Starscan

Johnson Space Center Astronomical Society

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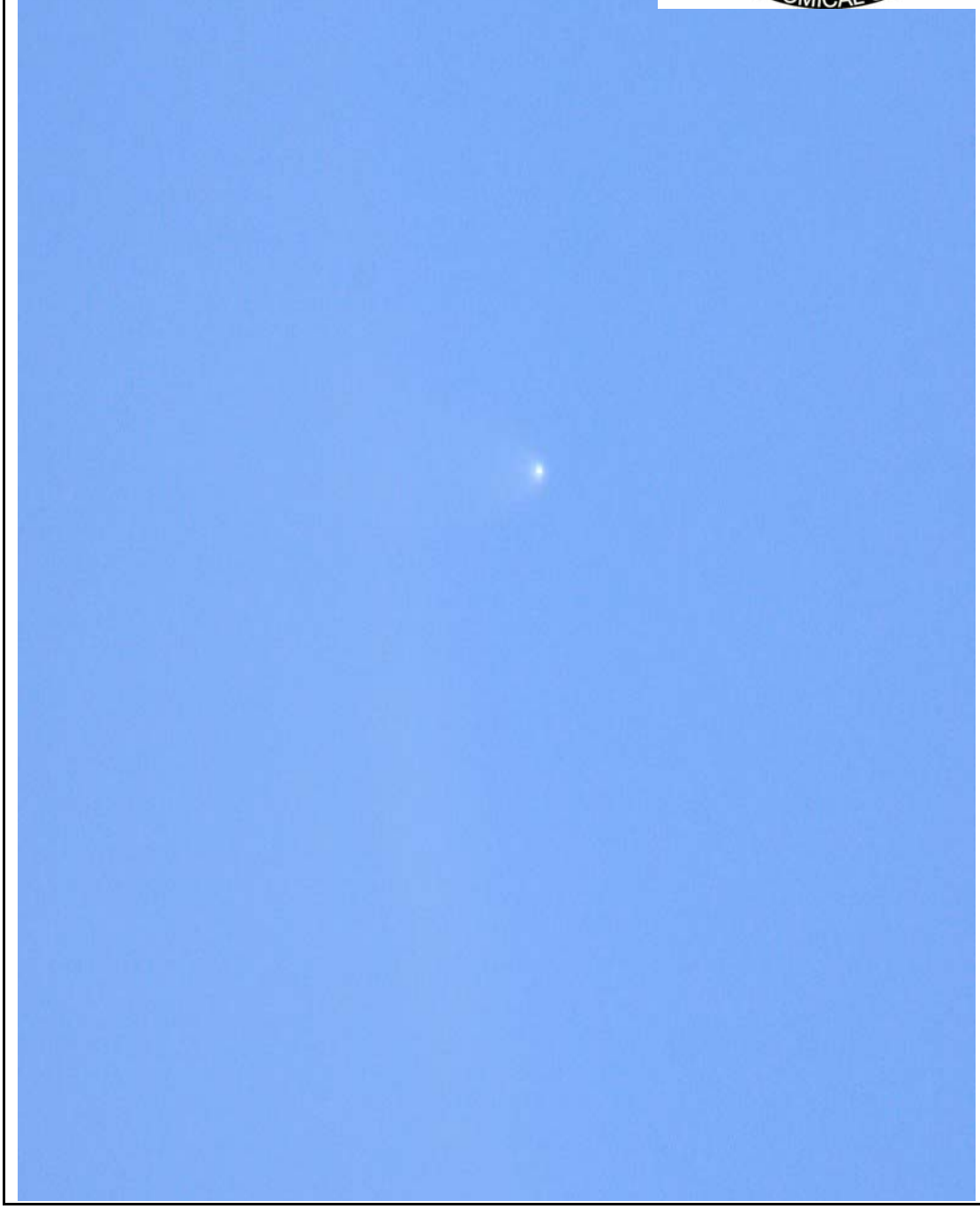

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The Great Comet of 2007 – Part 1

By Don Pearce

This is a tale of a bright comet whose original elusiveness made it difficult to observe, and how it sneaked up on most of the astronomical community. To understand why, we have to trace its history back even before its discovery.

Long before recorded history, perhaps several million years ago, a comet was nudged out of the Oort Cloud, and began its long journey towards the inner solar system. It was approaching from well below, "south" of the ecliptic, and at a very steep angle so that it was coming from almost straight “down”, being inclined over 77° to the ecliptical plane. On about May 29th of 2006 it finally reached its ascending node, while perhaps about 18-19th magnitude, and still almost 4 A.U. from the Sun. At that time it wasn't too far from being at opposition from the Earth and its orbital speed was about 21 kilometers/second.

