



HGO's 16" Ritchey is now Go-To!

For many years the Observatory Directors, and the SVAS Board of Directors, have explored the possibility of adding a "Go-To" capability to our 16" Ritchey Chretien at HGO. It has been a far too expensive upgrade, at least that was always the final conclusion. A phone call to Tom Mathis, CEO of the company that manufactured our Mathis 500 fork mount, put everything in motion. He said there have been many successful upgrades of this mount using Dan Grey's Side-real Systems servo motor controller, the SiTech II. He sent me a link for the specific SiTech manual for upgrading our mount. After researching the necessary parts and procedures, it became apparent that the upgrade could be made for less than \$1K. Far less than previous estimates! After presenting the cost analysis to the Board, it was decided to go ahead with the installation.



Walt Heiges & Bill Thomas

Needless to say this was an intimidating project! I felt the entire weight of responsibility on my shoulders, because spending the clubs money (your money) meant the installation must be successful. It's not everyday one installs gears, servo motors, pulleys, figures out the wiring, power supply, and configures a servo motor controller. At least that was the case for me. OK, one thing at time. The first



challenge was physically mounting the servo motors in the existing mount. To say space was limited is an understatement! Deciding if the servo
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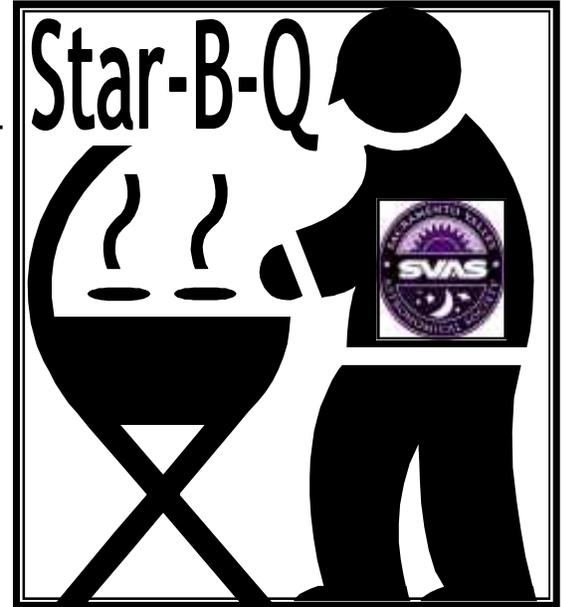
SVAS Event Calendar July-Aug, 2014



July 12th, Citrus Heights Camp out Citrus Heights, Rusch Park, 9:15 to 10:30pm. Contact Walt or Perry. The sponsor of this event is going to provide a free SVAS booth at the next Sunday-Funday event, so help us make it a success!



Star-B-Q, July 25 & 26th Don't miss our annual Star-B-Q held at Blue Canyon! Great raffle, good food, and friends! The July general meeting will be held here, and it's a great chance to talk to the SVAS Officers and Board about club activities and operations. Check with Tim Tingey or Richard Sandler for info on the Messier Marathon.



July 26th, General Meeting, Held at Star-B-Q



July 26th New Moon



August 15th, General Meeting, Friday at 8:00pm

Sacramento City College, Mohr Hall Room 3, 3835 Freeport Boulevard, Sacramento, CA.



August 25th New Moon



August 23rd Blue Canyon, weather permitting.



Star Party Schedule for 2014

- July 25th, 26th, Star-B-Q
- Aug 23rd
- Sept 27th
- Oct 25th
- Nov 22
- Dec 20th

Star Parties

Blue Canyon

Star-B-Q Schedule and Rules

Arrive early if you can, say around 2:00pm on Saturday, to find a great parking spot and get your scope set up before we start **cooking steaks about 4:00pm**. The **raffle begins around 5:30pm** and lasts a couple hours, so don't follow my lead and end up eating late during the raffle! Lots of great prizes will be spread out on tables for everyone to view and pre-select should you have a winning ticket! There will be club announcements and awards following the raffle. Then on to a great viewing evening under the stars.

Rules Rules and more Rules, however they are meant for everyone's enjoyment! It's the same rules we should be following at all HGO Star Parties. The following is a summation and update of the formal rules posted in the SVAS Web Site, the ones we all agree to follow when signing up as a new SVAS member.

Guests: As a SVAS member in good standing, you may invite up to four guests unless special permission has been granted. Please ask your guests to park outside the permitted area and tarmac, to preserve space for members and their equipment. Also make sure not to block any emergency vehicle access lanes! Try to park with a 4 foot maximum space between vehicles, and set up your equipment in front or behind your vehicle to make more room for parking!

White Light discipline: Friday evening is usually more for the dark sky oriented photographers and deep space viewers, so please pay extra attention to white light. It takes at least 30 minutes for the eye to adapt to full darkness, so it's very irritating when someone shines a white light requiring another 30 minutes for your eyes to re-adapt to dark skies. It goes without saying that stray white light will ruin a camera's exposure! Red light protects the dark adapted vision, so cover flashlights, computer screens, and car lights with dark red plastic film. Don't forget interior and trunk lights. Even bright red lights can be a problem.

Saturday is more of a family night geared toward general observing. One of the biggest problems is cars coming and going all night, and it seems each one has at least one white light shining be it backup lights or running lights. To reduce this annoyance, we would like to request that you arrive on the tarmac no later than an hour after sunset. If you plan on leaving early, try to park near the exit road and back into your spot so you won't need to use backup lights when leaving. Also plan your exit between midnight and 1:00am, so the folks staying overnight can get their eyes adapted again and enjoy the rest of the evening! The old guard are all familiar with turning off, covering, or removing interior and trunk lights. They all are willing to guide you out to the exit with their red flashlights. Please don't yell at anyone who violates the "no white light" rules, because we are all there to have a good time. Let's respectfully assist newcomers, and explain the necessity of red lighting.

These areas are off limits to SVAS members:

- *Aircraft runway, because aircraft can and do land at any time!
- *The dirt "aircraft overrun" strip between the runway and tarmac.
- *Private observatories south of HGO.

*The south end of the tarmac is reserved for aircraft parking, CHP helicopters, and private observatories. Placer county just filled in some of the aircraft tie-downs, they only left a couple on the north east corner of the tarmac. Everyone must be ready to move their equipment off the tarmac, to allow space for aircraft taxi and tie-down.

Safety: Airplane traffic has priority at all times. You may be asked to move your observing site if additional aircraft parking is required. Please no bicycles, skateboards, rollerblades, roller skates, or Frisbees! There is a lot of very expensive equipment that is susceptible to serious damage from youngsters goofing around. Keep your children under control and close by at all times, because you could be responsible for replacing a damaged \$3,000+ mirror let alone running someone's evening (year)!! Alcohol affects your night vision among other things, so please don't drink at HGO. Smoking is very hard on delicate lens coatings.



Be aware of the benches at the south side of HGO, they are really dangerous in the dark! Be sure to bring mosquito repellent, sunscreen, and a hat!

Camping: Camping with, RVs, 5th wheels, camping trailers, and tents is a very sensitive subject, but remember we are the guests of the Placer County Airport when we use the tarmac! As SVAS members, we are only allowed to camp in RVs, Campers, and Tents on our own permit property defined by the east edge of the asphalt airport tarmac and the tree line behind HGO to the east.

An emergency evacuation plan, for large events like Star-B-Q, was worked out between SVAS, the Forrest Service, and Placer County. To allow for an ample sized emergency exit lane, and three to four rows of parking, we may only use a 12' width of tarmac for the first easterly row nearest HGO. This means all vehicles in that row should be parked mostly on the SVAS permit dirt area, to allow room for equipment setup behind your vehicle and inside the 12' tarmac space.

