

# GuideStar



October, 2014  
Volume 32, #10

## At the October 3 Meeting

### Techno-Stories from Space

Don Pettit, NASA astronaut



Frontiers are interesting places; they offer the possibility to make observations outside our normal range of experience. The International Space

Station is such a frontier offering a local reduction in acceleration forces by nearly a factor of a million. This allows the observation of subtle phenomena that are typically masked on Earth. This orbital vantage also allows observation of Earth phenomena on the length scale of half a continent. A smattering of my observations will be presented. There will be many questions and few answers, which of course is a characteristic of being on a frontier and why we venture there.

**The GuideStar is the winner of the 2012  
Astronomical League Mabel Sterns  
Newsletter award.**



The Houston Astronomical Society is a member of the Astronomical League.

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#### HAS Web Page:

<http://www.AstronomyHouston.org>

See the *GuideStar's* Monthly Calendar of Events to confirm dates and times of all events for the month, and check the Web Page for any last minute changes.

All meetings are at the University of Houston Science and Research building. See the last page for directions to the location.

Novice meeting:.....7:00 p.m.

“Reflector Telescopes” —

See page 7 for more information

General meeting: .....8:00 p.m

*See last page for directions and more information.*

## The Houston Astronomical Society

The Houston Astronomical Society is a non-profit corporation organized under section 501 (C) 3 of the Internal Revenue Code. The Society was formed for education and scientific purposes. All contributions and gifts are deductible for federal income tax purposes. General membership meetings are open to the public and attendance is encouraged.

### Officers

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### Advisors

Dr. Reginald DuFour, Rice Univ.  
 Dr. Lawrence Pinsky, U. of H.  
 Dr. Lawrence Armendarez, U. of St. Thomas

### Dues and Membership Information

Annual Dues:Regular .....\$36  
 Associate.....\$6  
 Sustaining .....\$50  
 Student.....\$12  
 Honorary..... N/C

All members have the right to participate in Society functions and to use the Observatory Site. Regular and Student Members receive a subscription to *The Reflector*. *The GuideStar*, the monthly publication of the Houston Astronomical Society is available on the web site. Associate Members, immediate family members of a Regular Member, have all membership rights, but do not receive publications. Sustaining members have the same rights as regular members with the additional dues treated as a donation to the Society. *Sky & Telescope* and *Astronomy* magazines are available to members at a discount.

**Membership Application:** Send funds to address shown on last page of *GuideStar*. Attention - Treasurer, along with the following information: Name, Address, Phone Number, Special Interests in Astronomy, Do you own a Telescope? (If so, what kind?), and where you first heard of H.A.S. You can also join (or renew at the organization web site, [www.astronomyhouston.org](http://www.astronomyhouston.org).

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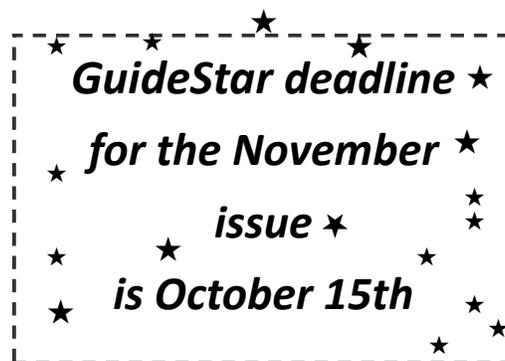
## Other Meetings...

**Johnson Space Center Astronomical Society** meets in the the Lunar and Planetary Institute on the 2nd Friday of each month. Web site: [www.jscas.net](http://www.jscas.net)

**Fort Bend Astronomy Club** meets the third Friday of the month at 8:00 p.m. at the Houston Community College Southwest Campus in Stafford, Texas [http://www.fbac.org/club\\_meetings.htm](http://www.fbac.org/club_meetings.htm). Novice meeting begins at 7:00 p.m., regular meeting begins at 8:00 p.m. Website: <http://www.fbac.org>

**North Houston Astronomy Club** meets at 7:30 p.m. on the 4th Friday of each month in the Teaching Theatre of the Student Center at Kingwood College. Call 281-312-1650 or E-mail [bill.leach@nhmccd.edu](mailto:bill.leach@nhmccd.edu). Web site: [www.astronomyclub.org](http://www.astronomyclub.org)

**Brazosport Astronomy Club** meets the third Tuesday of each month at the Brazosport planetarium at 7:45 p.m. The Brazosport planetarium is located at 400 College Boulevard, Clute, TX, 77531. For more information call 979-265-3376



## President's Message

by Bill Pellerin, President

### All Clubs Meeting

The 2014 All Clubs meeting is on November 7, 2014 at the Houston Museum of Natural Science. Information on this event is available at this web address:

[http://www.astronomyday.net/regional\\_meeting.html](http://www.astronomyday.net/regional_meeting.html)

Note that this date is the first Friday of November, the Annual Meeting of the Houston Astronomical Society would otherwise be on this day. The board unanimously recommends to the membership that we defer the Annual Meeting to December. This will be voted on by the membership at the October meeting.

### Parking for the HAS Meeting

Parking for the HAS meeting is in a new place due to the new football stadium. This new parking place will be the permanent location for parking going forward. See the information in this *GuideStar* or on the HAS web site.

### Bylaws revisions—notice of vote!!

Changes to the bylaws of the Houston Astronomical Society were presented to the board by three members of the executive committee - Bill Pellerin (president), Rene Gedaly (vice-president), and Bill Flanagan (Secretary). (Scott Mitchell has also helped with the review.) The purpose of the modifications was to make the document easier to read and understand and to resolve some issues that get in the way of the organization being able to conduct its business.

The board voted unanimously (in the 9/17/2014 board meeting) to support the adoption of the modified bylaws. Bylaws changes must be approved by the membership and will be presented at an upcoming meeting.

A summary of the changes and a copy of the original and the proposed bylaw documents is on the HAS web site, [www.astronomyhouston.org](http://www.astronomyhouston.org), and a summary of the changes is included in this issue of the *GuideStar*.

**There will be a vote by the membership, as required by the bylaws, to accept these revisions. The vote will be held at the Annual Meeting (see information under the All Clubs Meeting about the date of the Annual Meeting) of the HAS.**

Copies of the existing bylaws, the proposed bylaws, and a description of the changes in the bylaws are available on the HAS web site: [www.astronomyhouston.org](http://www.astronomyhouston.org).

### Other matters from the board meeting:

- Our vice-president, Rene Gedaly, leading our nominating com-

mittee announced that they now have candidates for all available positions. Elections are at the annual membership meeting.

- A budget request for web-hosting of our meeting videos was approved, and a budget request for a one-time purchase of a backup hard drive was approved.
- A proposal to establish a commercial relationship with our website hosting service ([www.astronomyhouston.org](http://www.astronomyhouston.org)) was accepted.
- A request from the observatory committee to fund the establishment of additional parking and camper spaces, and to improve existing camper spaces, was approved.

Cheers,

*..Bill Pellerin*

President

## ***Summary of Proposed Bylaws Changes***

### TABLE 1. SUBSTANTIVE CHANGES

<i>Article</i>	<i>Section</i>	<i>Item</i>	<i>Proposed change</i>
Article IV: MEMBERS	S2: DUES	1, 2	Deadline for dues is March 31 – lose membership benefits afterwards -- reinstatement
		3	Clarify that dues are prorated for new members (only) Remove redundant wording
	S3: VOTING PRIVILEGES		
	S4: MEETINGS	2	Add ability to change the month of the Annual Meeting
	S5: NOTICE OF MEETINGS		Update definition about how meeting notices are delivered
Article V: OF- FICERS	S6: QUORUM AND VOTING		Change the level of membership attendance required to establish a quorum from 15% to 10%
			List the meetings that require a quorum to vote
			Specify when Secretary must keep minutes
Article VI. COMMITTEES	S5: DUTIES OF OFFICERS	3	
		1(h)	Rename Education Committee the Education & Outreach Committee
		1(i)	
		1(i)	Dissolve Welcoming Committee
		2(d)	Create Membership Committee
	4(h)		
	4(i)	Remove requirement to present committee reports at Annual Meeting  Define function of Education & Outreach Committee  Define function of Membership Committee	
S3: NOMINATING COMMITTEE	3	Add directors to list of nominated positions	
Article VII. BOARD OF DI- RECTORS	S2: ELECTION OF DIRECTORS	4	New item. Clarify that the election of the board is held at the Annual Meeting
		1-4	Reorder items into sequence: Qualifications, Nominations, Vacancies, Election
Article XI. METHOD OF ELECTION Provisos	S2: METHOD	2	Change the number of members required to tally votes
			Remove the proviso section at the end of the Bylaws. It refers to the conversion and prorating of dues for sustaining members during 1997, and carries forward to this day if not removed

*Continued on next page...*

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## TABLE 2. CHANGES TO MAKE BYLAWS EASIER TO READ

<i>Proposed change</i>	<i>Example</i>
Use the same terms	Is it bylaws or By-Laws or Bylaws? Standard terms are defined in the <i>Bylaws Style Guide</i>
Use parallel structure and phrasing	Many astronomers are also excellent communicators. And use good grammar
Use the present tense of verbs forms throughout the bylaws	<i>See above</i>
Use consistent punctuation and formatting	Punctuation conventions are defined in the <i>Bylaws Style Guide</i>

Pin down what “shall” means by replacing it with another choice:

The Board of Directors <b>shall</b> meet at least once each quarter...	Must they? Yes	The Board of Directors <b>must</b> meet at least once each quarter...
Meetings <b>shall</b> also be called upon written request of three (3) members...	Must they? No, but they can if they want to	Meetings <b>may</b> also be called upon written request of three (3) members...
The name of this corporation <b>shall be</b> HOUSTON ASTRONOMICAL SOCIETY	21 <sup>st</sup> century? No, and stop shouting	The name of this corporation <b>is</b> the Houston Astronomical Society.