Then, on Aug. 7th, 2006 Ron McNaught discovered it on images from the .5-meter Uppsala Schmidt telescope at Siding Spring in Australia, while still at mag. 17.3, and about 3 A.U. from the Sun. It was located in Ophiuchus and given a name, Comet C/2006 P1 (McNaught). The preliminary orbital elements were way off and gave a q (perihelion distance) value of 1.55, but by the end of August a good orbital determination had been made and gave a q of .17 A.U. At this point, comet watchers became aware that this comet had the potential to either become very bright and/or develop a significant tail around time of perihelion.

However, there were two problems, one natural and one due to human error. First let us discuss the natural, which turned out being a problem of geometrical perspective. After reaching its ascending node Comet McNaught began to climb, gaining speed as it raced toward the Sun. By December 8th it reached its maximum height (.4 A.U. above the plane of the ecliptic), but by this time the Earth was on the other side of the Sun, so that the comet was approaching from the same direction as the Sun’s location. At this time the solar elongation had closed to about 14.4°, and the prospects for observing it would only be good if the comet were to become very bright.

The comet reached its maximum solar altitude of 84° on Jan. 8th, 2007; in other words it was almost directly above the Sun on that day. The reason this did not occur near Dec. 8th was the same reason that an airplane flying towards you from the horizon would appear lower than when it is directly overhead.

After Jan. 8th, the comet continued plummeting south very rapidly, and on Jan.12th it reached perihelion at .1707 A.U. and its orbital speed increased to its maximum of 102 kilometers/second (228,000 mph) The elongation further decreased until it reached a minimum of 5.4° on Jan. 13th, one day later. It also reached its descending node on the 13th and started becoming

more favorably placed for southern hemispheric observers, except for one important factor, which I will explain a little later. On Jan. 15th the comet reached its closest approach to the Earth, (.8179 A.U.) only 3 days after perihelion. So we had the very fortunate confluence of perihelion and perigee occurring at about the same time. To summarize why this comet's orbital geometry made it so difficult to observe, as it brightened approaching the Sun, it was approaching (from our perspective) from behind and over the Sun, never exceeding a solar elongation of about 16° since Dec. 1st. What all of this meant was that the comet, when at its brightest, would never be observed in a dark sky.

All of the information discussed in the previous paragraph was known from the end of August. What was not known, as has become apparent, was its intrinsic brightness. The IAU assigned an absolute magnitude value of 10 and an n value of 4 (inverse 4th power) for the brightening parameter. (usually displayed as 10 in software for brightening factor, i.e. 2.5x 4) It should have become apparent at least by November 1st that these values were seriously in error, for it was running about 2.5 magnitudes brighter then and about 3 magnitudes brighter by the 1st of Dec.

However, there are other considerations. Once it was suspected that this comet was making its initial trip from the Oort Cloud, I am sure that red flags went up at the IAU in terms of the fear of overestimating a "virgin's" magnitude. With the experience with Kohoutek and Austin, to name two comets, and the very real possibility that an original Oort visitor would have surface volatiles that could, initially, sublimate at a rate that would indicate the comet is brighter than it would turn out to be, I am sure that caution was utilized. Whatever the reason, the 10 absolute magnitude value was ultimately found to be about 5 magnitudes too faint.

Just recently, the IAU changed it to 6, but I believe 4.7 is a better fit. Even this value would not yield the results that were ultimately observed. For whatever reason, I had a gut feeling that this comet could become spectacular, and announced at the December Houston Astronomical Society meeting (Dec.1st) that it might become either very bright and/or develop a long tail. Earlier I mentioned the fact that after Jan. 8th, it began passing in front of the Sun, meaning that it was now crossing between the Sun and the Earth. This would produce an effect known as forward-scattering of sunlight by the comet's dust grains.

The amount of forward-scattering would be dependent on the scattering angle (the smaller that angle the greater the magnitude enhancement). According to one study (J. Marcus) on about Jan. 14th the comet's magnitude increase would be at a maximum of about 2.3 magnitudes from forward-scattering, yielding a total magnitude of –5.2 for the comet's total magnitude. This is almost exactly the observed value on that date, and the brightest that the comet ultimately attained. That, of course would make this comet the brightest since Ikeya-Seki in 1965.

But let us return to the comet's elusiveness. During most of Dec. of 2006 the comet eluded observers; however, the comet was imaged using CCDs.