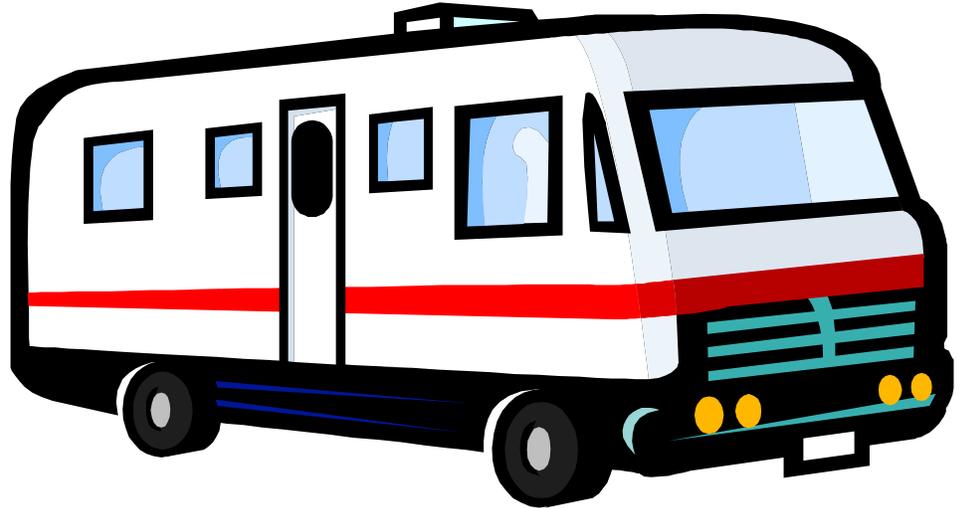
There is only room for a set number of RVs. They must be parked entirely on the SVAS permit dirt area, completely off the tarmac, and should remain all night. Please park with a 4' space or less between vehicles. Set up your telescopes and seating area only to the front or rear of your RV or camper, not to the side. Check with our observatory director, and reserve your space ahead of time.

Campers, and camping trailers may park close together on the northern end of the SVAS permit area, off the tarmac and towards the exit road. Keep the 12' tarmac equipment space in mind.

Tent camping is OK only on the SVAS permit dirt area, behind and to the north of HGO. Please stay clear of the observatories to the south of HGO. Again, no tents, campers, camping trailers, or RVs on the airport tarmac!

Car Camping on the tarmac is now permissible! You may sleep in your car or next to it, in a sleeping bag or on a cot, under the stars.

Due to **Fire Restrictions** no BBQ grill of any type will be allowed, except for the official SVAS grills. No other open flames are allowed. Fire restriction may worsen to no grill at all.



Please don't use any power outlets from HGO for your RV or camping needs, only for telescopes! You may trip a main breaker that we don't have access to! Be aware that generators are very noisy, so locate them away from observers and in a fire safe area. We don't have a garbage pickup or RV hookups, so please carry your waste (including sewage) back with you, and clean up the area when you leave.

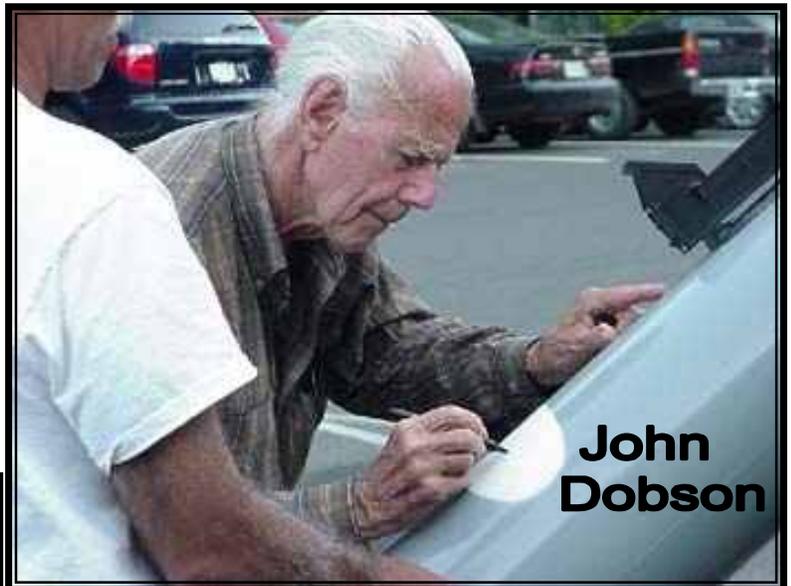
OK, now we have reviewed the rules, lets have a safe and fun Star-B-Q!

SVAS Officers and Board of Directors

*Please read the official formal rules on the SVAS web site, wwwSVAS.org. Any questions? Call or e-mail the Observatory Director, a Board Member, or a SVAS Officer.



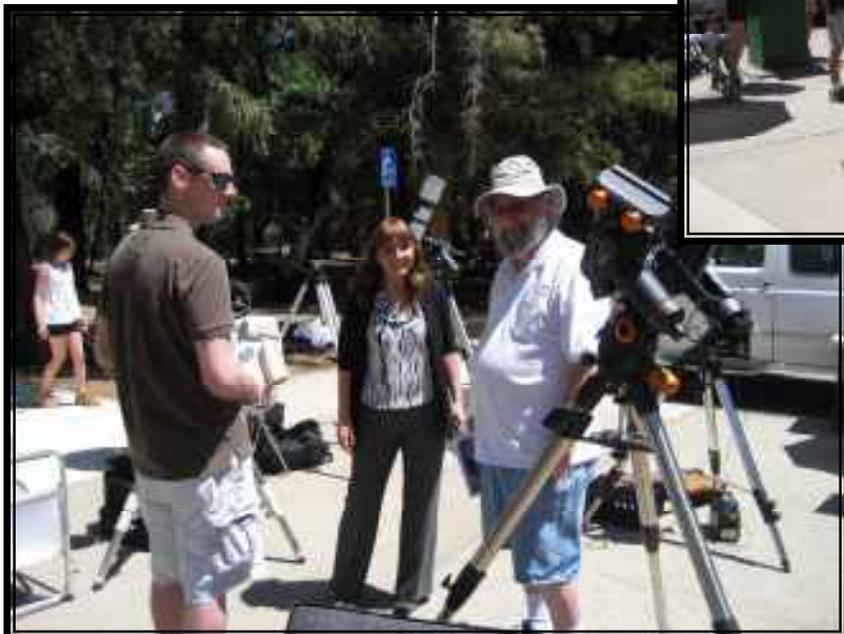
Labor Day weekend will be upon us before you know it, and now is the time to plan your trip to Yosemite. The Forrest Service continues to support astronomy clubs sharing the skies with the park's visitors by offering us free park entrance and free camping! Such a deal, all we need to do is show up and do what we love to do, sharing the heavens with visitors from all over the world. Yes, visitors come from all parts of the globe to see our spectacular park, the vistas from Glacier Point are absolutely breathtaking! Our reward, besides sharing the views is having the pristine dark skies to ourselves later in the evening. Visitors subside in a couple hours, leaving us no city lights, no pollution, very high altitude clear air, but so many galaxies and so little time. Don't fear the crowds in the valley over Labor Day, just plan on staying and camping up top near Glacier Point. Join the fun representing the SVAS on this monumental weekend, be sure to let your favorite Board Member know you will be attending!



John Dobson loved Glacier Point. On one occasion the rangers told him the telescopes had to be taken down before nightfall, declaring "the sky is not part of the park". John replied, "Ah, but the park is part of the sky"! It only took a phone call to the head office to clear up the problem. Do we have John to thank for the countless Glacier Point star parties hosted by astronomy clubs from all over California?



Discovery Museum Solar Viewing



This was a two day event, and the weather definitely cooperated with some pleasantly warm clear days. There were seven scopes Saturday, manned by SVAS volunteers Walt Heiges, Perry P. Porter, Kevin Normington, Wayne Lord, Bill Hagbery, Tom, and Lonnie Robinson. Two scopes were hydrogen alpha. The views in the hydrogen alpha were sensational showing surface granulation, prominences, and flairs, but the standard



Wayne Lord

white and yellow filters had a slight edge when viewing the sunspots. Bill Hagbery brought his giant meteorite, and really had it together for viewing the Sun. Notice the canopy situated just right for viewing in the shade, the cardboard circle on his HA scope shaded the eyepiece, and if that wasn't enough he had several hand held misters and a cold pack to cope with the heat. We all have a lot to learn from Bill's setup!