# October/November Calendar



Date	Time	Event
<b>October</b>		
1	2:23 p.m.	First Quarter Moon
3	7:00 p.m.	HAS Novice Meeting, U of H
	8:00 p.m.	HAS General Meeting, U of H
8	5:50 a.m.	Full Moon (early a.m. Lunar Eclipse)
14	2:12 p.m.	Last Quarter Moon
18		Prime Night, Columbus Site
19	2:00 a.m.	Comet C/2013 A1 Siding Spring grazes Mars
21		Orionid meteors peak
23	4:55 a.m.	New Moon
	4:00 p.m.	Partial Solar Eclipse begins low in the WSW
30	9:48 p.m.	First Quarter Moon
<b>November</b>		
1	8:00 a.m.	Mercury at greatest elongation west
2	2:00 a.m.	Daylight Savings Time ends, move clocks back 1hr
6	4:22 p.m.	Full Moon
7	7:00 p.m.	Regional All Clubs Meeting, HMNS Arnold Space Hall
8	3:00 p.m.	Astronomy Day, George Observatory
14	9:17 a.m.	Last Quarter Moon
17	4:00 p.m.	Leonid Meteors Peak
22	6:31 a.m.	New Moon
		Prime Night, Columbus Site

Send calendar events to Doug McCormick - [skygazer10@sbcglobal.net](mailto:skygazer10@sbcglobal.net)

For the latest information on club events, go to <http://www.astronomyhouston.org/>

## HAS Board Meeting

HAS Board meetings are scheduled regularly (see the calendar, above). All members are invited to attend these meetings, but only board members can vote on issues brought before the board.

Meetings are held at the Houston Arboretum at 7:00 p.m. on the date specified.



★ Follow the *GuideStar* on Twitter at:

★ ***GuideStar\_HAS***

★ Join Facebook and look for:

★ ***Houston Astronomical Society***

★ ***Starline***

★ Call 832-go4-HAS0 (**832-464-4270**) for the latest information on the meeting and other information about activities within the HAS.

★ ***Event Notification or Cancellation***

★ HAS uses [RAINEDOUT.NET](http://RAINEDOUT.NET) to communicate late breaking updates about our various events. . Message delivery is via text messaging and e-mail. There are several ways to subscribe. If you would like to receive these notices via text messaging directly to your phone, subscribe to any of the sub-groups which interest you as follows:

★ To receive text messages, send any or all of the following (one at a time) to **84483**

★ You will receive a confirmation message back for each successful enrollment.

<i>Text Message</i>	<i>Alerts about...</i>
OUTREACH	Public Outreach Events
STARPARTY	Members Only Star Parties (HAS observ-
URBAN	Urban Observing Events
MEETINGS	HAS Meetings

★ You may also enroll your phone numbers or individual e-mail addresses via the website:

★ Here's a shortened link to get you there: <http://goo.gl/evrGsR>

★ For more information, please visit [www.RainedOut.net](http://www.RainedOut.net).

★ RainedOut notices will also automatically be sent to our e-mail list. Note that regular e-mail list conversations are not part of RainedOut communications and will not be sent to your phone as part of this service. Instructions to sign up for the e-mail list (a great way to keep your finger on the pulse of the club) are found here:

★ <http://www.astronomyhouston.org/about/email-list>.



## Observations... of the editor

by Bill Pellerin, GuideStar Editor

### More Refractor Info —

I gave the novice presentation in September on refractor telescopes. That presentation is now available in the HAS forums area if you're interested in reviewing it.

I added one topic in the presentation that's posted. I was asked after the presentation if there is a filter that correct for chromatic aberration. Yes, there is. It's called a -V (minus V) filter. You can buy these from various vendors of astronomy equipment.

They work by stopping some of the violet (and infrared) light from getting through the telescope to your eyeball. All well and good, but as usual, there's no free lunch. Using one of these filters makes the overall view greenish looking (if you're trying to convince someone that the Moon is made of green cheese one of these might be helpful). By filtering out the violet light the filter is dimming the entire view of the telescope. I would recommend one of these for lunar and planetary observing where the object is bright and a bit of light loss isn't a problem. For star fields there's not much benefit.

I skipped by the issue of arc-seconds per pixel for imaging. This is true for any type of telescope that you might use.

Here's how you calculate arc-seconds per pixel.

$\text{Arcsec/pixel} = (\text{pixel size in } \mu\text{m}/\text{focal length of the telescope}) \times 206.3$

That is... pixel size in micrometers divided by the focal length of the telescope, with that result multiplied by 206.3

Telescope focal length is 540 mm

Pixel size = 4.4 microns (see the specifications for your camera or imaging chip.

So...  $(4.4/540) \times 206.3 = 1.68$  arc-seconds/pixel

The right arc-seconds/pixel ratio required is different for different uses. For doing variable star work you want the arc-seconds/pixel number to be smaller than the average 'seeing' which is typically 2 or more arc-seconds to spread the light over multiple pixels (and average out the difference in sensitivity among the pixels.

It's always a trade off with imager size, telescope focal length, and field of view needed.

*Until next time...*

*clear skies and new moons!*

*..Bill*

## **Novice Presentation—October, 2014**

### **Reflector Telescopes—**

By Debbie Moran

This month we have the finale of the Telescope Series with a talk by long time member and optics expert Fred Garcia about reflector telescopes. This is one of the most versatile and popular of all designs for amateurs with good value for the aperture and simplicity of set up in the case of a Dobsonian mount. But a knowledge of collimation of the optics is a must. Come hear this talk before you decide on a telescope to call your own.

We do have a November speaker scheduled, the delightful Bill Spizzirri who will recount his visit to the Spin Cast Mirror Lab at

the University of Arizona. This lab revolutionized mirror design for today's professional telescopes, fashioning them out of spun molten glass instead of grinding them as had been done in the past. We hope to hear this talk at the next opportunity if the November meeting is re-scheduled due to the All-Clubs meeting on the same date.

# Observatory Corner

*By Mike Edstrom, Observatory Director*



Today I had a report that there are six 18 wheelers lined up at the drilling site North and East of the Dark Site with drilling equipment we'll just have to wait and see what is going to happen, they may be drilling a second well at that site.

We are coming into peak observing time of the year with the first cool front now is the time to take advantage of HAS's most valued asset the Dark Site. Please remember to fill out your observing log and put it in the center box on the observing field.

On November 1st the Observatory committee will meet at the Dark Site at 2:00 pm any HAS member is welcome to come and take part in the meeting. If you are planning on coming to the meeting and want to stay and eat with us please RSVP by October 27<sup>th</sup> so we can buy enough food. If you have suggestions or comment for the committee please send them to [hasobschair@astronomyhouston.org](mailto:hasobschair@astronomyhouston.org) and I will bring them up in the meeting.

As you visit the Dark Site we invite you to make suggestions as to improvements you would like to see please put the on the log sheets.

As a safety reminder please read the sign posted on the side of the metal building at the Dark Site which has directions to the hospital and contact information for the sheriff's department it also has the address to the site in case of a medical emergency.

## **And the Work Goes On**

I need to remind everyone that we need to start filling out Log Reports at the site so I can give this information to the Fondren Foundation. The property is on a 99 year lease and part of the Lease agreement is that HAS needs to report every year to the Fondren Foundation that the property is being used. The Log Reports are located in the box in the middle of the field. Just open the cover, fill out the report and then slide it into the slot that is in the inside of the cover and then close the box. It is very important that everyone fill out a Log Report so that we are showing that the Observing site is being used. Your help on this is very much appreciated.

