 20/20 as long without the lenses compared to a person with thicker corneas. A typical person with thick corneas who doesn't spend much time doing things which promote eyestrain (e.g. reading or staring at a computer screen for hours) can expect good vision for several days without the lenses. In my case, I have near perfect vision in my right eye for up to a day after I take out the lens, and for about eight hours in my left eye.

My wearing schedule for my OK lenses is just like my schedule was for regular lenses. I put them on in the morning, take them off as needed during the day, then take them off just before bedtime. During the day I take them off when I go swimming at the local YMCA. This is when the magic begins. I can now read the clock on the far side of the pool without having to ask someone what time it is. I can recognize my friends across the pool rather than having them come up to me and accuse me of avoiding them.

The real magic happens on the days when I plan to do some observing in the evening. I take the lenses off an hour or so before I start observing. By the time I'm set up, my observing eye is nicely rested and ready to go. Both of my eyes will last out an entire night of observing, especially on the short summer nights. The left eye starts to "fuzz out" a bit after four or five hours, but it never goes much worse than about 20/80, even when the lenses have been out for up to twenty-four hours.

The remaining astigmatism in my observing eye (right) is small enough that I don't notice it at all at medium to high powers (up to 3.2mm exit pupil). With a 5.5mm exit pupil, I still notice some flaring on bright stars, but it is significantly better than before I underwent the OK treatment. I don't have any eyepieces that produce an exit pupil between 3.2mm and 5.5mm, so I can't say exactly where I start to notice the astigmatism again. I might also add that my corneas are somewhat larger than normal (my pupils will dilate to somewhere between 7.5 and 8mm). This means that when my eyes are night adapted, more light will be entering my eyes from the edges of my corneas which are not as well corrected by the OK treatment as the centers.

All in all, I'm quite satisfied with the results of the treatment. I wasn't looking for miracles, I was just hoping for a noticeable improvement. I wasn't disappointed.

THE EYE AND ITS ABILITY TO VIEW DIM CELESTIAL OBJECTS

- PART ONE

© 1990 - STEPHEN R. WALDEE

Today's professional astronomers sit in comfortable control rooms watching brightly-lit television screens under ordinary indoor ambient light, as megabytes of data are collected from ultrasensitive CCDs and photometers connected to telescopes that may be located on another continent! Yet amateur visible observers or astrophotographers must work under the conditions of traditional astronomers of the pre-electronic age, training their eyesight to operate at the very limits of acuity to be able to glimpse the dim images in their oculars or gazing eyepieces.

The beginning astronomer often marvels at the ability of the experienced observer who can discern a 12th magnitude galaxy or diffuse comet; to the neophyte the field of view may be utterly blank, while the veteran perceives light and structure.

Simply employing a big, fast telescope with short focal ratio, like a giant Dobsonian, will not guarantee success. For as Al Nagler explained to me while demonstrating his small refractors, it is not absolute light level but contrast that enables your eye and brain to discern images within the limiting magnitude of your instruments. Thus, virtually all of the Messier objects, and countless hundreds of NGC items, may be spotted in very small aperture optics even in environs only a few miles outside of the San Jose area. Dark adaptation is one of the keys to maximizing viewing efficiency.

Sir William Herschel and his son John were the first great systematic deep-sky observers in the generations after the comet-hunter Charles Messier. While the Frenchman recorded galaxies and nebulae to keep from mistaking them from new comets, the Herschels were out to discover anything their eye and powerful reflectors could detect; they found thousands of new objects from the 1780s to the 1830s. William Herschel's great 40 foot reflector, made from a polished 48-inch diameter disc of "speculum" metal alloy, was capable of about 66% efficiency, if used without a secondary reflecting mirror in the so-called "Herschelian" mode of operation; thus, it probably gave visual performance comparable to a modern 42-inch aluminized mirror, assuming a typical 88% reflectivity. Since Herschel frequently employed only a single-lens eyepiece, light loss at the ocular was not much more than one of today's coated multi-element eyepieces.