There were only four of us Sunday, but



Bill Hagbery

the crowds were small. Walt, Kevin, Ralph Merletti, and Lonnie manned the scopes with fairly short lines. It seemed a bit cooler than Saturday, a slight breeze helped a lot. The two photos below, and the ones on the next page, are from the Sunday event.



Walt Heiges

We all agreed it was great to get together and discuss club issues. It makes the next board meeting go

much smoother.

Many thanks to Susan Douglas from the Discovery Museum, for inviting the SVAS for this event. Join us there next year for another great Sun viewing event! They will be moving soon to a new location near downtown, and hopefully the SVAS will be there too.

Observer Editor



Kevin Normington



Ralph Merletti



Ritchie Go-To Continued from page 1

motors could be mounted up or sideways to allow space for the wiring and encoders, while allowing enough room for belt adjustment was the first challenge. Finding the correct toothed gears was really fun. It seems there was only one combination of gear pitch and size that offered the correct shaft diameters matching our existing worm gears and

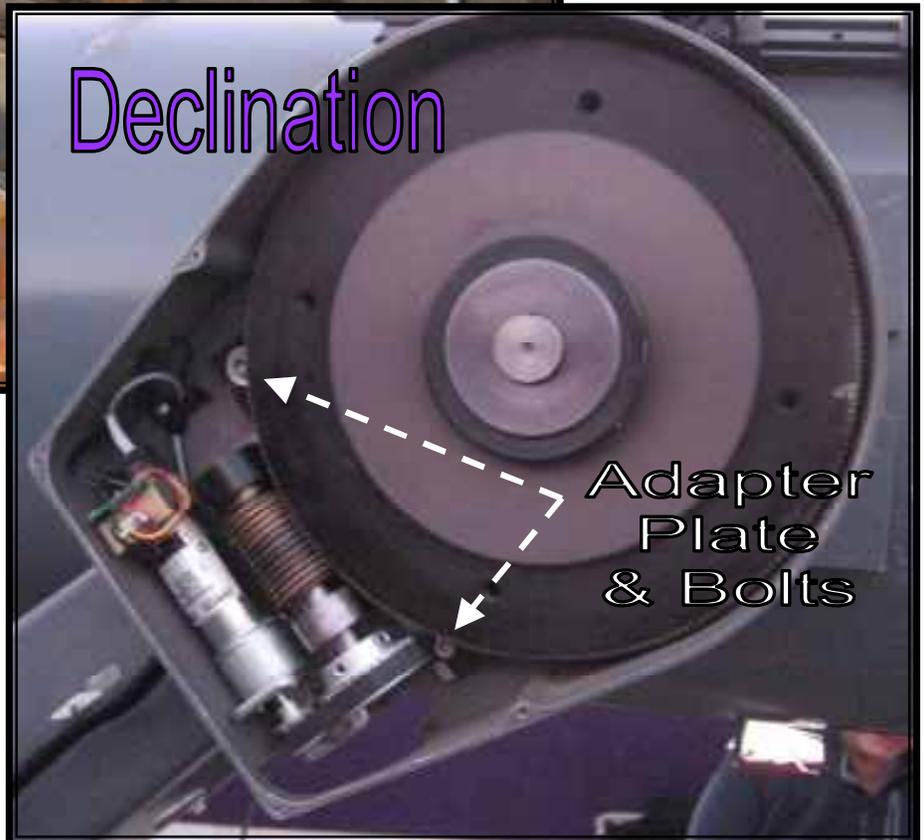
servo motors. After finally finding the correct pulleys, it was even more fun to figure the belt size, and the available on line calculators were very helpful. Having the correct pulleys and belts in hand, it was now time to fabricate the motor mounts.

The right ascension housing had plenty of room once the motor cir-



cuit boards were moved from the horizontal top side of the motors and mounted in a vertical position on the encoders back side. This provided top clearance for the housing cover. The declination housing was another story, offering up extremely tight available space. Before we could begin the installation, it was obvious the declination worm gear mount needed to be altered to allow space for the motor. After careful planning, we decided it would be possible to make an adapter mounting plate that allowed the worm gear mount to be reversed, upside down, making room for the servo motor. you can see the two adapter plate mounting bolts just at the edge of the worm gear. The final installation left only 1/8" extra for belt adjustment, and the motor power plug had to be bypassed by soldering the lead directly to the circuit board for extra clearance. Great fun!

Everything proceeded as planned, and it all came together nicely. The excitement peaked as I turned on the SiTech controller for the first time, and we commented It's alive! What a rush to push the hand pad buttons and watch the massive Ritchey respond effortlessly to our commands. We all breathed a sigh of relief as the system was



checked out, it required only a few adjustments to the worm gear clearance, and a little lubrication to smooth things out.

Now on to calibrating the SiTech controller to the mount encoder ticks per revolution. I tried to figure out the gear ratios mathematically as close as possible by multiplying all the ratios. The numbers were astronomical, after multiplying the encoder ticks, 10x motor gear box, the 2.4x and 3x toothed belt gears, then the 360x and 300x worm gear ratios in the scope, I arrived at close to 18 million encoder ticks per revolution on each axis! The first run at the stars was disappointing, the scope only moved about 2/3 the required distance. I failed to multiply the 500 count encoders by 4x for



quadrature, but after the correction it was still obvious my calculations were incorrect. Bill Thomas, my ATM partner to the rescue. He has a way of cutting to the chase, and knowing the exact needed fix. Bill spent an afternoon helping us find the correct ratios with a laser attached to the scope and rotating it 360 degrees in RA while aligning the start and finish position to a marker on the floor. The Dec was a bit tougher since it would only rotate about 220 degrees (the mount gets

in the way), so we used the degree wheel on the scope. The SiTech software would then calculate the exact encoder ticks per 360 degree revolution, for us to enter in the controller. It took several sessions for each axis, to be averaged together for a final accurate result. Success! The final numbers were close to 14 million ticks, still a huge number, and the first estimate was only off by meager ~4 million ticks! The next session under the stars displayed all our se-



lected objects within the field of view of a low power eyepiece. We then went on to make the final adjustments for slewing speeds.

I gave a lot of thought as to how we would control the new go to system. We had already experienced the difficulty using The Sky on HGO's desktop computer. It was difficult to physically connect to the scope, and a bit awkward to sit at



**Lonnie
Robinson**

the desk to enter telescope commands. I wasn't sure the new system could be configured to our older The Sky program? Phil McDonald shared his great Servo Cat installation with me last year at Blue Canyon, he controls his big 16" Astrosystems Dob wirelessly (with WiFi) from his iPad with Sky Safari software. I was so impressed that my number one 2013 Xmas gift request was a Blue Tooth transmitter for my 16" Dob, and I downloaded Sky Safari to my 8" ASUS Droid tablet for a push to system. iPad with WiFi is a superior system offering extended connection distance, but more pricey. The Droid will not work with WiFi, at least currently, so Blue Tooth with about a 25' connection radius was the solution. I really liked using the touch screen in the dark, and the new Sky Safari proved to be a fantastic planetarium program so I recommended it to control our Ritchey. The costs were very low, and the result is very impressive. We can now walk around HGO controlling the scope wirelessly, and command the Ritchie go-to at the touch of a finger. Members can use their own Droid tablets (or Droid phones) if they like, by simply downloading Sky Safari and connecting to the clubs Blue Tooth. Sky Safari will wirelessly run the Meade 12" also, with the purchase of another Bluetooth transmitter (or serial adapter cable) and the LX200 serial adapter cable. This program has been a joy to use, I know you will like it! Sky and Telescope calls it "a game changer".

Finding a great spot to mount the controller was also a challenge. Routing all the wires was just a mess, so I designed a special table to mount on the tripod with some serious wire management underneath. For years I have experimented with small table tops mounted on telescope tripods. I really like having a place to put charts, (in this case a tablet pc) red flashlights, eyepieces, beverages, all very near the business end of the scope. The trick is keeping it out of the way for observing, and so far it works really well without any issues of scope vibration. Please let me know how you like it, or not. It could be cut smaller if necessary.