If you have a Randalls card, and have not done so, please have it coded for the Houston Astronomical Society. Our number is #6618. The Society gets 1% of the gross sales that member spends at Randalls. Randalls totals up the amount spent each quarter and will send us a check if the amount goes over \$2,500, otherwise the total roles over to the next quarter of zeros out at the end of the calendar year. So please link your Randalls card to the Houston Astronomical Society so

that the society can benefit from this Randalls program. This is very easy to do, just go to the Courtesy Booth and tell the person there what you want to do.

*Mike Edstrom*

[medst22531@msn.com](mailto:medst22531@msn.com)

[hasobschair@astronomyhouston.org](mailto:hasobschair@astronomyhouston.org)

## Just Looking

### A GuideStar Interview by Clayton L. Jeter

## Mike Edstrom—Observatory Chair



You seem to meet the nicest people out at our dark site/observatory out in Columbus. Mike Edstrom, our Observatory Chairperson is one of those folks. Through the years at our clubs meetings, at the dark site, or out west at TSP, Mike and I have had lots of chats and even more laughs together. During one of those chats we



discovered that we were not only both in the Army but stationed at Fort Eustis Virginia near Newport News about the same time. We both worked in Aviation. Small world.

Mike has really reached in and tackled

the ins and outs of amateur astronomy. Not only is he a workhorse out at our site, but he has recently built himself a beautiful private observatory on the field there.

If you haven't been introduced to Mike before, then you will now. Meet Mike Edstrom...

### **The Mike Edstrom bio...**

I was born in Lincoln Nebraska and raised in Wahoo, Nebraska a town of 3,500. I graduated from high school in 1966 and attended the University of Nebraska Lincoln for 2 semesters. I joined the Nebraska Army National Guard in 1967 and retired in 1988. I had several jobs in the aircraft industry and later in the retail clothing business. In 1978 I went to work for Sysco Foodservice in Lincoln Nebraska in 1992 I was promoted to the corporate office in Houston. I retired from Sysco on June 30, 2014 after 35 years.

My wife's name is Debbie and we have 3 children ages 28, 30 and 32, we live in Katy TX which is very convenient to get to the Columbus Dark Site.

In the fall of 2000 Don Selle invited me to go to the Dark Site. We used the f/7 that night to star hop and find several Messier items and that's all it took and I was hooked. I asked Santa for a Celestron C-8 on a CGE mount and in February of 2001 I joined HAS.

I have served on the board of HAS for several years as a Director at

Large, Star Party Chairman and Vice-President I also served on the Observatory Committee. While serving on the Observatory Committee I worked on several projects reworking the gears and computer controls of the C-14, stripping the old floors in the observatory and chart room for painting, and the installation of the internet system at the Dark Site.

In 2013 with the untimely passing of my good friend Bob Rogers I was asked to run for the Observatory Chairman's position and thanks to the members of HAS I was elected. In the past year, mainly due to a great committee, we have made several improvements to the Dark Site. We have leased all of the "Private Observatory" sites that Bob Rogers was instrumental in getting started. We have installed a weather station consisting of a weather conditions station and an All Sky Cam which are available on the HAS website.

### **The Mike Edstrom interview...**

**Clayton:** Hi Mike, it's great to be able to slow you down from all your work out at the site and of course your long "Honey-do-List" at home for this interview. So let's get started...

I know the f/7 in the observatory has pristine optics, but just what was it about that first night that hooked you? Remember any Messier objects from that evening that blew you away?

**Mike:** Thanks Clayton, yes the f/7 was

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the first scope I was able to use at the Dark Site with the help of Don Selle. It has been a number of years, but Don had me star hop to a Globular Cluster I don't remember which one but when I actually could find one I was hooked. I think the next thing was the 7 Sisters. After that, if I remember correctly, Allen Gilchrist was on the C-14 and we spent time with him.

**Clayton:** Santa brought you a Celestron C-8 on a CGE mount...how was that scope? Were the goto's accurate?

**Mike:** The goto's on the CGE were very accurate and tracking for visual was good enough. I tried astrophotography with it and for short exposures it would work, but when I went to long exposures it just didn't track well enough so I went to the CGEM.

**Clayton:** How did you become so involved with HAS and why?

**Mike:** After spending the night at the site with Don and Alan. Don invited me to an HAS meeting where I met several people including Bob Rogers, I joined that night.

**Clayton:** You seem to be very much into astrophotography, a hobby within a hobby. What equipment are you using and how are your results?

**Mike:** I have used several pieces of equipment including a DSI-1, DSI-2, Canon 350D Canon T2i and now a QHY-9C camera along with an Orion Mini Autoguider. My telescopes are the Celestron C-8, an Orion 80mm and now a 6" Astro Tech RC. As for results the equipment has all been great it's the user that has the large learning curve and I'm still working at that.

**Clayton:** Tell us a bit about your new private observatory out at the site? Do you have an extra key that I could borrow? We are best friends, right?

**Mike:** Sure I'll rent you a key. When Bob Rogers, Ed Fraini, Don Selle and Allen Wilkerson showed the plans at the board meeting to get approval I was fascinated. The thought of having a place I could setup my scope and other equipment and not have to take it down then reset it the next time was a great opportunity. Don Selle and I decided that if we built them together we could learn from each other and not make too many mistakes. We bought plans from SkyShed Backyard Roll Off Observatories and went to work. It has taken several months of working on Saturdays and some Sundays but the payoff is great. I still have some interior work to do but all the equipment is setup and the startup each night is about 10 minutes.

**Clayton:** I note that the attendance is way up at the dark site within the last year. What's up with that?

**Mike:** Clayton, the increase I feel, is partly due to the website that has drawn a large number of new members, but largely due to Steve Fast's Prime Night programs. I know he has put a lot of work into it and it is frustrating setting them up only to have the

weather not co-operate. I look forward to more star parties and Prime Nights in 2015.

**Clayton:** Do you find new members from other local clubs joining just to be able to use our dark site?

**Mike:** The Dark Site is one of our greatest assets as an organization of folks seeking to find dark skies. Over the last couple of years with the addition of the internet system, the weather station and camera along with the private observatories we have a very fine facility for folks to use.

**Clayton:** Any long range planning ideas for future development out at the site?

**Mike:** There are several additions I'd like to see at the site – additional parking, additional short term trailer parking with power and water, updating the restroom facilities and several others that will take time and funding.

**Clayton:** Was it a challenge to fall into Bob Roger's position as the HAS Dark Site Chairman? Were you a bit overwhelmed?

**Mike:** Following in Bob Rogers' shoes was not possible he had knowledge of the stars I'd love to have and maybe someday I'll learn part of what he knew. As for a leader and a friend to all that came to the site that's too much to try to fill. Yes I was a bit overwhelmed but with the help of a great committee and several individuals, I feel we are getting close to my goal of having a "Best-In-Class" facility for all to use.

**Clayton:** How would you like to see your own astronomy grow?

**Mike:** I want to have the time, no, *take* the time to learn more about astrophotography so I can image some of the great objects that are out there to see through astrophotography.

**Clayton:** Do you have any helpful advice

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## Meet My Variable Friend SS Cygni

By Bob King, *Sky & Telescope*, <http://www.skyandtelescope.com/astronomy-news/observing-news/>

Get acquainted with SS Cygni, the sky's brightest cataclysmic variable star. It's guaranteed to keep you on your toes.

Use this map and the directions below to drop in on SS Cygni, one of the season's most mercurial and exciting variable stars. Click for a large version.

I got hooked on variable stars in the '80s when I bought a new, expensive telescope and promised myself I'd "do some science" with the thing



Bob King / Source: Chris Marriott's SkyMap

instead of just poking around the sky. Not that there's anything wrong with poking around the sky.

I soon joined the American Association of Variable Star Observers

(AAVSO) and discovered I was drawn to stars with wild, unpredictable swings in brightness. So-called cataclysmic variable stars soon became my focus and one in particular, SS Cygni, an all-time favorite.

In a typical dwarf nova, a Sun-like star orbits a planet-sized but massive white dwarf which draws material from the companion into a spinning accretion disk.

Cataclysmics, also known as dwarf novae, are binary stars in close orbit about one another. One of them is Sun-like, the other a compact white dwarf star with an appetite.

Their embrace is so tight — 100,000 miles for SS Cygni according to some estimates — that the dwarf's powerful gravity strips material from its companion and feeds it into a spinning whirlpool of glowing hydrogen gas called an accretion disk.

Changes in the rate of flow of material into the disk can cause it to suddenly burn much hotter and brighter. Not only does the

disk radiate more light, but it can heat the surface of the companion star, causing it to glow more brightly, too.

Some dwarf novae such as [U Geminorum](#) can jump from magnitude 15 to 9.5 in just 1-2 days. After an outburst, the star slowly returns to its original quiet state and then flares up again weeks or months later.