Herschel was systematic in all approaches to observing, and quickly determined that he could perceive the faintest of images only when his eyes were adapted to the dark. He measured the diameter of his own relaxed pupil and found it to be 0.2 inch (about 5mm), and thus selected a power of magnification that would transmit the light gathered across the full aperture of his huge mirror into his eye, which works out in this case to be about 92 diameters, a power which today's amateurs find to be an excellent choice for many star clusters and galaxies, despite the advertising hype for cheap "450X" toy telescopes. Herschel may have used unbelievably high powers on occasion, but it was only for measuring specific objects for testing the figure of his mirrors.

To preserve his sensitivity to dim "diffused nebulosity," Herschel kept his eyes shaded from sunlight during the daytime, and at the telescope donned a black hood to shield himself from the glow of his sister's writing lamp as she recorded his observations. It may be challenging and difficult for an amateur to locate a dim Herschel object by means of a star chart, but the real accomplishment was for the great Sir William to discover the object in the first place, with no pre-conceived notions for expectations. It was he who observed that once an object was seen in a large instrument, it could then be found with a smaller one. This phenomenon assists contemporary amateurs in duplicating Herschel's feats with our small modern instruments.

In Part 2: More on the history of dark adaptation and visual perception.

METEOR NOTES

- JIM RICHARDSON

June is one of the most active months of the year for meteor showers, but a look at the night sky would hardly reveal this fact. This is because all three moderate showers; the Arietids, the Zeta Perseids, and the Beta Taurids occur during daylight hours only, and none have been detected at night. Count rates are based on radar observations, not visual. Disappointing, isn't it? However, there is still a way to "observe" these showers through radio wave reflection, or echo. The basic theory is that the ionized trail of a meteor will reflect radio waves, and thus allow the reception of signals from stations at, or just below the threshold of normal detection. This works best for frequencies of >15 Mhz, and station distances of <300 miles, the higher frequencies requiring shorter distances. The idea is to tune in a weak station, just barely audible, and monitor it. A meteor can be told by a sudden drastic rise

in the signal strength, usually accompanied by Doppler carrier shifts, causing a garbled, wavering audio in modulated signals.

Of the remaining showers, three have made only singular or sporadic appearances, and are not normally visible. There is the chance, however, that they may be periodic and show themselves again some year.

This leaves only five annual visual showers this month, all having very low rates, and difficult to detect. Use the given velocity to verify a suspected shower member. The average meteor velocity is 30-50 km/sec, lasting about 0.3 to 0.4 seconds, and slow or swift meteors are fairly easy to tell from the average.

Individual Shower Notes:

Tau Herculids: Very slow meteors, usually orange or even red, but sparse even at the maximum. A waxing gibbous moon at the maximum doesn't help. This shower is associated with Comet 1930 VI Schwassmann-Wachmann 3.

Chi Scorpiids: Fairly slow meteors, and like the Tau Herculids, sparse in frequency, and fighting a waxing gibbous moon at the maximum. This stream is a contributor to Hoffmeister's (1948) Scorpius-Sagittarius system.

Librids: This shower was observed only in 1937.

Sagittariids: This shower was observed only by radar and only in 1957 and 1958 (Radar detection began in late 1940's).

Theta Ophiuchids: This stream is the maximum (!) of Hoffmeister's (1948) Scorpius-Sagittarius system, with a rate of 2/hr.

June Lyrids: This weak visual stream has appeared only since 1966. Its strength varies, and was best in 1969 at 9/hr. Generally it runs at about 1-2/hr at the maximum, and is well placed for evening viewing, with a radiant high in the eastern sky.

Daytime Beta Taurids: Associated with the Southern Taurids (Sep. - Nov.), Northern Taurids (Sep.-Dec.), and P/comet Encke 1970 L.

Corvids: Like the Librids, this shower was observed only in 1937.