Finally, towards the end of the month, traditional images and scattered observations began coming in. However, due to its proximity to the Sun and its still relative faintness, there was disagreement as to how bright it was. It was also late in Dec. before the forward-scattering concept began to be seriously discussed. In early Jan. more images and observations began pouring in from northern latitudes.

Then, on the first weekend of January, “all hell broke loose”, astounding reports and images began coming in like a flood, still mostly from the northern latitudes. From the Houston, Texas area I attempted on Friday and Sat. (Jan. 5th & 6th) to observe McNaught, under clear skies, but to no avail. On Monday Jan. 8th, at 10 minutes after sunset I saw McNaught for the first time in binos. I knew, immediately, that it was the brightest comet I had ever seen. To see a comet in bright civil twilight, only 5° from the horizon and only about 13° from the Sun was a startling experience. I estimated its magnitude at –2.0. It also had an obvious narrow fan tail about one half degree long. I also observed it on the next two nights under poorer conditions, and on Wed. the 10th I was again startled to see McNaught, this time through murky skies, and still shining like a beacon through tree limbs less than one degree from the horizon. This time I estimated its magnitude at –3.9, about as bright as Venus.

Unfortunately for observers in Texas, the veil came down at this point. Although there was some sunshine on Friday, the 12th, perihelion day, there were still too many clouds around the Sun for me to be able to see the comet. I have not seen the Sun (and obviously not the comet) at all since that Friday.

Meanwhile, all over the world, observers were seeing the comet naked eye; it seems that the most reliable maximum magnitude estimates reached were about -5.0 to -5.2, more than 6 times brighter than Venus. Amazing images were also taken with the NASA SECCHI HI-1B instrument and the SOHO LASCO C3 camera. Observed tail lengths varied for several reasons. The perspective was not that good around perihelion, and observed tail lengths were also hampered by observations being made during broad daylight to during bright civil twilight and close to the horizon. Generally, reported tail lengths did not exceed much more than a degree with the exception of some observations made earlier in Jan. from northern latitudes. Of course, as its elongation grows and the perspective improves southern hemisphere observers will undoubtedly see longer tails.

As a side note, McNaught currently has a hyperbolic orbit and will likely escape the solar system altogether in the distant future. It has only spent a little over 7 months above the ecliptic during its entire span of existence.

Was McNaught a great comet? For us in the northern hemisphere, if your definition requires a “great comet” to be seen in a dark sky with a long flowing tail, then the answer may be no. Undoubtedly, observers from the southern hemisphere will see extensive tail structure. But I would submit that McNaught is indeed a truly great comet because of its astounding brightness, the like of which we may not experience again for a long time.

The Great Comet of 2007-Part II

(Synchrones, Syndynes, or Striae)

After Comet McNaught passed perihelion on Jan.12th and its descending node on Jan.13th, the coma continued to be observed in the northern hemisphere only because it was still so bright it could be seen in broad daylight. This would last for almost another week, and then, if this had been a “normal” comet, would have been forever lost for northern observers. But something startling and fantastic occurred on around Jan. 18th.

The first picture I saw was taken by Graham Palmer from New Zealand, (taken Jan.18th) and I was totally astounded by its appearance. While not showing the “streaks” (my very first impression) as well as some other later images, it clearly showed me something I had never witnessed before in a comet. I remember thinking to myself, because the human brain tends to operate within a known zone, that maybe this was some kind of crazy weather phenomenon. The flood of incoming images, however, only intensified the reality of what this comet was displaying, a truly wondrous gift of nature.

By Jan. 22nd the tail had reached its maximum length of an estimated 80-90 degrees (counting its extension into the northern hemisphere), although most southern hemisphere observers were only reporting about a maximum 30-degree tail. It also displayed a maximum width of about 30 degrees. Overall tail length was perhaps in excess of 150 million kilometers (about 1 AU).

But as large as this comet was, it wasn’t its size that really made it so amazing. It was the incredible structure of the tail that very few people had ever witnessed. To make it even more incredible, observers from the northern hemisphere, while well out of observational range of the head of the comet, were seeing these bands even up to 45 degrees north. Two of our members, Kenneth Drake and Dick Locke, were even able to image them.