Special thanks goes out to Bill Thomas, Bruce Sayre, Stuart Schulz, and Perry P. Porter. Bill was always there to answer any questions and introduce folks who know the system. Bruce offered great advice on the initial system requirements, helping us save a lot of money. Stuart donated over \$500 to the SVAS, so we could add the auto guider feature included in the Servo II controller. Perry, last but not least, offered his total continuing support designing, installing the motors, and tuning the system. Thanks to the SVAS Officers and Board for believing in this project.

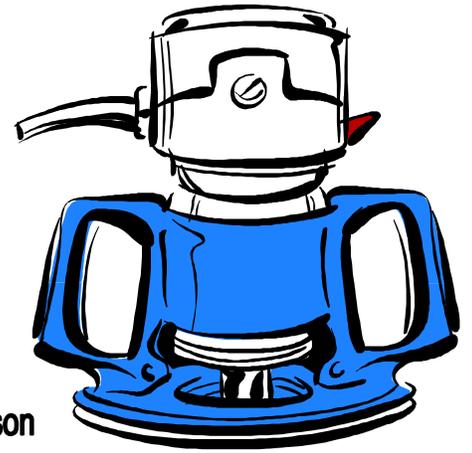
This was indeed a club effort.

Lonnie Robinson

The Mighty Router

Part 3 Router Bits

by Lonnie Robinson



There are trillions of different router bits! OK, perhaps millions. How can we simplify which ones we really need? Buying them separate can cost a lot, and I found some inexpensive sets from Grizzly Industrial that make finances bearable. Lets get started with some broad router bit categories; straight plain cutters, round over, flush-trim and pattern, rabbeting, and a very cool specialty bit called the “bird’s mouth”.

I feel the 1/2” cutter shaft, rather than 1/4”, is a necessity. It makes for smoother cuts, reducing vibrations that can actually cause a 1/4” shaft to break, especially when cutting harder materials like aluminum. Yes, aluminum will cut fairly easily if the cut is shallow, make multiple small cuts, wear protective glasses, use a little lubricant, and proceed slowly. If you use larger diameter cutters that create a lot of centrifugal force, a 1/2” shaft is required. For a relatively small additional cost, let’s go with all 1/2” shafts for safety, function, and convenience.

Double Fluted Straight Bit



Everyone needs a **Straight Bit** in their inventory, it can do a lot of everyday jobs from cutting circles and designs to surface planing and edges. You can make dado cuts (a slot or groove for edge attachment or shelf installation) when using a fence or guide, and even pattern cutting like name plates or address plates, with a set of guide bushings installed in the router base (Harbor Freight offers a great set of very inexpensive brass guides). This should be the first cutter you need to own, I recommend the double cutting blade over a single for a smoother cut.

Roundover



Round-Over Bits are next. They can be purchased with a bearing on the bottom, which will accurately guide the cutter along an edge. Without the bearing and using a fence, the adjustments are super critical. The bearing makes it possible to make round-over cuts while guiding the router freehand. They are available in many different radius’s, and I found a very economical set from Grizzly Industrial that has all the basic sizes. I keep one installed and adjusted in an old router, for handy continued use on most projects.

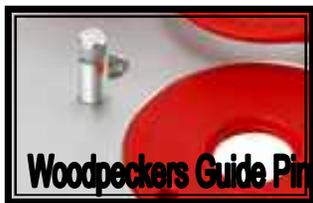
Next in line is the **Pattern Bit and Flush Trim Bit**, they can be used for many jobs. These can be purchased with a bearing on the top or bottom to be used for following a pattern, and you will need one of each. There are also single cutters available with interchangeable top or bottom bearing locations. Patterns are easy to make out of 1/4 inch Masonite, and attach them to the project material with double backed tape. It’s a lot less work to make a very accurate pattern in this soft thin material, than to make your first piece in thick plywood or

Pattern



Flush Trim





solid hardwood, then multiple pieces can be copied quickly and accurately. These bits should be used with the router mounted inverted, in a table, and a guide pin or fence is recommended. This pin mounts near the cutter and supports the piece while cutting. First cut the work piece to a rough shape, reducing the amount of material the router needs to remove on each pass. If the material is thicker than your bit length, simply use the top mounted bearing (nearest the shaft on a pattern bit) and cut the first pass with the pattern on the bottom. Then invert the work piece and change to a bottom (end bearing position like the flush trim bit) mounted bearing to accurately follow the previous cut. Very complex deep patterns can be achieved this way.

A rabbeting bit is very useful in telescope making, like cutting a groove on the inside of the upper cage and focuser plate for the light baffle. It is a square cut around or inside an edge, like a picture frame recess cut to mount photo and glass. They come in sets with several different sized bearings to produce different width cuts.



There is a very cool bit called the **Bird's Mouth**. It is capable of

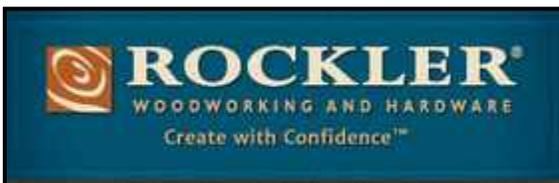
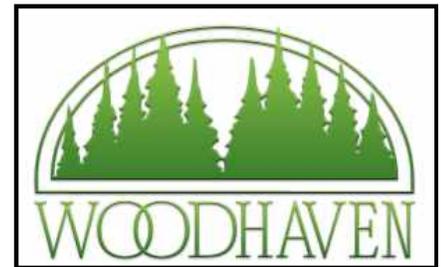
making multi sided round shaped projects,



and I thought it would be very useful in making mirror box corners. It has angled edges that will cut mounting slots for mirror box side pieces. I always find the corners are the most difficult to make, but this bit could make them easy! For those wanting to make wooden optical tubes for smaller scopes, this cutter will make some fancy joints for multi sided wood cylinders. I chose the bit (from LeeValley & Veritas, #27049373) that cuts eight sided projects, it has the correct angles and dimensions for cutting box corners.

In the next articles I will discuss some router projects relating to telescope making. Stay tuned.

Check out my favorite router bit suppliers below.



Folsom Hills Elementary



What a great day for solar viewing, and so many youngsters (300+) enjoying perhaps their first views of the Sun. The teachers included a class lesson about the Sun, then as each class went to lunch they dropped by to view it in our telescopes. This was a very well mannered bunch, they were all extremely polite and very interested. After the last group finished up, one of the teachers presented each of us with a great looking award for being a science hero. Check out the clubs new banners that Walt worked so hard to finish. They looked great! The Sun photo below was taken with a small camera suspended over the eyepiece.



Come join us next time for a fun day sharing our hobby!

Observer Editor





Lonnie's Viewers



Wayne Lord



Walt Heiges



Perry P. Porter & Walt





Gibson Ranch Park Star Party

Saturday, May 17



This was my first visit to Gibson Ranch. After turning in the long driveway off Antelope Road, the immense size of the area was immediately apparent. I finally found our group just across from the main park area, where folks were camping out for the weekend. The sky looked great at sunset, but just after dark some high clouds started to roll in obscuring all but the brightest objects. Nevertheless, we had a great turnout of campers lining up behind the scopes. I was glad they were satisfied only viewing Saturn, Mars, and Jupiter. We did see a globular or two through the haze. The bad seeing made for an early trip home, but still confident we had put on a great show. The park activities director, Del Ray Pope, said she definitely wants us to do it again next year!