June Bootids: This shower was strong only in 1916 at 100/hr, and again in 1921 at 6/hr. These meteors are very slow at 14 km/sec, and are associated with P/Comet Pons-Winnecke

(Data from "A Working List of Meteor Streams", A.F. Cook (1974))

April-May Notes: Two moderate showers highlighted this period, with good observation weather for each one. The April Lyrids (max. Apr. 22) gave typical rates of 8/hr avg. Zenith Hourly Rate (ZHR) for Apr. 21, and 15/hr avg. ZHR for Apr. 22. Clouds prevented viewing a third night. The Eta Aquarids (max. May 4) tended to be somewhat erratic, with large spreads in hourly counts (rather than a fairly constant rate), but the average rates came out to about normal: 6/hr avg. ZHR for May 3, 20/hr avg. ZHR for May 4, and 13/hr avg. ZHR for May 5. This indicated that the peak may have been higher than the normal 20/hr and occurred late in the morning of May 4, but this shower is a rough one to collect data on, with only 3.5 hr window between radiant rise and morning twilight, with the moon adding further interference. Other minor showers detected this month: Sigma Leonids, Delta Draconids, Virginids, Mu Virginids, Alpha Scorpiids, Alpha Bootids, and Phi Bootids, all at 1/hr.

One final note: I received an unofficial report that a meteorite has recently gone through the roof of a house in the Netherlands, with no further details available as yet. The last such event was in 1952 in Alabama, when a meteorite not only went through the roof of a house, but hit a lady inside, putting her in the hospital with minor injuries. This is the only known incident of a person being struck by a meteorite, although meteorites have reportedly killed animals on rare occasions.

If you are interested in learning about, and observing these sometimes spectacular objects, or if you see a fireball and would like to report it, please contact Jim Richardson at 408-578-0387 (h) / 408-978-8113 (w).

COMET COMMENTS

- DON MACHHOLZ

No new comets have been discovered recently. This is certainly a slow year for new comets. Comet Cernis-Kiuchi-Nakamura (1990b) has dimmed in our evening sky, while Comet Skorinchenko-George is now in our solar glare, it will emerge in the August morning sky. But Comet Austin and Periodic Comet Schwassmann-Wachmann 3 remain in our morning sky.

Comet Austin moves rapidly through opposition from the morning into the evening sky. It is dimmer than expected, and credit goes to

veteran comet observer John Bortle for predicting the down-turn of Comet Austin's brightness. Additionally, a lack of a strong dust tail subtracts from the beauty of the comet. Nevertheless, the comet still looks great through a telescope. You'll see a changing perspective over the next few weeks as it approaches to within 22 million miles of the Earth on May 24, as we cross the plane of the orbit on June 6, and as the comet passes opposition on June 7, when we will see a "Sun's -eye view".

ASTRO ADS

ASTRO ADS are free to all non-commercial advertisers wishing to sell astronomically related products or services. Please send your ad directly to the Editor, John P. Gleason, 5361 Port Sailwood Dr. Newark, CA 94560 **NO LATER THAN THE 15TH OF EACH MONTH.** Your Astro Ad will run approximately 3-months.

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Celestial Images

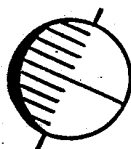
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This month's featured print:

"The Belt of Orion"

A dramatic 11" X 14" print of the Horsehead nebula and the three main belt stars of the constellation Orion.

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FREE astronomy software for Commodore computers. Also, need equatorial head for 60mm refractor. Contact: Del Johnson, 408-448-0239 4/90

KODAK 7" f/2.5 Aero Ektar lens \$325, Edmund 12 1/2" mirror grinding kit, \$170. Contact: John Brookman, 408-374-0594 (evenings 6 to 8 pm) 4/90

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COMET EPHEMERIS

DATE (UT)	RA (1950)	DEC	RA (2000)	DEC	ELONG	SKY	MAG
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Comet Austin (1989c₁)