SS Cygni's two stars whirl like stellar Tilt-A-Whirls around their center of gravity once every 6.5 hours. Most nights, the system simmers away at magnitude 12, but during an outburst its light increases 40-fold to about magnitude 8, bright enough to spot in 50-mm binoculars! In the same way we're drawn to the beautiful symmetry of Orion's Belt stars, many of us are captivated by SS Cygni's striking and unpredictable moods.

Amateur astronomer Bob Modic captured SS Cygni in both quiescent and outburst states in photos taken August 28, 2010 (left) and nine nights later on September 6th. (Next page.)

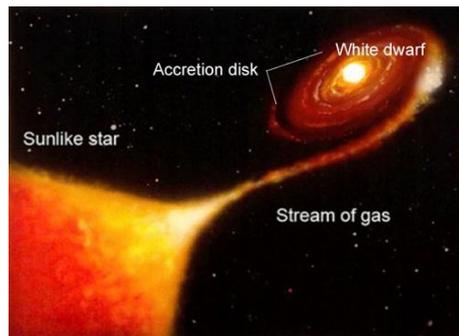
After all, it has everything going for it. This temperamental star is bright enough to follow in a from minimum to maximum in a scope as small as 4.5 inches, it's relatively easy to find, and it undergoes an outburst every 4 to 10 weeks with a duration of a week or more.

At the top of the next page is a light curve of SS Cygni for the year 2005. Each spike represents an outburst or brightness maximum. Notice that the length of time between maxima varies, as do the peak and minimum brightness.

Seeing SS Cygni in outburst after several weeks of quiescence makes for a delicious thrill. It's as if the star has been transformed from a lump of coal into a diamond. And to think you're witnessing this vampire-like interaction between two distant stars from your own front yard.

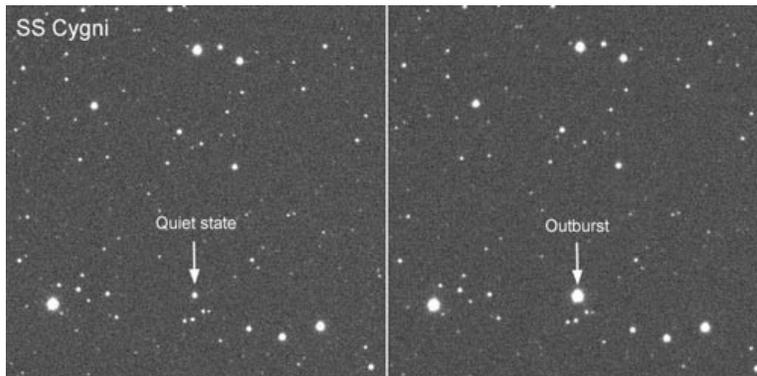
An AAVSO chart is shown on the page after the next page. Numbers shown are magnitudes

(Continued on page 12)



Credit: NASA

(Continued from page 11)



Credit: Bob Modic

with the decimal omitted, ie. 86 = magnitude 8.6.

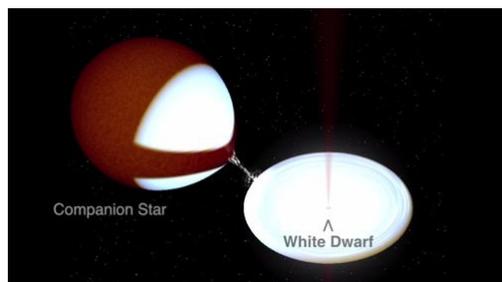
You don't need ideal skies or even good seeing. Heck, it can be mostly cloudy. Variables aren't picky. I've popped the scope out to catch my favorites between cloud banks. I make a quick brightness estimate for the AAVSO using one of their free, online charts, note the time and get in before the rain starts falling.

Of course you can observe for fun and not worry about making brightness estimates, but if you'd ever like to contribute a bit to our scientific understanding of the inner workings of cataclysmic variables, the AAVSO welcomes your observations.

Last year, amateur astronomers' careful monitoring of SS Cygni's brightness proved crucial in helping an international team of radio astronomers finally determine an accurate distance (372 light-years) to the star.

The previous estimate of 520 light-years made with the Hubble Space Telescope didn't jibe with our understanding of the brightness of accretion disks. The new distance resolves the issue while showing how amateurs can make a difference.

A model of the SS Cygni system based on radio telescope work by the International Center for Radioastronomy Research (ICRAR) is below.



Credit: J. Miller-Jones (ICRAR), using software created by R. Hynes

form as expected.

To find our featured star, start with Deneb at the head of the Northern Cross. About  $10^\circ$  to star's east (and  $3^\circ$  south of the bright, loose open cluster M39), stop at the 4th-magnitude star Rho Cygni. Follow the zigzag of stars below Rho some  $3^\circ$  south to 5th-magnitude, red-hued 75 Cygni. You'll find SS Cygni less than  $1/2^\circ$  to the northwest at the south end of a triangle of 9th-magnitude stars. Once there, the AAVSO chart above will help you estimate its brightness.

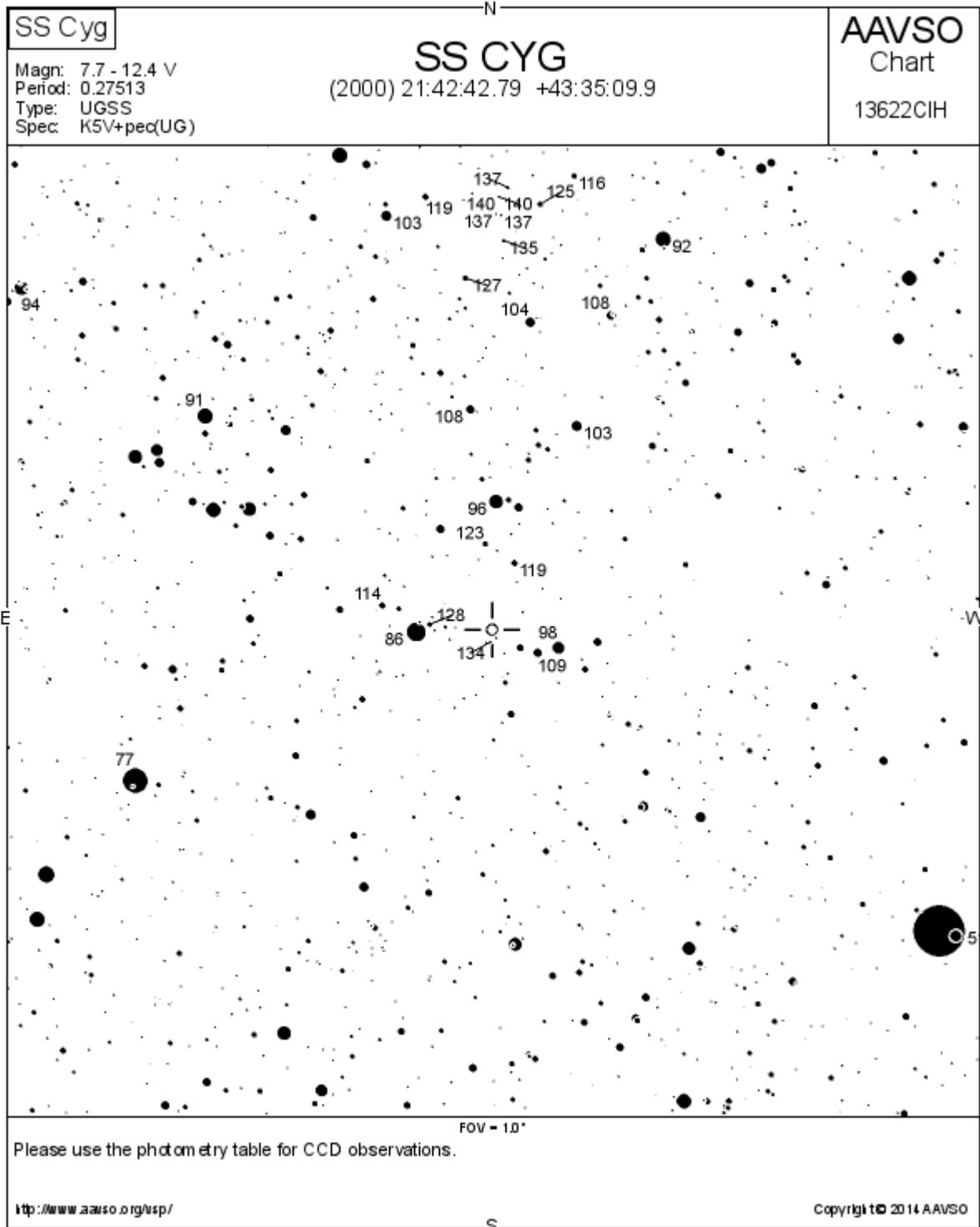
**An AAVSO star chart for SS Cyg is on the next page.**

*This content distributed by the  
AAVSO Writer's Bureau*

As I write this, SS Cygni only days ago underwent a brief outburst to magnitude 8.4. It's since dropped to the mid-nines as it returns to quiescence. Or will it? That's what makes this star so fun — it's predictable to a degree but doesn't always per-

### SS Cyg star chart from the AAVSO.org web site.

The article about this star precedes this page.