These bands, which immediately began to be referred to as “synchronic bands”, also presented a real challenge for me. I stared at my monitor and wondered what mechanism could have produced this. I suspected, due to the even spacing that, it had to involve the rotation of the nucleus, with the probability that some “hot spot” (or vent) was releasing material in rhythm with its rotational period. I researched a 1976 article by Zdenek Sekanina, then I consulted with some cometary experts. Finally I came up with this:

Due to rotation and perhaps a regular periodic outburst from an active area on the nucleus, particles are being ejected. They tend to congregate into, perhaps, fluffy conglomerates, and that as they move along the main axis of the dust tail, further fragmentation occurs resulting in the development of “mini comets”. These are what we have been calling the striae (or “striations”or were calling synchronic bands) It is assumed that solar radiation continues pushing them further away with time, and that the regular spacing results from the aforementioned on-off activity of an active area on the nucleus.

Technically, there are also synchrones and syndynes involved with the entire process, but , since it doesn’t involve the spectacular visual phenomena

we will leave that topic to another discussion. There was also a noticeable lack of any ion tail right around perihelion, due to the rapid ionization and disassociation causing the CO+, OH+, and H2O+ radicals to be short-lived. Comet McNaught is currently (Feb.1st), in the constellation Indus deep in the southern sky and is about 3rd magnitude and fading as it recedes from the Earth and the Sun. It will eventually settle in Ara as it departs from the solar system, altogether.

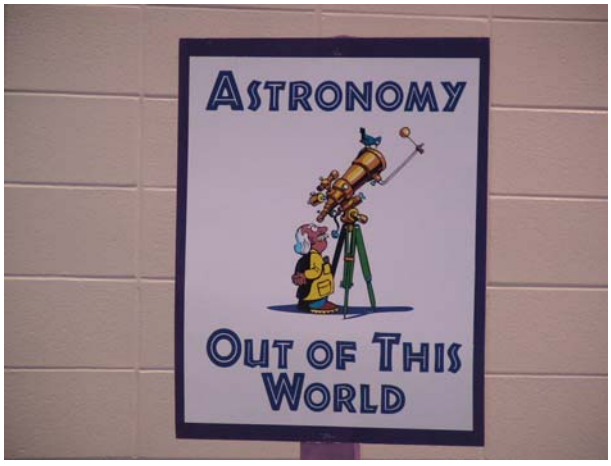
This has certainly been the greatest comet in my observing career, but, also with a certain frustration due to several factors. One, of course, is having been isolated in the northern hemisphere, and the other being the incredibly bad weather we have experienced in southeast Texas. Nevertheless, I will always cherish the three observations I made of McNaught, if only for the reason of what it ultimately became. I want to thank Stephanie McLaughlin, Dr. Erika Gibb, and Don Machholz for helping me to develop some insight into this wondrous object

Don Pearce

Star Party at Jamison Middle School

By Connie Haviland

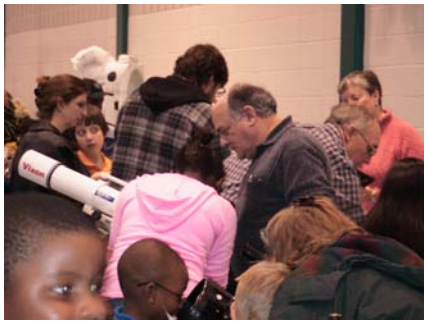
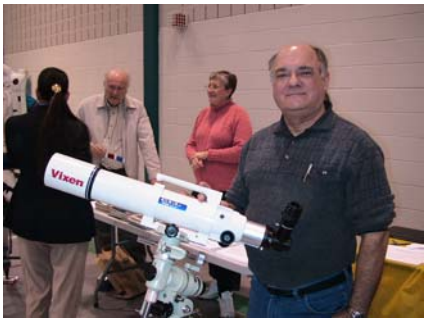
Once again, JSCAS members came through to provide young people the opportunity to learn more about astronomy. As Dave, John and I approached Jamison Middle School, we were amazed to see the number of cars in the parking lot. It was full and there were cars filling up the side streets as well. This was going to be a busy night. We had to come in from the backside of the school in order to get our scopes into the building. Unfortunately, Mother Nature did not give us clear skies, but that did not stop us from having a successful evening.



The Jamison Middle School's staff was wonderful. They provided us with a couple of tables to hand out articles from light pollution to February's sky map to a list of the various names for the full moon. Lisa brought boxes of astronomy magazines and they were there for the taking. We had printed out flyers with contact information for parents to take home and locate our webpage online. We invited every single person that stopped by to attend our star parties and our meetings. And we made it a point to mention the Family Nights at the LPI each month and invited them to come join in on the fun.