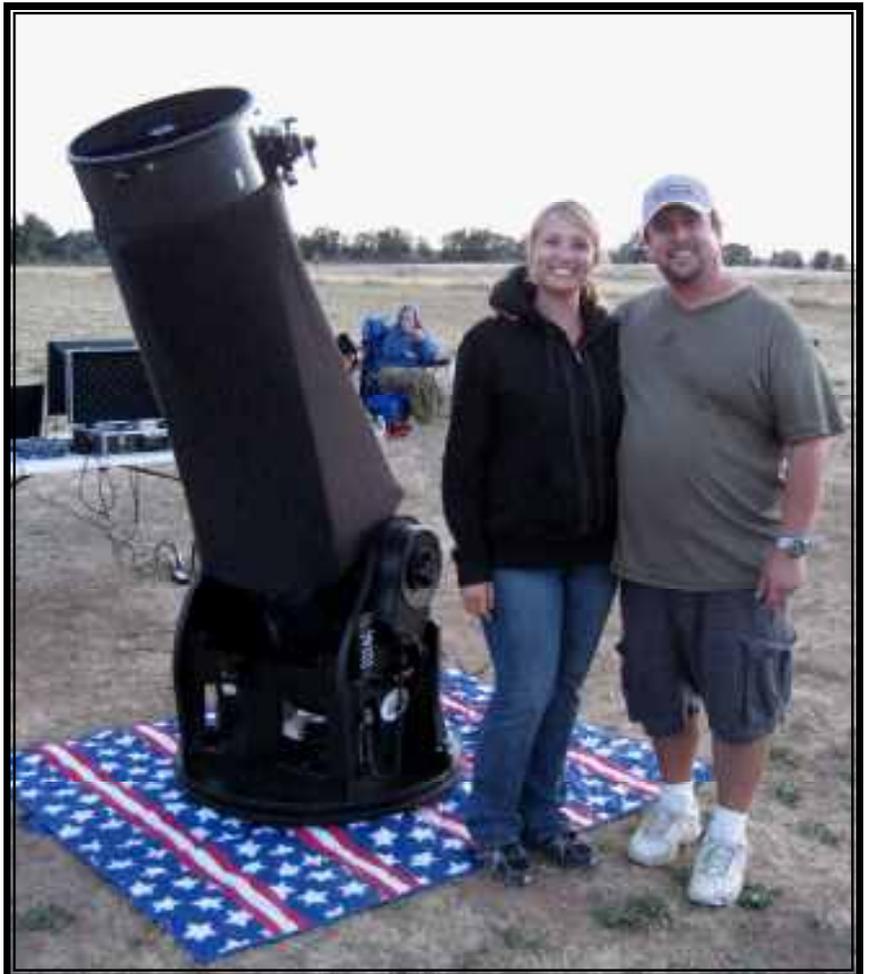
Observer Editor

Gibson Ranch Panorama



Dan & Crystal
Deeble

Check out thier article
about photographing the
Horsehead in this issue!



Capturing the Elusive Horsehead Nebula

by Dan & Crystal Deeble

My wife and I have hunted for the Horsehead nebula on many occasions from our backyard location in Antelope, CA. Our yard is quite possibly a 'worst-case viewing scenario' with three streetlights within 200 feet of our observing area and in a suburban backyard with various neighborhood lights, surrounded by tall trees giving us very little horizon below 25 degrees to work with. On this particular night, we were freezing outside but it was very good seeing and decided to brave it out and see what we could pull up. Normally we're limited in this location to objects brighter than magnitude 8, but we get lucky now and then. The kids were in bed and we knew we'd have at least a few hours to poke around before the cold would finally drive us inside, so my wife began listing targets on her iPad while I directed the scope and configured our NSN connection to broadcast the images.

As we were panning around the Orion Nebula, we decided to go for broke and try to locate the Horsehead. Armed with both digital and paper star charts, we first decided to try and see if the go-to would bless us with a nicely framed target that we could just work on refining - no such luck. Our alignment had been rushed that evening and it was just a bit off, so we couldn't rely on it being accurate enough to target the nebula. We began star-hopping our way through Orion, trying to determine if what we were seeing through the camera lined up with the charts. Slowly we would jump from one to the next, then back because we figured out we had mistaken one star for another. It was agonizing and exciting as this was truly the first time we'd had to navigate on our own! Eventually we settled on exactly the spot where we believed the Horsehead was hiding, but all the screen showed was a dark patch with some faint wispy tendrils of the surrounding nebula. I slowly increased the exposure and gain, trying anything I could think of to give us a glimpse... As I was standing off to the side of the LCD monitor, I noticed that when not looking at it face-on, you could sometimes see what is best described as a 'photo negative' of the camera's image. There wasn't any detail, but you could detect the boundaries of things better than if you were looking at them directly. I continued to play with the camera settings until sure enough, my wife could begin to make out a faint outline on the screen. Something was definitely there! For about the next hour, we tweaked every conceivable camera setting until at last, after almost three hours of searching, the unmistakable shape of the Horsehead came into view!



Crystal and I both yelled with excitement - which, at almost 1AM did NOT delight our neighbors! - and instructed the camera to begin capturing snapshots of the image. Reluctantly, with fingers and toes completely numb, we had to pack it in. But we had done it - we had managed to capture the Horsehead from our less-than-ideal suburban yard! Our next trip is to Loon Lake, and we're hoping that at 6,000 feet and no light dome to contend with, we can really get some spectacular views!

Dan & Crystal Deeble

Save Lick Observatory!

A couple years ago, our president Ross Gorman organized a field trip to Lick observatory. I couldn't go because of work, and was very disappointed to miss an opportunity to see this great historical facility. Now I hear it may need to close because of a lack of funding! We all should make plans to visit soon before it's too late, and better yet investigate how we can help save this national treasure. Check out the Lick website, ucolick.org/save lick/help_save_lick.html for more info.

Located on the 4200' summit of Mount Hamilton, just east of San Jose, it offers up the 36" Lick Refractor (second largest refractor ever made), the 36" Crossley Reflector, the 1 meter (39.37") Nickel reflector, and the 3 meter (118.11") Shane Reflector.

Let's do what we can to save Lick for future generations!

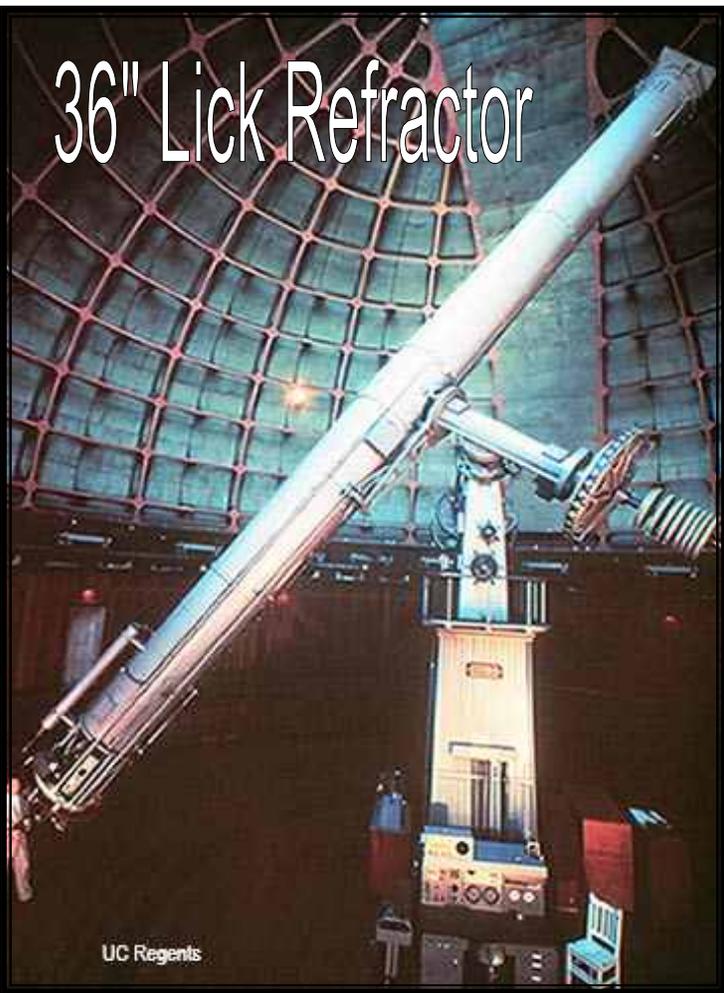
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Photo Credits
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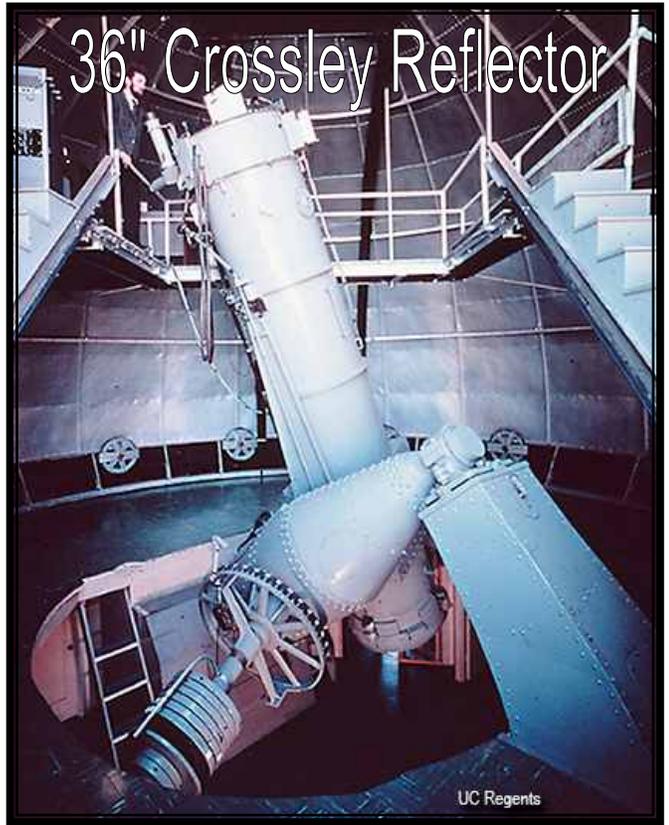