05-24	20h12.1m	+06°35'	20h14.6m	+06°45'	112°	M	5.3
05-27	19h22.9m	-03°11'	19h25.5m	-03°05'	130°	M	5.4
05-30	18h36.0m	-12°10'	18h38.8m	-12°08'	147°	M	5.8
06-02	17h54.8m	-19°12'	17h57.7m	-19°13'	161°	M	6.2
06-05	17h20.6m	-24°12'	17h23.6m	-24°15'	172°	M	6.6
06-08	16h53.1m	-27°36'	16h56.2m	-27°41'	175°	E	7.0
06-11	16h31.4m	-29°55'	16h34.6m	-30°01'	168°	E	7.5
06-14	16h14.4m	-31°30'	16h17.6m	-31°38'	162°	E	7.9
06-17	16h01.0m	-32°37'	16h04.2m	-32°46'	157°	E	8.2
06-20	15h50.5m	-33°25'	15h53.7m	-33°34'	152°	E	8.6
06-23	15h42.2m	-34°01'	15h45.4m	-34°10'	148°	E	8.9
06-26	15h35.7m	-34°27'	15h38.9m	-34°37'	144°	E	9.2
06-29	15h30.6m	-34°48'	15h33.8m	-34°58'	140°	E	9.5
07-02	15h26.8m	-35°04'	15h29.9m	-35°15'	137°	E	9.8
07-05	15h23.9m	-35°18'	15h27.0m	-35°28'	133°	E	10.0
07-08	15h21.8m	-35°29'	15h24.9m	-35°40'	130°	E	10.3

Periodic Comet Schwassmann-Wachmann 3 (1989d₁)

05-24	23h58.4m	-09°15'	00h01.0m	-08°58'	66°	M	10.3
05-29	00h18.5m	-08°42'	00h21.0m	-08°25'	66°	M	10.5
06-03	00h36.5m	-08°06'	00h39.0m	-07°50'	67°	M	10.7
06-08	00h52.8m	-07°29'	00h55.4m	-07°13'	68°	M	11.0
06-13	01h07.6m	-06°52'	01h10.2m	-06°36'	69°	M	11.2
06-18	01h21.1m	-06°16'	01h23.6m	-06°00'	70°	M	11.5
06-23	01h33.4m	-05°43'	01h35.9m	-05°27'	72°	M	11.8
06-28	01h44.5m	-05°13'	01h47.0m	-04°58'	74°	M	12.1
07-03	01h54.6m	-04°47'	01h57.1m	-04°32'	76°	M	12.4

THIS MONTH'S METEORS

SHOWER NAME	DATES	DATE OF MAXIMUM	MAXIMUM VISUAL ZENITHAL RATE (per hr.)	RADIANT R.A./DEC.	VELOCITY (km/sec.)	NOTES
Tau Herculis	May 19-June 14	June 3	< 1	15h12m/+39	15	
Chi Scorpiids	May 27-June 20	June 5	< 1	16h28m/-13	21	
Daytime Arietids	May 29-June 19	June 7	60 (rader)	2h56m/+23	37	Daytime
Daytime Zeta Perseids	June 1 - 17	June 7	40 (rader)	4h08m/+23	27	Daytime
Librids	June 8-9, 1937	June 8	10 (1937)	15h08m/-28	16 ± 2	1937 only
Sagittariids	June 8-16, 1957-8	June 11	30 (rader)	20h16m/-35	52	1957-8 only Daytime
Theta Ophiuchids	June 8 - 16	June 13	2	17h48m/-28	26.7	
June Lyrids	June 11-21, 1969	June 16	1-2	18h32m/+35	31 ± 3	1966-→ 9/hr (1969)
Daytime Beta Taurids	June 24-July 6	June 29	30 (rader)	4h08m/+19	30	Daytime
Corvids	June 25-30, 1937	June 26	13 (1937)	12h47m/-19	10 ± 2	1937 only
June Bootids	June 28, 1916	June 28	< 1	14h36m/+49	13.9	100/hr (1916) 6/hr (1921)

\$1190. Also, Olympus binocular viewer with 2-pairs of eyepieces, \$350, lower price if purchased with telescope. Call after 7 pm, 209-463-1817 Edward Hillyer, 2305 De Ovan Ave. Stockton, CA 95204 4/90

CELESTIAL IMAGES

- JOHN GLEASON

ASTROPHOTOGRAPHY BREAKTHROUGH!