John, Ed Malewitz and Jim Cate provided a variety of telescopes so that we were able to show students and their parents a small sample of what you can star-hop with. David Haviland had a PowerPoint presentation that included the 3 types of telescopes, what you can see with these scopes and along with other things, he had pictures of our "big" scopes that a few of our members have made themselves. I answered questions about our club, suggestions on what to buy as a beginner scope and along with Dave, even recommended getting a set of binoculars and a star chart or book with star maps and go out and start observing. Many people were amazed to learn that you can use binoculars to observe. So maybe there will be a rush on binoculars and more people out there observing.

People were asking a lot of questions and we were able to provide them with a vast source of information with the members that were there. There were times where I was completely surrounded by a lot of people wanting to look through scopes and get more information about what they were looking through. Lisa Lester and, for a short time, Sarah Haviland manned the tables with the handouts and bunch of astronomy magazines for the visitors. William Haviland and John Cavuoti, II provided the manpower to help setup and take down the equipment.

I want to commend John, this was his first star party where he provided a scope and he handled it very courageously. As he stood there and answered questions, “little guys” were manhandling his new scope and he handled it very well. There were moments where you could see in his eyes that “concerned” look, but he got through it. I am sure many of you have been there, done that, where you had little hands down the front of your scope or right in the middle of the glass, leaving little handprints. Ed zeroed in on a spot on the wall, across the gym and we all pretended to star hop. Paul Hanagraff was there manning the CenterPoint Energy booth for the evening. Leslie provided assistance over at that NASA table.

All in all, it was a great success. Even Sarah got to check out the astronaut’s EMU Mobility Suit. I want to thank everyone who were able to make it and want to let you know that we have been asked by someone from HISD to come and do this for them sometime toward the end of March. We directed him to Lisa and said to get with her and see what we can do. The staff at Jamison Middle School thanked us many times for coming and presented us with this huge basket of goodies. I want to add, this was my first school star party and I had a great time.

L to R: Jim Cate, Leslie Eaton, William Haviland, Connie Haviland, John Cavuoti, II, Dave Haviland, Sarah Haviland, Lisa Lester, Fred Henderson, and Ed Malewitz (and in spirit and at the other booth Paul Hanagraff)

Some Recent Observing Notes from 2 states

By Chris Wells

After enduring 4 weeks of typically English weather (cold, rainy and cloudy), I thought I'd jot down some observing notes for the JSCAS starscan.

Think back if you can to that wonderful spell of good stargazing weather we had in the November thanksgiving period (I think it ran from 20th through 24th). I recall setting my telescope up on most nights and suffering a little at work as a consequence. I had just bought an cheapy GOTO telescope that I'd already put to good use at a Haak Winery star party with it's native Meade 90mm F/13.5 Mak. I remounted my Vixen Super Polaris FL-90S (90mm F9) on the mount just to see if it could handle it. It ended up being rather wobbly due to the tube length but thankfully due to the lack of wind would settle down nicely for some excellent views (as long as I don't touch the eyepiece).

11/23/06 from League City (just above sea level)

The sky limiting magnitude was around 4.5 which is about as good as it gets.

Bubble Nebula (NGC7635)

I really wanted to push the 90mm Fluorite optics to see what's possible and targeted the Bubble Nebula (NGC7635). By my calculations both M52 and NGC7635 should be in the same FOV. I easily located M52 and after studying a CCD image I took of the bubble about a year ago, located the main star (Wolf-Rayet) within the bubble. But alas the bubble itself mostly evaded me. I thought I got some glimpses of it when using more power (9mm Nagler) and an OIII but can't be certain. Perhaps "Averted Imagination" was taking place. I remember trying to find it with my C8 when I imaged it and only got glimpses of it then so 90mm optics were always going to be a stretch.

ET Open Cluster (NGC457, C13)

I was recently introduced to this object at Ft McKavett and later the Haak Winery star party (thanks Tripple).
Beautiful Image with 18mm Radian and now one of my favorites.

M103 Open Cluster

Using 32mm Plossl, I was at first confused about which stars are part of the cluster and which are not. I also thought I'd seen a small bright galaxy just below it at the edge of the FOV. Focusing on this and turning up the power with a 4.8mm Nagler showed what appeared to be a perfect line of stars (around 5) evenly spread at around 1arcsec or less. So close in fact that they would blend together. I must research this and perhaps target these stars for CCD imaging another day – see later report.

NGC7789 Open Cluster

This object was selected from David Eicher's "The Universe from your Backyard" book where he describes it as "one of the best open clusters for small telescopes". I have to say that I was less impressed especially after earlier seeing the ET Cluster (NGC457).