36" Lick Refractor



UC Regents

36" Crossley Reflector



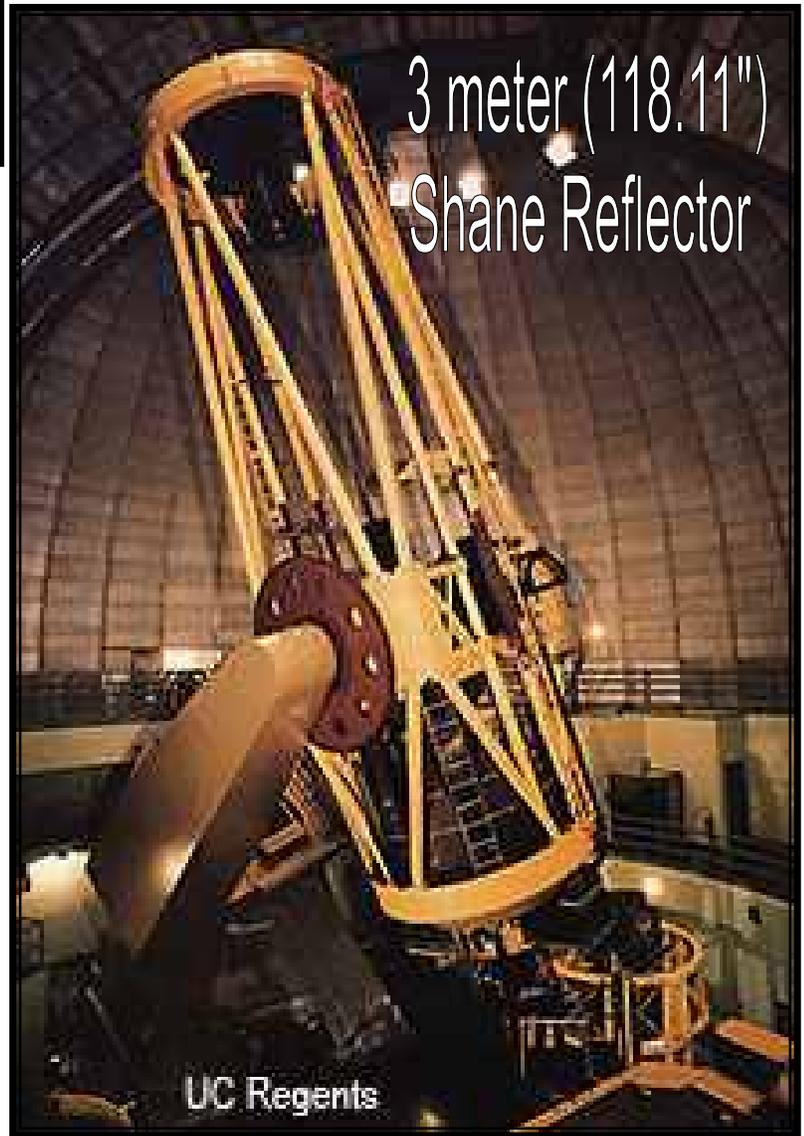
UC Regents

1-Meter (39.37") Nickel Reflector



© Lauriatoteh.com

3 meter (118.11")
Shane Reflector



UC Regents

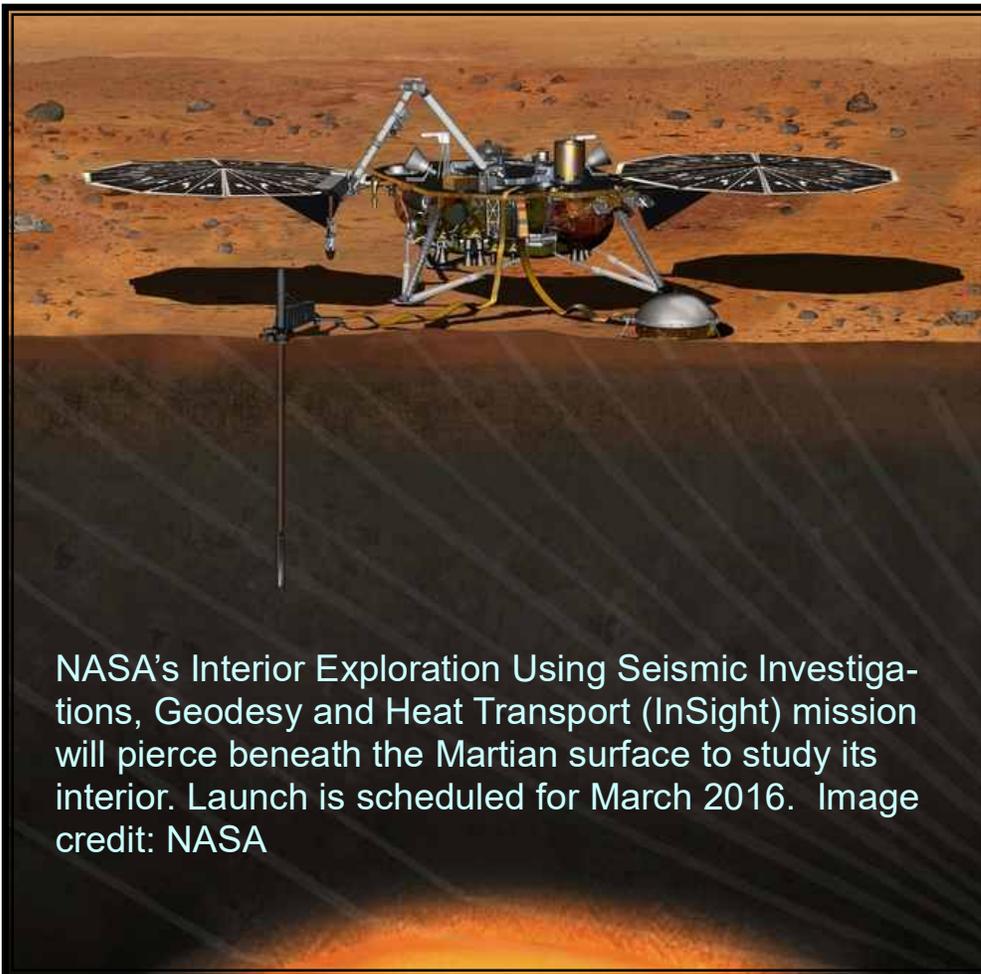
New 2016 Mars Mission



NASA and its international partners now have the go-ahead to begin construction on a new Mars Lander after it completed a successful Mission Critical Design Review on Friday.