Credit: AAVSO—See [www.aavso.org](http://www.aavso.org) for this and other star charts

## **Elected leadership positions for 2015: Two slates**

***Submitted by the 2014 Nominating Committee: Mike Edstrom, John Haynes, Jessica Kingsley, Debbie Moran, and Rene Gedaly, Chairperson***

**F**or the first time in HAS history, this year's slate of candidates for the following year may change. We, the nominating committee, enthusiastically support each of these candidates. But because the board of directors is hoping you, the membership, will vote to update the bylaws this year, the committees, and therefore nominees, may get shuffled.

Below we present two slates of candidates for 2015. The first slate contains our nominees for the board and standing committees established under the current bylaws. The second contains the same candidates plus one, but in the positions that reflect updated bylaws.

If you vote down the proposed changes to the bylaws, the first slate goes into effect. If, however, you vote to approve changes to the bylaws that govern our society, you agree to create the Membership committee—promoted from an ad hoc to a standing committee, dissolve the Welcome committee, and create the new Education & Outreach committee—a combination of the standing Education and ad hoc Outreach committees. Board positions remain the same.

*The Nominating Committee encourages all members to attend the next annual meeting. A quorum of 15 percent of the membership is required to both change the bylaws and vote in the 2015 leadership.*

<b><i>Nominations for 2015 Elected Leadership Positions</i></b>			
<b><i>1st Slate: Under current bylaws</i></b>		<b><i>2nd slate: Under new bylaws</i></b>	
President	Rene Gedaly	President	Rene Gedaly
Vice President	John Haynes	Vice President	John Haynes
Secretary	Bill Flanagan	Secretary	Bill Flanagan
Treasurer	Don Selle	Treasurer	Don Selle
Director	Ash Alashqar	Director	Ash Alashqar
Director	Mark Holdsworth	Director	Mark Holdsworth
Director	Jessica Kingsley	Director	Jessica Kingsley
Director	Debbie Moran	Director	Debbie Moran
Director	Bram Weisman	Director	Bram Weisman
Telescope	Allen Wilkerson	Telescope	Allen Wilkerson
Field Trip & Observing	Stephen Jones	Field Trip & Observing	Stephen Jones
Program	Justin McCollum	Program	Justin McCollum
Publicity	Bram Weisman	Publicity	Bram Weisman
Novice	Debbie Moran	Novice	Debbie Moran
Audit	Scott Mitchell	Audit	Scott Mitchell
Observatory	Mike Edstrom	Observatory	Mike Edstrom
Education	Debbie Moran	* Education & Outreach	Bram Weisman
Welcoming	Vacant	* Membership	Steve Fast
		<i>*New committee</i>	

## Gee Whiz! Another Texas 45 Awardee

By Rene Gedaly

Texas 45 Observing Program Coordinator

Master observer Amelia Goldberg is the fifth member to earn a pin for completing the homegrown Texas 45 observing program. Amelia claims her award in record time, start to finish, earning a silver level certificate for observing 45 list objects plus five solar system objects through star-hopping alone.

Amelia observed half the list using 9x63 binoculars and the other half with her 15" scope. Although easy for the master observer, evidently all observing is good observing. "It was nice to have something to do when I couldn't do the real deep sky stuff that I usually do." Did it hold her interest, though? "For me, it was what I call gee-whiz stuff."

Congrats, Amelia. And for the rest of us working the list or thinking about it, remember just 45+5 objects gets you the pin.

*Rene Gedaly*

Program Coordinator  
HAS Texas 45

### Texas 45 autumn objects: Oct-Nov-Dec

Observe and log at least 10 of the 15 objects in this list. You may also log objects from this list at any hour or any season visible

Cls	Primary ID	Alternate ID	Con	RA 2000	Dec 2000	Mag	Ur. 2	PSA	TLO
Glob	M 30	NGC 7099	Cap	21h40m22.0s	-23°10'42"	6.9	143	77	--
Con	Grus	constellation	Gru	22h27m23.5s	-46°21'07"	4.8	178	79	--
PNe	Helix Nebula	NGC 7293	Aqr	22h29m38.5s	-20°50'14"	6.3	142	77	172
Doub	Beta PsA	17 PsA	PsA	22h31m30.4s	-32°20'46"	4.3	160	76	--
Var	Fomalhaut	Alpha PsA	PsA	22h57m39.4s	-29°37'22"	1.2	160	76	--
Gal	M 31 Andromeda Galaxy	NGC 224	And	00h42m44.3s	+41°16'07"	4.3	30	3	176
Gal	Sculptor Galaxy	NGC 253	Scl	00h47m33.1s	-25°17'20"	7.9	158	7	174
Open	ET Cluster	NGC 457	Cas	01h19m35.0s	+58°17'12"	5.1	29	3	193
Gal	M 33 Triangulum Galaxy	NGC 598	Tri	01h33m50.9s	+30°39'36"	6.4	62	2	178
Var	*Achernar	Alpha Eri	Eri	01h37m43.0s	-57°14'13"	0.4	203	8	--
PNe	M 76 Little Dumbbell	NGC 650/651	Per	01h42m19.9s	+51°34'31"	10.1	29	2	--
Open	Muscle Man Cluster	Stock 2	Cas	02h14m43.0s	+59°29'06"	4.4	29	2	--
Open	h Persei	NGC 869	Per	02h19m00.0s	+57°07'42"	4.3	29	2	187
Open	Chi Persei	NGC 884	Per	02h22m18.0s	+57°08'12"	4.4	29	2	187
Gal	M 77	NGC 1068	Cet	02h42m40.8s	-00°00'48"	9.7	119	6	--

Ur.2: page # in *Uranometria 2<sup>nd</sup> ed.*; PSA: page # in *Pocket Sky Atlas*; TLO: page # in *Turn Left at Orion 4<sup>th</sup> ed.*

Program Rules: (1) observe 10 objects from each season plus any 5 solar system objects of your choice, (2) log your findings using the HAS Texas 45 observation log, (3) complete a pad log at the HAS dark site for each observing session, (4) jot the pad log # onto the Texas 45 observation log and (5) place the pad log in the box on the field. When complete, email the Texas 45 observation log to the program coordinator at [renegedaly@gmail.com](mailto:renegedaly@gmail.com).

\* Did you attempt to see Achernar but couldn't quite locate it? Try again through December, and if it still eludes you, claim the negative observation on your Texas 45 log to receive full credit.

## Dust “Muscles” in on BICEP2 Discovery Claims

By Don Selle, Treasurer

When the BICEP2 research team announced their results “at a splashy news conference on March 17 at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.” it didn’t take long for the news to reach the general public.<sup>1</sup> The breakthrough result the BICEP2 team released was their detection of the effects of gravity waves generated in the earliest fractions of a second of the universe’s existence on the Cosmic Microwave Background (CMB).



*BICEP2 at the South Pole*

The news was spread quickly online, and in the media. Many reports included a link to a video of one of the BICEP2 researchers informing Andre Linde of the results, which quickly went

viral. The speed at which the news traveled was well justified. Buzz surrounding the announcement quickly turned to speculation that the work would result in one or more Nobel prizes.

The results, if confirmed would be clear observational evidence supporting the theory of cosmic inflation, independently developed by Alan Guth in 1980, and further elaborated by Andrei Linde over 30 years ago. Because it solved many problems of Big Bang cosmology, inflation theory has become an accepted part of the explanation of how our universe has evolved. Confirmation of inflation would be a **very** big deal, and it looked like BICEP2 had made the measurements necessary to confirm that cosmic inflation actually took place.

Almost immediately thereafter, members of the astrophysics and cosmology communities were pouring over the data, and within a few weeks, the the BICEP2 results were facing several significant challenges. All of these challenges focused on how BICEP2 had corrected their data for the effects of interstellar dust. One analysis of the data, carried out by physicist Dr. Raphael Flauger of the Institute for Advanced Study in Princeton, N.J. has raised questions so compelling that “a growing number of cosmologists now say the potential contribution of dust is so significant that the BICEP team does not have the evidence to claim a discovery”<sup>2</sup>

The BICEP Team has continued to stand behind their discovery claim in the face of considerable criticism, though they have acknowledged

that it might be significant to their claim. Regardless of the eventual outcome, whether the BICEP discovery claim is vindicated, or if it will be finally proven false, the events leading up to the announcement and their aftermath provide an interesting insight into the way that “big science” at the frontiers of our knowledge is done.