NGC7662 Planetary Nebula

Planetary Nebulas always respond so well to high magnification and this was no exception. The view yielded flashes/glimpses of structure with a 4.8mm Nagler. Excellent visual image.

12/26/06 from Angel Fire, NM (8500 Ft above sea level)

This is the highest elevation I recall viewing at. The transparency of the sky was simply incredible, easily magnitude 6 skies or more. The seeing was however lousy and never seemed to settle down. I was using a Meade 90mm F/13.5 Mak and even after 3 hours of cool down time (around 20 degrees) the images remained soft.

M42

The extended nebulosity made this a stunning image. Much better in this 90mm scope than with the C11 at home. Star separation due to seeing issues was however a different story. I could distinguish separation between the trapezium stars, and the E star but the F star just never got a look in.

M103

I primarily wanted to investigate the line of close stars noted earlier thinking the greater magnification of F/13.5 would help. Using a 9mm Nagler I thought I could only see 3 stars rather than 5 reported earlier with different optics.

Must try this again with my C11.

I did however wonder what it would have been like with better optics (the Vixen 90mm Fluorite).

1/25/07 from League City (just above sea level)

First quarter moon. With the break in the weather I took the C11 out for a drive. The usual showpiece objects (M42 with E and F easily discernable, Saturn).

Hind's Crimson Star in Lepus

The Feb 2007 Sky and Telescope article reminded me of an object I havn't seen for a while – Hind's Crimson Star.

I first saw Hind's Crimson star on 11/21/00 in Kurt's 16" Dobsonian. This was before I even owned a telescope and was stunned then by the color of this red star.

While I've seen the star many times since, it's always been rather

disappointing and never lived up to that first viewing. Once I noted it being a lackluster orange color.

The first challenge was to find it – how hard could this be. I have the latest GPS powered C11 that is aligned and ready to go and after all, I've found this manually with a dobsonian on numerous occasions.

1st problem – no decent finderscope on the C11 and also my star hoping skills are a tad rusty

2nd problem – Hinds Crimson is not a named star in the database

3rd problem – R Leporis also not listed in the database

Not deterred, I snuck indoors and through an Internet search found an SAO lookup (courtesy of Robin Gatter's excellent web site). Just so you know it's SAO150058.

Well it's back – so red in fact I'm not even going to try to describe the color of this star – it's just hard to believe the color I was seeing.
In my opinion Hind's Crimson Star should not be missed particularly NOW.

By Chris Wells
(Yearning for another West Texas or New Mexico trip)

AN INVITATION

The Houston Astronomical Society invites members of the local area clubs to experience the dark skies of our observing site near Columbus on March 10. Our facility comprises an observing field with 38 concrete pads with electrical power. Bring an extension cable and a power strip and you can connect your scope to 115vac power at almost any place on the field.

Other amenities include two fully equipped restrooms complete with hot water and shower; camping and picnic areas; and a temperature-controlled bunkhouse. The site also has an observatory building which houses three telescopes permanently.

The entrance gate will remain unlocked from 3:30p to 6:00p allowing ample time for setup. The night will offer total darkness from 7:34p (March 10) to 12:39a (March 11) during which time darkout rules will be in effect.

For those interested, we will do a laser tour of the constellations. The observatory will also be staffed with telescope operators who will be on hand to take us on a telescope tour of the nights' objects of interest.

Of course, visitors are free to follow their personal observing/imaging agenda with their own equipment if they so wish.

White light will be permitted after 12:45a and the exit gate will be unlocked from that time to 1:15a allowing everyone to leave safely.

Bring your favorite equipment with your observing list, snacks, drinks (non-alcoholic, please) and appropriate clothing and enjoy this opportunity to observe under skies far darker than your backyard!

Please e-mail me by March 03 that you will attend and let me know your club affiliation and the number of observers and non-observers in your party. (I do need a rough head count as space could be at a premium).

We'll look forward to seeing you!

George Stradley
Field Trip/Observing Program Coordinator
Houston Astronomical Society
stradley@sbcglobal.net

ps: let me know if you need directions to the site.

Star Party News

By Lisa Lester

We have back-to-back star parties scheduled in February. The first one will be Friday, February 16, 2007 at Bay Area Charter School. We had a star party for the students last year and they were a wonderful group. We should have about 150 budding astronomers eager to look through our scopes so we hope to have a good turn out of club members. On Saturday, February 17, 2007 we will have our first road trip. Come on down to Moody Gardens and share your love of astronomy & the night sky will people who are visiting the area and the residents of Galveston County.