or

*HOW I LEARNED TO STOP WORRY-
ING AND LOVE THE CCD CAMERA,*

or

*HOW A BLENDER, A BOTTLE OF
TEQUILA, AND A FEW LIMES HAVE
FOUND THEIR WAY INTO MY EQUIP-
MENT CASE!*

3:30 am, Fremont Peak. The silence of the pristine morning was broken by the whirl of the blender and the crushing of ice. Deer could be heard bounding through the undergrowth as the perfect Margarita was being poured. In the background the continuous opening and closing of relays were heralding the dawn of a new age. "Elapsed time 50 minutes" spoke my talking wrist watch in its electro-mechanical voice. I walked over to the 5-inch f/8 fluorite refractor and reaching up, I closed the camera shutter. The guide star? Still positioned exactly on the intersection of the illuminated reticle eyepiece. Later that same morning after film development, the negative yielded star images round and sharp.

Does this sound like a 21st century article from *Sky & Telescope*? Is this some wild fantasy conjured up from a tired old astrophotographer? The answer is No. *Automatic guiding* is here today!

The concept of, and the need for automatic guiding goes back many decades. Imagine setting at the guide telescope for 5 and 6 hours at a time capturing the feeble light of a distant star. In some cases, photographic exposures ran for several days, with the astronomer pausing the exposure only during the daylight hours. In their pursuit of deep, high resolution exposures of the universe the professionals have been continually improving their telescope drive systems. With periodic drive gear errors now below 5 arc seconds, and improved star tracking detectors, professionals have virtually eliminated the drudgery of long photographic exposures. Exposures that in the not so distant past were ultimately at the mercy of the

"human" drive corrector.

All of this is fine for an institution on a million dollar equipment budget. But, what about the "poor" amateur astronomer?

Well friends, our time has come! For under \$1000 you can purchase a star tracking system with arc second tracking accuracy. A system that is star magnitude limited only by your telescope aperture and local dark sky conditions.

In the last month, I have been privileged to test a remarkable new telescope accessory. From the Santa Barbara Instrument Group (SBIG for short) comes the model ST-4 Star Tracker and Imaging Camera. It is a multipurpose instrument that can be used as an automatic star tracker for long photographic exposures, or, in conjunction with a PC, as a sensitive electronic imaging camera.

The eye of the system consists of a CCD detector with an array of 192 by 165 pixel elements. In operation the pixels convert incoming photons into electrons and stores them for later comparison to a dark frame that you make during a calibration sequence. It's this switching between the dark frame and what the CCD actually sees that causes a microcontroller to make the drive correction decision. The CCD head itself is only about 3-inches in diameter and fits into any 1.25-inch eyepiece holder or off-axis guider.

The microcontroller (*directly linked to your existing telescope push-button or joy-stick slow motions*), calculates the necessary telescope corrections in both RA and DEC in less than a second as it notes the change in signal from one pixel to the next. Star location on the pixel array is determined to a fraction of a pixel accuracy, thus enabling very accurate tracking.

During my most recent tests, the tracking accuracy was limited only by atmospheric seeing! Using a separate guide telescope to monitor tracking performance, it was amazing to watch minute corrections being made when star drift occurred.

Just how faint of a guide star will this system track on? So far I have been down to 8th magnitude with a 80mm refractor from my Newark observing site. This heavily light polluted site prevented me from using built in boost controls that allow for tracking on even fainter stars. 10th magnitude was easy in the 5-inch f/8 using an off-axis guider at Fremont Peak. But 9th and 10th magnitude stars are really the exception. Most deep sky objects can be composed around guide stars much

brighter.

Since I am still testing I will not go into the specific details of setup and operation. This much is certain however, the top astrophotographers across the country are saying the same thing, "It works!". Interested amateurs should contact SBIG directly (address and phone number in *Sky & Telescope*), as they are currently shipping production units, units that are destined to change amateur astrophotography forever! More to come in future issues of the Ephemeris, but first I must pour myself another Margarita.