### **CMB Astronomy**

But first a little background. CMB astronomy has been in existence for only the last 50 years. Yet in that time, great strides have been made in our understanding of the origin and evolution of the Universe, much of which has been supported by observation of the CMB.

The CMB is the remnant of the intense high energy conditions of the Big Bang, when the universe was a hot dense plasma. It was so hot in fact that electron and protons could not form atoms, and so dense that photons could not escape. The plasma expanded and cooled. Finally about 380,000 years after creation, atoms of Hydrogen began to form, and in the process of formation they emitted high energy photons, which eventually were able to escape as the plasma became transparent to them. These are the photons, which escaped to fill space and became the CMB.

As it evolved, our universe continued to expand, stretching the very fabric of space-time. This red shifted the CMB light increasing its wavelengths from gamma rays, to x-rays to visible light and onward until today the CMB is in the microwave range with wavelengths in the millimeter range. Fluctuations contained in CMB, as the oldest observable remnant of the Big Bang, are a record of what the universe was like at the time it became transparent, can tell us how our universe was created.

*(Continued on page 17)*

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The CMB was first predicted from theory in 1948 by Ralph Alpher and Robert Herman who initially estimated its temperature at  $5^\circ\text{K}$  just above absolute zero. Like many scientific predictions, this one was not acted upon immediately due to the fact that astronomers were not then interested in it, and the technology for measuring it was in its infancy.

It was serendipitously discovered in 1964 by Arno Penzias and Robert Wilson bringing both men the Nobel Prize in 1978. When it was discovered, astronomers and astrophysicists were in a long running debate on the origin of the Universe. There were two main camps each supporting their favored theory, the steady state Universe and the so called Big Bang universe. The debate had been raging for almost 20 years and while it was far from the only evidence, the detection of the CMB was the straw that broke the back of the Steady State model, boosting the Big Bang Universe into almost unanimous acceptance.



George Smoot

Ever since its discovery, measurement of the CMB has been at the forefront of observational cosmology and astrophysics, for it is in the details the details of CMB that cosmologists hope to accurately determine such characteristics of the Universe as its age, size and the amount of matter, dark matter and dark energy of which it is made. The CMB may also tell us what the Universe was like in its earliest moments and lead us towards a better understanding of how it evolved into what it is now.

Early efforts to measure the CMB required development of new instruments and measurement techniques. In the book *Wrinkles in Time*, George Smoot (with co-author Key Davidson) tells the story of the early observations of the CMB from the 1970s through the results of the COBE satellite mission in the 1990s.<sup>3</sup>

In the early days, small teams of researchers used weather balloons get the instruments high above most of the atmosphere as the water vapor and dust in it blocks the CMB. Smoot and his team would pioneer the use of the U2 spy plane to carry their instruments as a more reliable platform. He also led the first expedition to the South Pole to measure the CMB where the cold dry air made the measurement from the ground possible.

Smoot and his colleagues were competing with 5 other teams to map the CMB to see if it was an absolute frame of reference, and if they could see any fluctuation in its temperature which would perhaps give a clue to the overall shape of the universe. They knew that the Milky Way galaxy is moving through space and expected to

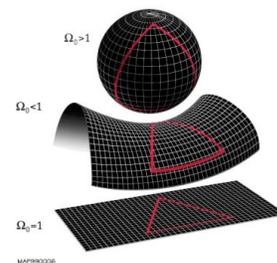
see a “dipole” in the map as the Doppler effect would make the CMB appear slightly hotter in the direction of travel, colder in the other.<sup>4</sup>

In 1977, when they presented their results and claimed to have detected the dipole in the CMB, the results they got were completely different than what was expected. Our galaxy was moving towards the constellation Leo at over a million miles per hour.<sup>5</sup> Such a speedy movement of our galaxy through space was totally unexpected and created quite a stir. Smoot’s team had discovered that the Milky Way was moving through space towards the “Great Attractor”, a super cluster of neighboring galaxies.

Criticism of the results flowed in. One of the more challenging Smoot’s team faced was that it had not properly accounted for the effects of the Zodiacal dust on their data. After several months of additional work to counter the claims the results were accepted.

### Problems with the Big Bang Theory

By the 1980s astronomers were beginning to observe the large scale structure of the universe. Galaxies seemed to be grouped into clusters, super clusters and filaments or “walls” surrounding voids, like so many soap bubbles. In addition, cosmologists



The flatness problem. Open, closed and flat space-time

were beginning to realize that there were problems with the “standard” big bang model.

One was the “flatness” problem, in that the uni-

verse seems to be improbably almost exactly balanced between an open universe, expanding eternally, or a closed universe slowing and eventually collapsing into a big crunch. Since any minor deviation from this condition would be magnified as the

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universe expands, this would mean the universe is improbably finely tuned. Another problem was the apparent uniformity of the CMB itself, which implied that the early universe was so uniform it could not form the large scale structure which astronomers were observing,

Cosmologists began to try to answer these questions. What caused the universe to take this form, how has the universe evolved to what we see today? One of the answers that seemed to work is the inflation theory developed by Alan Guth and later extended by Andre Linde. This theory proposed that within the very first instant of the Big Bang, the universe then much smaller than an atom, expanded by a huge amount. This rapid expansion would result in the uniform, flat universe we see today.

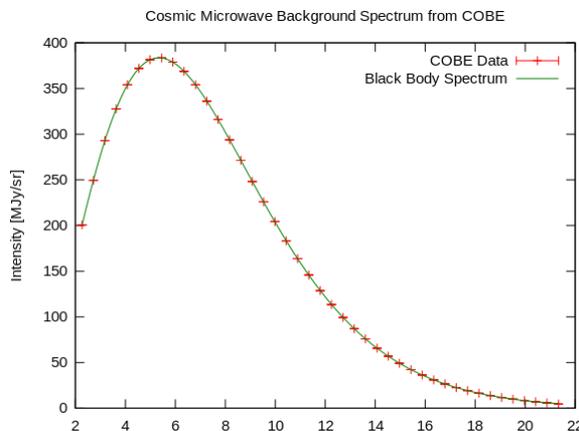
As importantly, this theory also proposed that during this expansion, normal quantum fluctuations in the fabric of space time would have resulted in tiny patches of space that were slightly denser than others. These patches were theorized to later become the seeds about which matter would clump under the action of gravity, forming galaxies, galaxy clusters, and the rest of the structure we see in the universe, and it was believed, that these seeds would show up as tiny fluctuations in the CMB.

### **COBE WMAP and PLANCK**

In 1976 NASA accepted a proposal to build a satellite called COBE – the Cosmic Background Explorer which would map the CMB in unprecedented detail, looking for minute

fluctuations in what was then considered a nearly uniform background. It would also carry instruments to measure the spectrum of the CMB and an infrared instrument to map the emissions from cosmic dust, which would be used to correct the CMB measurements. In total, the science team for COBE would top 200 researchers.

Construction of the satellite began in 1981. Due to many delays, including a redesign caused by the Challenger disaster, COBE was not launched until Late in 1989. In addition, release of the COBE data was delayed by about a year to allow completion of ground based measurements from the South Pole that would be used to calibrate and confirm the COBE measurements.



*The cosmic microwave background spectrum measured by the FIRAS instrument on the COBE satellite is the most-precisely measured black body spectrum in nature.*

Finally in April of 1992, the COBE team released its results and made an announcement that they had found fluctuations in the temperature of the CMB at a level of about 1 part in 100,000 which was clear evidence for density fluctuations in the early universe, seeds from which the structure of the universe would eventually form. COBE data would constrain several cosmological models and add insight into early formation of stars and galaxies; however, it would raise many more questions than it answered. In 2006, George Smoot and John Mather shared the Nobel Prize for Physics for their measurement of the CMB by COBE.

COBE has been followed by two more sophisticated satellites that had the instrumental capability to map the CMB in much greater detail, and in several additional frequency bands. The results were all sky maps of the CMB with a much higher angular resolution. WMAP (Wilkinson Microwave Anisotropy Probe) was a U.S. Government operated science project, a joint development of NASA Goddard Space Flight Center and Princeton University. Like WMAP, the Planck mission, which is still ongoing, is also a government operated science mission of the European Space Agency. It was designed to complement and improve on the results from WMAP.