Don't forget our trip to Fort McKavett March 15- 18, 2007. People are already signing up. That week is Spring Break for many schools so I'm not sure if we will visit a school that week. Ken and I are going to host a cook out at the ranch house we are renting on Thursday night. Friday night we'll have the traditional sharing of the grills and Saturday noon we'll have a wonderful BBQ. I'm going to pitch in and give Bea a rest from making the potato salad, beans, etc. since she will be doing that the next weekend for the Living History group. Also, we will give the staff a rest Saturday night and fend for ourselves instead of having BBQ sandwiches, chili dogs, & Frito pies. We will have Star Party for the public on Saturday night. Hope you all will be able to come!

STARSCAN WANT ADS

Ken and I have 105 Sky & Telescope Magazines and 111 Astronomy Magazines
from about 1997 - 2006 to give to anyone interested. We also have the first 6 Night Sky magazines and 26 Discover Magazines.

I can bring these to the February meeting or arrange a delivery.

Let me know if you'd like them or if you want only one of the titles as I have them boxed separately.

Lisa Lester
cell phone
281-744-3668

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Telescope Wanted
By Paul Maley

Wanted: Celestron 11, preferably not a GPS and must have equatorial wedge (CGE model best) ...Paul Maley (pdmaley@yahoo.com)

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Telescope and Mount for Sale
By Ed Malewitz

Takahashi FC-50 Apochromatic Fluorite Refractor, 50mm f:8
Finder
Thousand Oaks Solar Filter
10-1 TNR Micro Focuser

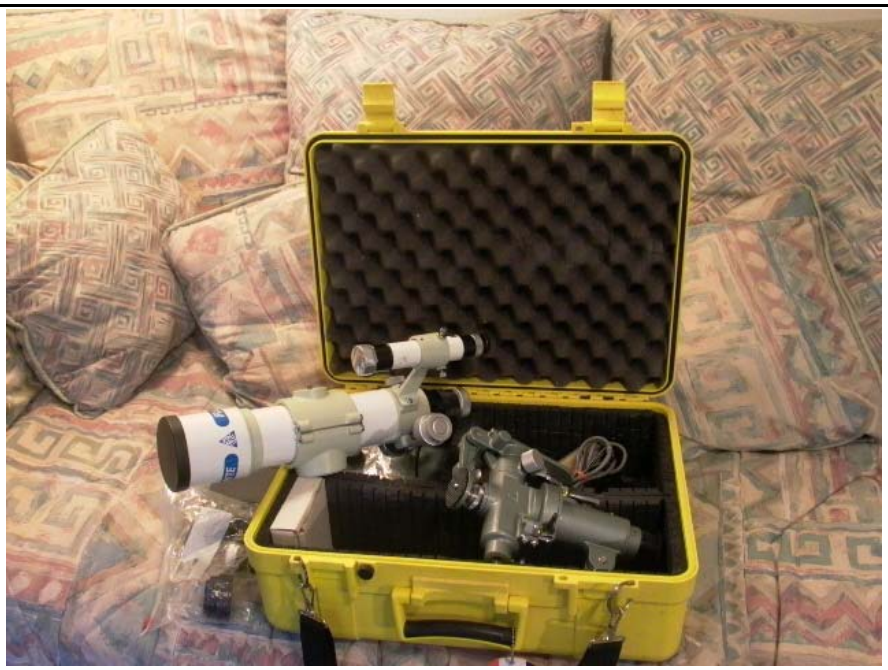
Takahashi Sky Patrol Equatorial Mount, complete with:
DC powered sidereal drive
Three counterweights
Knobs, power pack, charger
Illuminated Polar Axis Alignment scope

Fitted Tundra Waterproof Case

This is the equipment I used to photograph the 1991 Solar Eclipse.

All are in superb condition.