NASA's Interior Exploration Using Seismic Investigations, Geodesy and Heat Transport (InSight) mission will pierce beneath the Martian surface to study its interior. The mission will investigate how Earth-like planets formed and developed their layered inner structure of core, mantle and crust, and will collect information about those interior zones using instruments never before used on Mars.

InSight will launch from Vandenberg Air Force Base, on the central California coast near Lompoc, in March 2016. This will be the first interplanetary mission ever to launch from California. The mission will help inform the agency's goal of sending a human mission to Mars in the 2030s.



InSight team leaders presented mission-design results last week to a NASA review board, which approved advancing to the next stage of preparation.

"Our partners across the globe have made significant progress in getting to this point and are fully prepared to deliver their hardware to system integration starting this November, which is the next major milestone for the project," said Tom Hoffman, InSight Project Manager of NASA's Jet Propulsion Laboratory (JPL), Pasadena, California. "We now move from doing the design and analysis to building and testing the hardware and software that will get us to Mars and collect the science that we need to achieve mission success."

To investigate the planet's interior, the stationary lander will carry a robotic arm that will deploy surface and burrowing instruments contributed by France and Germany. The national space agencies of France and Germany -- Centre National d'Etudes Spatiales (CNES) and Deutsches Zentrum für Luft- und Raum-

fahrt (DLR) -- are partnering with NASA by providing InSight's two main science instruments.

The Seismic Experiment for Interior Structure (SEIS) will be built by CNES in partnership with DLR and the space agencies of Switzerland and the United Kingdom. It will measure waves of ground motion carried through the interior of the planet, from "marsquakes" and meteor impacts. The Heat Flow and Physical Properties Package, from DLR, will measure heat coming toward the surface from the planet's interior.

"Mars actually offers an advantage over Earth itself for understanding how habitable planetary surfaces can form," said Bruce Banerdt, InSight Principal Investigator from JPL. "Both planets underwent the same early processes. But Mars, being smaller, cooled faster and became less active while Earth kept churning. So Mars better preserves the evidence about the early stages of rocky planets' development."

The three-legged lander will go to a site near the Martian equator and provide information for a planned mission length of 720 days -- about two years. InSight adapts a design from the successful NASA Phoenix Mars Lander, which examined ice and soil on far-northern Mars in 2008.

"We will incorporate many features from our Phoenix spacecraft into InSight, but the differences between the missions require some differences in the InSight spacecraft," said InSight Program Manager Stu Spath of Lockheed Martin Space Systems Company, Denver, Colorado. "For example, the InSight mission duration is 630 days longer than Phoenix, which means the lander will have to endure a wider range of environmental conditions on the surface."

Guided by images of the surroundings taken by the lander, InSight's robotic arm will place the seismometer on the surface and then place a protective covering over it to minimize effects of wind and temperature on the sensitive instrument. The arm will also put the heat-flow probe in position to hammer itself into the ground to a depth of 3 to 5 yards (2.7 to 4 1/2 meters).

Another experiment will use the radio link between InSight and NASA's Deep Space Network antennas on Earth to precisely measure a wobble in Mars' rotation that could reveal whether Mars has a molten or solid core. Wind and temperature sensors from Spain's Centro de Astrobiologia and a pressure sensor will monitor weather at the landing site, and a magnetometer will measure magnetic disturbances caused by the Martian ionosphere.

InSight's international science team is made up of researchers from Austria, Belgium, Canada, France, Germany, Japan, Poland, Spain, Switzerland, the United Kingdom and the United States. JPL manages InSight for NASA's Science Mission Directorate, Washington. InSight is part of NASA's Discovery Program of competitively selected missions. NASA's Marshall Space Flight Center in Huntsville, Alabama, manages the Discovery Program. Lockheed Martin will build the lander and other parts of the spacecraft at its Littleton, Colorado, facility near Denver.

For more about InSight, visit:

<http://insight.jpl.nasa.gov>

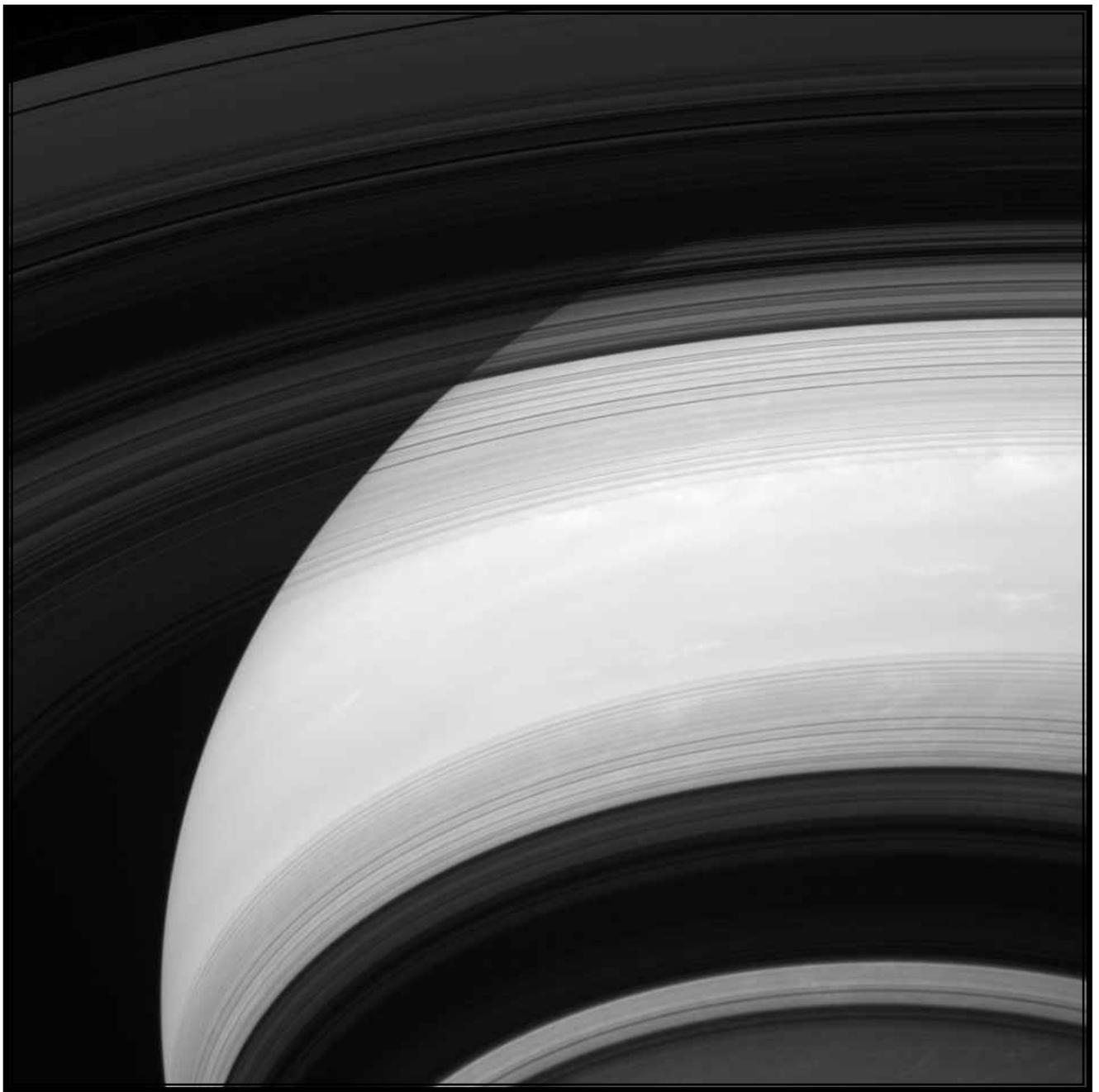
For Sale

Meade 10" f4/5 Newtonian Scope for sale.