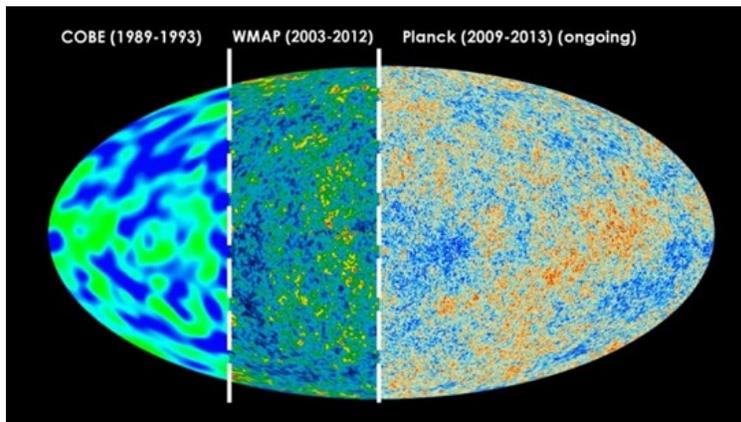
This more detailed data taken by these two missions is important to cosmologists because while they agree in general on a Big Bang origin of the universe, there are many competing Big Bang theories. Detailed measurement of the CMB and deciphering the information contained in it would help cosmologists confirm which of these models is closest to reality. It will also help answer many of the **BIG** questions such as what were the initial conditions at the origin and what will be the ultimate fate of the universe and everything in it.

In addition to mapping the temperature differences in the CMB, Planck added a number of instruments to more accurately

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map the distribution of cosmic dust, and to measure the polarization of the infrared and microwave radiation from the dust and ultimately to detect any polarization of the CMB itself. Inflation theory predicts that in the earliest moments of time as the universe is exponentially expanding, gravity waves would form and distort the fabric of space time itself. These distortions can be thought of as a Gravity Wave background and would cause some of the CMB photons to become polarized in a very characteristic way. This so called B mode polarization from the imprint of gravity waves on the early expansion of the universe, if detected, would be a direct confirmation of the



Inflation Theory of Guth and Linde.

### **BICEP2<sup>6</sup>**

This brings us back to the BICEP2 results announced last March. Both the BICEP1 and BICEP2 programs at the South Pole are (in effect) descendants of an earlier program call DASI, which was an array of 13 microwave telescopes, designed to measure very specific features of the CMB (called acoustic peaks) measurement of which would provide indirect evidence supporting the inflationary theory. DASI found these acoustic peaks and the team announced its results in December of 2002. More importantly, the DASI measurements indicated that measurement of the B mode polarization of the CMB due to the Gravity Wave background of Inflation should be possible.

With the announcement, the race was on to measure B-mode polarization in the CMB. WMAP was already in orbit without the instruments needed to measure the polarization, but Planck was just beginning to be designed and built, and instruments necessary to detect the B-mode polarization were incorporated into the Planck mission.

The chance of a South Polar based ground experiment measuring this B-mode polarization ahead of Planck would rest on two factors. The first is that, as difficult an undertaking as it actually is, development and mobilization of instruments to the South Pole would take much less time than it would to get them into space. The second is that an experiment designed only to detect the B mode polarization could focus on a small area of the sky and take many hours of data from

that location. Taking so much data from one small area would help by increasing the signal to noise ratio, in much the same way as long exposure astrophotography does. Planck, designed as an all sky-mapping experiment though in space where the environment for the measurements is much better, would not have the luxury of staring at a single location. The BICEP team also chose to measure microwave frequencies which would minimize the effects of any interstellar dust.

The BICEP team is an international collaboration of 13 different Universities and government agencies. Instruments were mobilized to the South Pole in 2005 for a three year observing run through the end of 2008. The BICEP1 results were encouraging enough that a second improved set of detectors was mobilized to the same South Pole observatory in 2010 and observations were made through 2012. The Keck Foundation funded a second telescope and detectors which continues to take data. It was the results of analysis of the data from BICEP2 that prompted the discovery announcement last March.

In conjunction with their announcement, the BICEP2 team uploaded their discovery papers online to arXiv.org, a website for open access of e-papers most of which are "pre-published" and are placed on the site to speed the circulation of research results and as importantly, to establish the primacy of discoveries. In addition to these papers, the team set up a website with the papers and data sets that the papers were based on.<sup>7</sup>

One of the key parts of the data analysis was the removal of polarization signal which would come from the scattering of the CMB photons by cosmic dust. While the BICEP researchers were careful to select a part of the sky to observe which was known to have little dust to cause this interference, this correction is very necessary. The data needed to make this correction are limited, though the best data on cosmic dust, taken by the Planck mission, has yet to be re-

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leased. The BICEP team obtained a representation of this critical dust data, through a presentation containing information on the distribution of cosmic dust that had been made by members of the Planck team.

The BICEP team obtained a copy of this presentation and “scraped” the data they needed from pdf copies of the slides containing the Planck dust data. While the Planck data was not the only dust data the BICEP2 team used to correct their results, it did represent the highest resolution and the most accurate data used in the BICEP2 analysis.

It was this fact among others that Dr. Flauger jumped on in his analysis and criticism of the BICEP2 results. His main contention is that the BICEP2 team misinterpreted the data on the slide and that if the data was used based on different assumptions, the noise from dust would essentially eliminate any signal that was found.<sup>8</sup>

The arguments of Dr. Flauger and other challengers has been strong enough that in the peer reviewers required that the BICEP2 team acknowledge the potential that their results might not stand in the papers published in the June 19<sup>th</sup> Physical Review Letters. While the BICEP2 team still stand behind their previous announcement, critics like Dr. Fluger point out that their admission has weakened the results sufficiently that the discovery claims are not supported.

Did the BICEP2 team jump the gun on their discovery announcement, trying to beat the Planck team to the punch? Will their discovery claims and possible Nobel prizes be upheld? The jury is still out, but it is very likely we will soon know these answers, as in the best traditions of science, the BICEP and Planck teams are in negotiations towards their collaborating on resolving the controversy.

### Notes

1. Astronomers Hedge on Big Bang Detection Claim – Dennis Overbye, New York Times June 19, 2014,
2. Science News – Dazzle or Dust? June 28, 2014 pg. 20
3. Smoot, Davidson - Wrinkles in Time, Harper Perennial 1993. This book is a must read for anyone interested in cosmology and the modern history of science.
4. The dipole is caused by the Doppler effect as the frequency of the CMB is raised slightly in the direction of travel (making it appear more energetic or hotter) and lowered (cooled) in the opposite direction.
5. Wrinkles in Time, pg. 140
6. BICEP stands for Background Imaging of Cosmic Extragalactic Polarization)
7. <http://bicepkeck.org/>
8. Astronomers Hedge on Big Bang Detection Claim – Dennis Overbye, New York Times June 19, 2014,

(Continued from page 10)

to pass on to observers just starting out in astronomy?

**Mike:** Be patient, look up and enjoy what you can see even away from the telescope. Being able to see the Milky Way at the site is something you can't see in the bright lights of the city.

**Clayton:** Is there an email address that you have that a Houston Astronomical Society member could contact you for an additional question or two?

**Mike:** Sure my personal e-mail is [medst22531@msn.com](mailto:medst22531@msn.com).

**Clayton:** Thanks Mike for taking the time to share your interest and thoughts within our HAS newsletter, 'The Guide Star'. We wish you luck with all of your astronomy interests. Thanks again for all of your hard work within our society and your focus on our beautiful dark site in Columbus. Great job!

**Mike:** It has been my pleasure and an honor to serve on the Board and as the Chairman of the Observatory Committee and I look forward to many more years of seeing all of you at the Dark Site.

**Clayton:** Clear skies always...

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*Clayton is an avid SCT visual observer and a longtime member of the Houston Astronomical Society. Contact him at: [stonebloke@gmail.com](mailto:stonebloke@gmail.com)*

## *Giant 1930s Telescope Model on View at McDonald Observatory*



FORT DAVIS — For the past year, McDonald Observatory has celebrated its 75th anniversary via events around the state. Now that those events have concluded, the arrival of a piece of the observatory's history puts a cap on the anniversary year.

Prior to building the observatory's first telescope, the 82-inch reflector that today is known as the Otto Struve Telescope, Warner and Swasey Company of Cleveland, Ohio, built a detailed model. At four feet tall and about three feet in diameter at the base, the one-ton model is a bit larger than a washing machine. For three quarters of a century, this model has resided in Ohio in various museums. It is now on view at McDonald Observatory's Frank N. Bash Visitors Center.



The model is currently on a long-term loan to the observatory. Supporters donated to an online crowdfunding campaign to pay for shipping it to Texas for the 75th anniversary. Before traveling to McDonald in late July, the model was on display in Austin at the Bullock Texas State History Museum as part of the exhibit "The McDonald Observatory: 75 Years of Stargazing."

At the time of its dedication on May 5, 1939, the Otto Struve Telescope dome housed the entirety of the observatory. Not only did it contain the world's second-largest telescope, but also living and sleeping quarters for astronomers. Over 75 years, astronomers have used this telescope to study every type of astronomical object, from distant galaxies to stars in the Milky Way galaxy, to planets, moons, and other bodies of our solar system.

Renamed the Otto Struve Telescope in 1966 after the observatory's first director, it has received extensive upgrades over the years and is still in regular use. The telescope has recently been renovated to allow Special Viewing Nights to resume. This makes it one of the largest telescopes in the country available to the general public.