$1500.00 As is,



Call Ed Malewitz (281) 488 1959 emalewitz@sprynet.com

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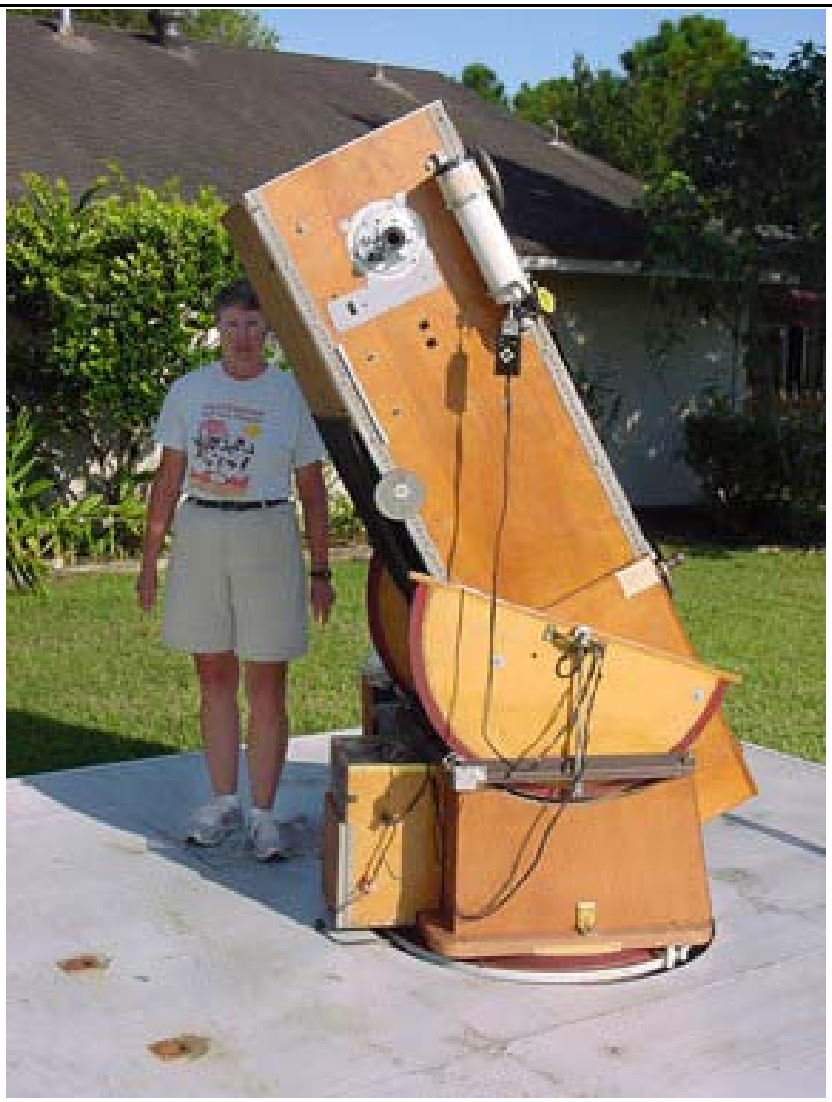
Telescope for sale
By Al Kelly

Perfect for imaging or visual star parties. 17.5" f4.5 Newtonian telescope with highly accurate microprocessor-controlled, stepper-based alt-az drive system with focal plane rotator. Designed and built by Andy Saulietis and the owner. Accepts ST4-compatible inputs for autoguiding. Mechanical and calibration work done by the owner to optimize system accuracy for autoguided CCD imaging. Original 1981 Coulter mirror refigured to smooth 1/8th-wave (P-V) surface by Sky Optical in late 80's. Strehl ratio of primary never measured interferometrically, but I suspect it is at least 0.85. Primary and secondary recoated with enhanced coatings group by PAP in early 90's. Fine optics in excellent condition. 80mm f5 finder. Breaks down to numerous major pieces for transport. With modest effort, works well as a traveling scope; also great as an observatory instrument.



Price negotiable. Will deliver within 300 miles or meet halfway up to that distance. System breaks down for transport in a van. Google Al Kelly for my website, then surf to my backyard observatory link for more info.

Al Kelly
Call 281-482-5190

February Meeting Agenda

February 9th, 7:30 PM, Center for Advanced Space Studies/Lunar Planetary Institute, 3600 Bay Area Blvd (at Middlebrook Drive)

7:30 PM – Welcome / Guest Speaker

8:30 PM (approx) – Break

8:40 PM – Sig Reports and Star Party News

9:00 PM – Charlie's Challenge

9:10 PM – Astronomical Oddities – Hernan Contreras

Last Words, Door Prizes

Any unfinished discussions can be continued over food and beverages at a location to be announced at the end of the meeting.

Club Officers

President – Bob Taylor

Vice President – David Haviland

Secretary – David Haviland

Starscan Editor – Ken Steele

Starparty Chairperson – Lisa Lester

Librarian – Lisa Lester

Historian – Susan DeChellis

Scientific Expeditions – Paul Maley

Web Master – Chris Randall

SIGS

Observing Awards – Triple Nickel

CCD Imaging – Al Kelly

Binocular Observing – Leslie Eaton

Telescope Making – Bob Taylor

Deep Sky Observing – Chris Randall

Cover Image
Comet McNaught in Daylight Skies over New Mexico

Credit: Becky Ramatowski