JUNE STARRY NIGHTS

- RICHARD STANTON

LUNAR OCCULTATION/APPULSE - The evening of June 6th during Evening Twilight at 21:06 PDT the 3rd magnitude star pi Scorpii will duck behind the Lunar dark limb at position angle 158 deg. About an hour later at 22:02 PDT it will reappear at position angle 245 deg. on the Lunar bright limb. As this is around 9 PM on a Wednesday evening you can either step into your backyard and observe this event and get in a little Lunar observing or watch Doogie Howser on TV...some choices are hard.

URANUS - If you still haven't gotten around to finding this planet in your telescope, this is the month to do it. Uranus will reach opposition on June 29th shining at magnitude +5.61 (naked eye from a dark site). For an easy find try the night of June 13/14, a little up and left from the apex of the tea pot lid in Sagittarius to the Globular Cluster M22, Uranus will be 24 arc minutes North of the cluster. With a wide-field eyepiece you'll get them both in the same view. It'll be even easier with binoculars.

SATURN - Don't forget that this beauty will achieve opposition next month so it is now well placed for observing. There is far more detail to be seen than is imagined from the casual glance and only the patient will be rewarded. My love affair with astronomy began with my first view through a telescope of this scintillating charmer and the fire has never dwindled. Share it with a friend.

DEEP SKY CHALLENGE - This month it's off to Ophiuchus in search of that denizen of the night, "The Snake". This is one you can only recognize when you don't see it. It's also known as Barnard's Dark S-nebula. It covers some 30 arc seconds and will be found NNE of theta Ophiuchi. The coordinates are 17:23.5 +20:45 (2000). The minimum aperture

recommended to search it down is 8 cm. Our editor loves to publish astrophotos.....hint.

COSMIC GRAPEVINE - The May 5 issue of *Science News* has an intriguing piece on Mars called "Episodic Oceans." Planetary scientist Victor Baker and his colleagues from the University of Arizona-Tucson theorize that what appear to be fluid-cut geologic features may be the result of an ancient ocean that has appeared and disappeared at least three times since the formation of Mars. The name they have chosen for this new vanished sea is Oceanus Borealis. Their theory is both plausible and provocative. If you don't have this journal, your local library certainly should.

SPACE PROGRAM UPDATE

- BOB FINGERHUT

CHECK-OUT OF HUBBLE MAKING SLOW BUT STEADY PROGRESS - The telescope operators are making steady progress in their effort to activate the Hubble space telescope. As they gain experience with the telescope, they are getting better at understanding its quirks and getting Hubble's systems to work together. Each of the problems, widely reported in the press, has been tackled and overcome. The solar arrays are deployed, the aperture door opened, and the high gain antenna untangled and operating over 75% of its range. Pointing stability will be improved with experience. The first photos should be received by the time you read this. The first photo will be released to the press even though it will probably be out of focus. It will take eight months to check-out, troubleshoot, focus, and calibrate all of Hubble's systems and instruments. That's when Hubble's mission will truly begin.

THE REST OF THE MISSION - Discovery's outstanding performance made it possible to squeeze an extra 1-2 miles of altitude into Hubble's orbit. That orbit is 332X331 nautical miles, a shuttle program record. Every extra mile increases the time before shuttle reboost will be required.

The landing provided the first test of Discovery's new carbon breaks, which are being added to all of the shuttle orbiters. The mission commander said the new breaks "felt firm and comfortable". This is another step toward giving the shuttle the capability to land at Kennedy Space Center so that the orbiter would not have to be ferried back from Edwards Air Force Base.

In addition to deploying the Hubble, the astronauts conducted work involving protein crystal growth, polymer membrane formation, and Imax photography.

RESCUED SATELLITES BACK IN ORBIT - Two satellites, rescued by the shuttle in November 1984, were refurbished by Hughes Aircraft Co. and relaunched. The Westar 6 communication satellite was relaunched as AsiaSat 1 by a Chinese Long March 3 on April 7. The Indonesian Palapa communication satellite was relaunched by a Delta 2 on April 13th.