Completely gone through and modified to make it easier and safer to use. The feet now have leveling adjusters and the drive motor has an on/off switch. The bands that secure the tube assembly are trapped so they can't come off. Both RA and Dec pivots were cleaned and greased, the drive clutch was cleaned and adjusted. The optic's are typical high quality Meade. The original 1.25 plastic focuser has been replaced with a metal 2" Orion with a 1.25" adapter. The mirror's were cleaned and collimated. The scope comes with two eyepieces, a 1.25/15mm Kellner and a 40mm Scopetronix Maxview 2". A Stellarvue 8x50 right angle correct view finder that accepts 17 to 40mm eyepieces, and a Telrad are included. Designed for visual observations, it works fine with today's fast rate imagers (with careful polar alignment) and quite well with Orion's Deep Space Video Camera. Asking \$1000,00. Contact Tim Tingey (916) 685-0935



M E A N D A Y M O O N S W O O D S



Saturn's rings cast shadows on the planet, but the shadows appear to be inside out! The edge of Saturn's outermost A ring can be seen at the top left corner of the image. Moving towards the bottom of the page, one can see the faint Cassini Division, the opaque B ring and the innermost C ring, which contains several ringlets that appear dark against Saturn in this geometry. The bottom half of the image features the shadows of these rings in reverse order superposed against the disk of the planet: the C ring, the B ring, the Cassini Division and the inner half of the A ring.

This view looks toward the unilluminated side of the rings from about 28 degrees below the ring plane. The image was taken with the Cassini spacecraft wide-angle camera on Dec. 2, 2013, using a spectral filter which preferentially admits wavelengths of near-infrared light centered at 752 nanometers.

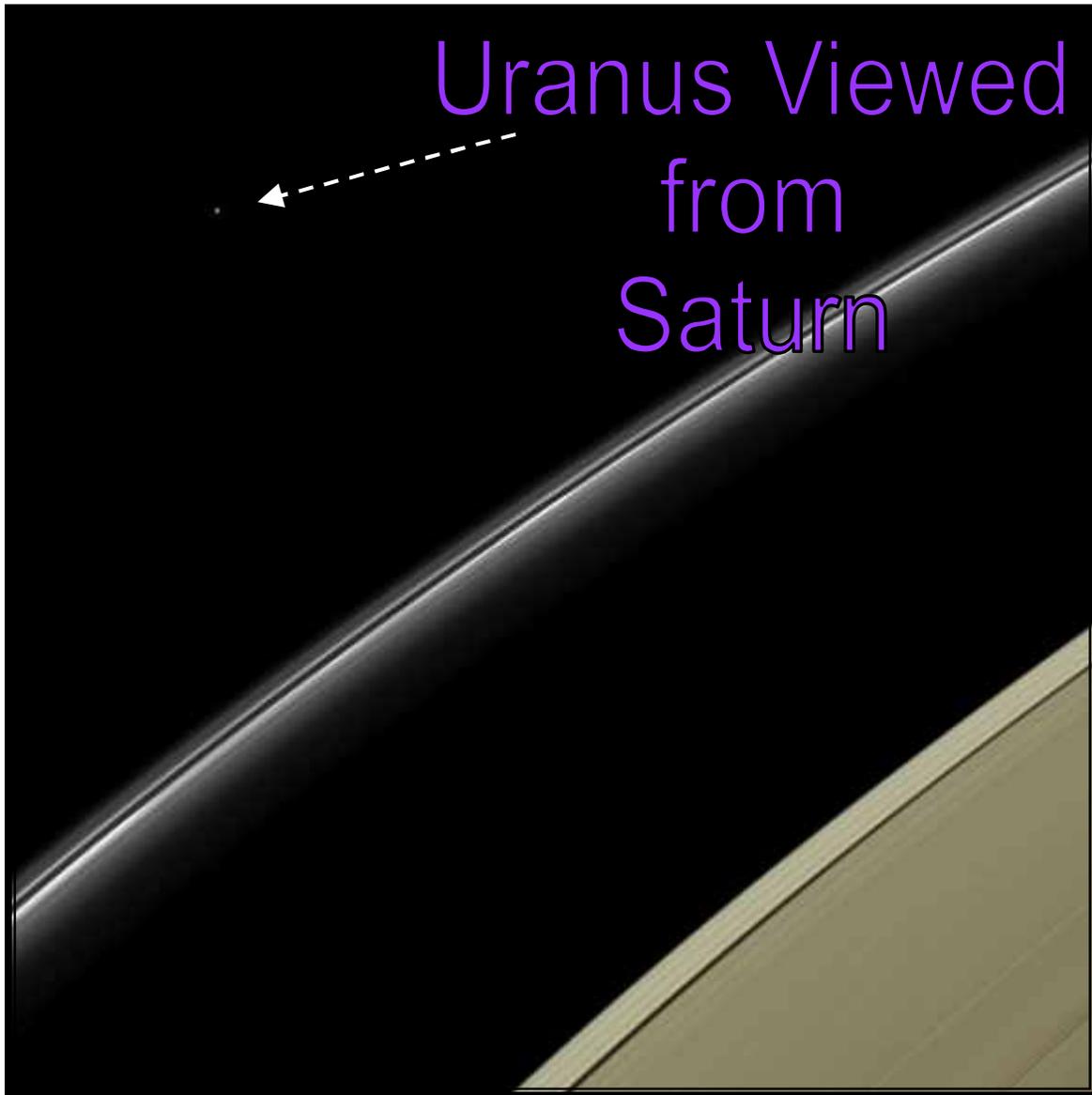
The view was acquired at a distance of approximately 750,000 miles (1.2 million kilometers) from Saturn and at a Sun-Saturn-spacecraft, or phase, angle of 57 degrees. Image scale is 45 miles (72 kilometers) per pixel.

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the mission for NASA's Science Mission Directorate, Washington, D.C. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL. The imaging operations center is based at the Space Science Institute in Boulder, Colo.

For more information about the Cassini-Huygens mission, visit <http://www.nasa.gov/cassini> and <http://saturn.jpl.nasa.gov>. The Cassini imaging team homepage is at <http://ciclops.org>.

Image Credit: NASA/JPL-Caltech/Space Science Institute

This view from NASA's Cassini spacecraft features a blue planet, but unlike the view from July 19, 2013 (PIA17172) that featured our home planet, this blue orb is Uranus, imaged by Cassini for the first time. Credit: NASA/JPL-Caltech/Space Science Institute



NASA's Cassini spacecraft has captured its first-ever image of the pale blue ice-giant planet Uranus in the distance beyond Saturn's rings.

The robotic spacecraft briefly turned its gaze away from the ringed beauty of Saturn on April 11, 2014, to observe the distant planet, which is the seventh planet from the sun.

The planets Uranus and Neptune are sometimes referred to as "ice giants" to distinguish them from their larger siblings, Jupiter and Saturn, the classic "gas giants." The moniker derives from the fact that a comparatively large part of the planets' composition consists of water, ammonia and methane, which are typically frozen as ices in the cold depths of the outer solar system. Jupiter and Saturn are made almost entirely of hydrogen and helium, with smaller percentages of these ices.

When this view was obtained, Uranus was nearly on the opposite side of the sun as seen from Saturn, at a distance of approximately 28.6 astronomical units from Cassini and Saturn. An astronomical unit is the average distance from Earth to the sun, equal to 93 million miles (150 million kilometers). At their closest - once during each Saturn orbit of nearly 30 years - the two planets approach to within about 10 astronomical units of each other.

In addition to its aesthetic appeal, Cassini's view of Uranus also serves a practical purpose. Scientists working on several of Cassini's science investigations expect that they will be able to use images and spectra from these observations to help calibrate their own instruments.

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Information about Cassini is available at the following sites: <http://www.nasa.gov/cassini> <http://saturn.jpl.nasa.gov>



Crescent Saturn

Saturn, which appears as only a thin, lit crescent, broken only by the shadows of its rings, poses gracefully for the Cassini spacecraft cameras. This view looks toward the unilluminated side of the rings from about 42 degrees below the ringplane. The image was taken with the Cassini spacecraft wide-angle camera on Sept. 20, 2013 using a spectral filter which only admits wavelengths of near-infrared light centered at 752 nanometers.

The view was obtained at a distance of approximately 1.4 million miles (2.3 million kilometers) from Saturn and at a Sun-Saturn-spacecraft, or phase, angle of 142 degrees. Image scale is 84.5 miles (136 kilometers) per pixel.

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