COLUMBIA TO GO UP NEXT - STS-35 is scheduled for launch about the first week in June. The payload is the Astro-1 ultraviolet telescope and the Broad Band X-ray telescope. This payload was scheduled to study Halley's comet in 1986, before the Challenger disaster. Among the objects of interest on this flight will be Comet Austin. The mission is scheduled for 10 days. Columbia will carry 7 astronauts.

TELESCOPE MOUNTING PROPOSAL

- DEL JOHNSON

Two very large and massive telescope fork mountings have come to the attention of the SJAA. Lockheed is currently soliciting a proposal from the SJAA to acquire these professional quality mountings for total donation!

Both fork mounts contain a compound solar telescope array called a SPAR. The SPAR contains several 6-inch uncoated objectives of limited value since they were designed for solar work only. Non of the solar filtration equipment remains, but the drive controls and gearing is intact on both mounts!

Fork mount #1 can support a 28" tube assembly. The SJAA has approached Gene Cisneros about acquiring his Celestron 22 tube assembly and parts for the construction of a 22-inch or even larger cassegrain telescope. The SJAA is also in joint discussion with the Hall's Valley astronomy group. The Hall's Valley group has presented to the SJAA a proposal that includes the use of 2 possible observatory sites at Grant Ranch Park for a permanent facility to be installed. This would be a joint project between the two groups.

Fork mount #2 can support a 36" tube assembly. The SJAA board is currently looking at its potential use also. This second mounting belongs to NASA, but Lockheed will go to NASA on our behalf with our proposals.

Both proposals will stress the SJAA's commitment to public programs and educational use. The acquisition of one or both mountings would provide the basis for a permanent observing site for the SJAA. This is something that the SJAA has wanted for a long time as it would serve as a focal point for club activities.

Membership input and suggestions are currently being solicited by the Board of Directors. A proposal is currently being drawn up for mount #1 as the Hall's Valley Group is very positive about the joint project idea. There will be more discussions at the June 9th board meeting, and at an indoor star party currently scheduled for June 30th at the Los Gatos Red Cross. For additional information, please contact me at 408-448-0239 or any of the SJAA officers. Their phone numbers are listed in the Ephemeris.

:::CELESTIAL CALENDAR - JUN-1990::: by Richard Stanton

LUNAR PHASES	Date	Rise	Tran	Set
FM 04:01hr	08-06	2048	0120	0552
LQ 21:48hr	15-06	0049	0652	1216
NM 11:55hr	22-06	0451	1309	2033
FQ 15:07hr	29-06	1249	1857	0029

NEARER PLANETS

Mercury.....	07-06	0454	1128	1807
1.15 A.U.	17-06	0500	1154	1852
Mag -1.6	27-06	0509	1232	1959

Venus.....	07-06	0400	1033	1711
1.26 A.U.	17-06	0356	1040	1729
Mag -3.9	27-06	0354	1048	1747

Mars.....	07-06	0220	0819	1423
1.27 A.U.	17-06	0200	0807	1421
Mag +0.3	27-06	0140	0756	1417

Jupiter.....	07-06	0738	1452	2208
6.18 A.U.	17-06	0708	1421	2137
Mag -1.8	27-06	0638	1350	2106

Saturn.....	07-06	2241	0335	0827
9.12 A.U.	17-06	2200	0253	0746
Mag +0.1	27-06	2119	0211	0703

SOL

0459+2242	07-06	0550	1302	2018
0540+2321	17-06	0546	1301	2019
0622+2320	27-06	0545	1259	2018

ASTRONOMICAL TWILIGHT

JD 2,448,049.5	07-06	0345	-	2205
059.5	17-06	0348	-	2215
069.5	27-06	0350	-	2210

EPHEMERIS is published monthly by the San Jose Astronomical Association - 3509 Calico Ave., San Jose California 95124. Members are encouraged to submit articles for publication. These should be typed and submitted no later than the 12th of the previous month. All submissions should be sent directly to the Editor, John P. Gleason, 5361 Port Sailwood Dr. Newark, California 94560 415-792-8248

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San Jose Astronomical Association
1840 Yosemite Dr.
Milpitas, CA 95035

Telephone(____) _____

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