The University of Texas at Austin McDonald Observatory near Fort Davis, Texas, hosts multiple telescopes undertaking a wide range of astronomical research under the darkest night skies of any profes-

sional observatory in the continental United States. McDonald is home to the consortium-run Hobby-Eberly Telescope (HET), one of the world's largest, which is now being upgraded to begin the HET Dark Energy Experiment. An internationally known leader in astronomy education and outreach, McDonald Observatory is also pioneering the next generation of astronomical research as a founding partner of the Giant Magellan Telescope.

*Courtesy The University of Texas at Austin McDonald Observatory, publisher of StarDate magazine*  
<http://stardate.org/magazine>

# Twinkle, Twinkle, Variable Star

By Dr. Ethan Siegel



As bright and steady as they appear, the stars in our sky won't shine forever. The steady brilliance of these sources of light is powered by a tumultuous interior, where nuclear processes fuse light elements and isotopes into heavier ones. Because the heavier nuclei up to iron (Fe), have a greater binding energies-per-nucleon, each reaction results in a slight reduction of the star's mass, converting it into energy via Einstein's famous equation relating changes in mass and energy output,  $E = mc^2$ . Over timescales of tens of thousands of years, that energy migrates to the star's photosphere, where it's emitted out into the universe as starlight.

There's only a finite amount of fuel in there, and when stars run out, the interior contracts and heats up, often enabling heavier elements to burn at even higher temperatures, and causing sun-like stars to grow into red giants. Even though the cores of both hydrogen-burning and helium-burning stars have consistent, steady energy outputs, our sun's overall brightness varies by just  $\sim 0.1\%$ , while red giants can have their brightness's vary by factors of thousands or

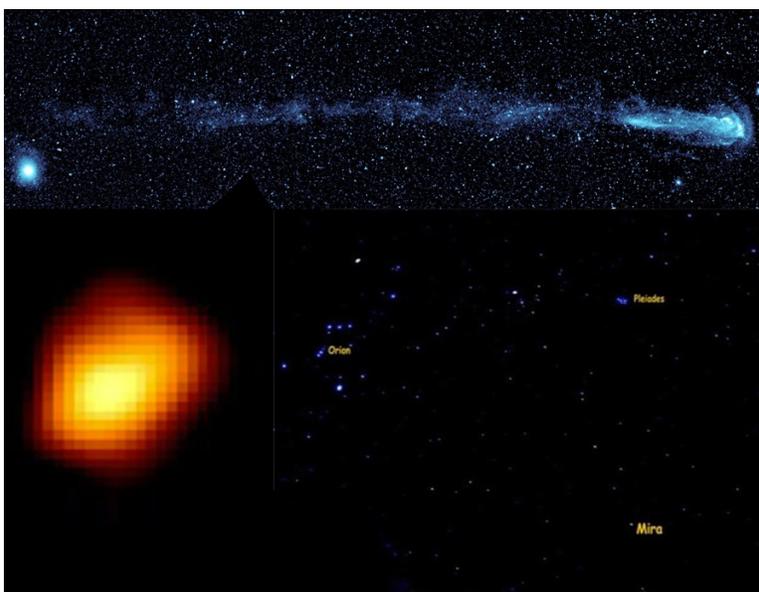
cataclysmic variables and more, but it's the Mira-type variables that give us a glimpse into our Sun's likely future. In general, the cores of stars burn through their fuel in a very consistent fashion, but in the case of pulsating variable stars the outer layers of stellar atmospheres vary. Initially heating up and expanding, they overshoot equilibrium, reach a maximum size, cool, then often forming neutral molecules that behave as light-blocking dust, with the dust then falling back to the star, ionizing and starting the whole process over again. This temporarily neutral dust absorbs the visible light from the star and re-emits it, but as infrared radiation, which is invisible to our eyes. In the case of Mira (and many red giants), it's Titanium Monoxide (TiO) that causes it to dim so severely, from a maximum magnitude of +2 or +3 (clearly visible to the naked eye) to a minimum of +9 or +10, requiring a telescope (and an experienced observer) to find!

Visible in the constellation of Cetus during the fall-and-winter from the Northern Hemisphere, Mira is presently at magnitude +7 and headed towards its minimum, but will reach its maximum brightness again in May of next year and every 332 days thereafter. Shockingly, Mira contains a huge, 13 light-year-long tail -- visible only in the UV -- that it leaves as it rockets through the interstellar medium at 130 km/sec! Look for it in your skies all winter long, and contribute your results to the AAVSO (American Association of Variable Star Observers) International Database to help study its long-term behavior!

Check out some cool images and simulated animations of Mira here:

[http://www.nasa.gov/mission\\_pages/galex/20070815/v.html](http://www.nasa.gov/mission_pages/galex/20070815/v.html)

Kids can learn all about Mira at NASA's Space Place: <http://spaceplace.nasa.gov/mira/en/>



*Images credit: NASA's Galaxy Evolution Explorer (GALEX) spacecraft, of Mira and its tail in UV light (top); Margarita Karovska (Harvard-Smithsonian CfA) / NASA's Hubble Space Telescope image of Mira, with the distortions revealing the presence of a binary companion (lower left); public domain image of Orion, the Pleiades and Mira (near maximum brightness) by Brocken Inaglory of Wikimedia Commons under CC-BY-SA-3.0 (lower right).*

more over the course of a single year! In fact, the first periodic or pulsating variable star ever discovered—Mira (omicron Ceti)—behaves exactly in this way.

There are many types of variable stars, including Cepheids, RR Lyrae,

## ***Kids Outreach & Public Star Parties***

***Bram Weisman — coordinator for Outreach and Public Star Parties***

**September 27:** Central Green @ La Centerra, Katy, TX. 2643 Commercial Center Boulevard  
Katy, TX 77494

Outdoor movie: Star Trek and observing the stars with HAS. Film starts at dusk. Observing until 10pm, perhaps later.

**September 27, 7:00 p.m.** Fathers and Flashlights - West University Place  
West Univ. Little League Field, 3756 University, Houston, TX 77005-2828

**October 10, 6:00 p.m. (dinner), 7:00 p.m. (setup), 8:00 p.m. (observing)** Camp for All - Brenham Tx  
Dinner provided at this special camp for children who are cancer patients at MD Anderson and Texas Children's Hospitals. Bill Pellerin, coordinator. For directions: <http://campforall.org/maps-directions/>

**October 11:** Rothko Chapel Moonrise Party, 8pm -11pm. This is a fundraiser, guest tickets required. HAS volunteers enter free, of course. For more info, visit <http://www.rothkochapel.org/>

## ***Preparing for a Public Star Party***

***By Bill Pellerin, President***

**If I'm going to participate in a public star party I do a little preparation first.** This is especially valuable when doing one of the major events, like Astronomy Day, where lines can be long and the crowds are large.

Here are some ideas:

- Print a copy of the SkyMap (skymaps.com) for the current month. There's an all-sky map, a list of happenings in the sky by date, and a list of easy to find and to see objects for unaided eye observers, binocular observers and telescope users. If you have the time, print copies of the map to give to attendees.
- Have a few things to say about the object that attendees can see through the telescope. For example, if I'm showing the attendees Jupiter I talk about the moons of Jupiter and how they were first noticed by Galileo when he first pointed his telescope at Jupiter on January 7, 1610. Be prepared to say which moon is which.

If I'm showing Albireo, a great object for a public star party I ask if the attendee can see the color difference in the two stars. I then ask why they think the stars are a different color and point out that color and temperature are the same thing. Blue hot is hotter than red hot.

- One question I get frequently is 'How much is a telescope like yours?' I answer honestly, but for most attendees that kind of initial investment in telescope equipment isn't practical. I point out

there there are small table-top telescopes that can be purchased and which provide great views of the sky. (The Orion FunScope 76 for \$65 and the Celestron FirstScope for \$49)

- Bring a step-stool for small kids who can't get to the eyepiece without help.
- Bring water bottles to drink. You're going to do a lot of talking while you are doing the star party. Water helps.
- Bring your spouse or a friend for crowd control. This person does not need to be an expert astronomer
- Bring HAS calling cards, which include the web address of the organization (Bram will have these). This is enough information for people to find our society and join if they wish. Point out that if they join we'll lend them a telescope at no additional charge.

## Shallow Sky Object of the Month

# R Crb — Brightest in 8 years

By Bill Pellerin, GuideStar Editor

**Object:** R Corona Borealis / R Cor Bor / R Crb

**Class:** Prototypical variable star

**Magnitude:** 9.8

**R.A.:** 14 h, 48 m, 34 s

**Dec:** + 28 degrees, 9 minutes, 24 seconds

**Distance:** 6000 ly

**Constellation:** Corona Borealis

**Optics needed:** Telescope

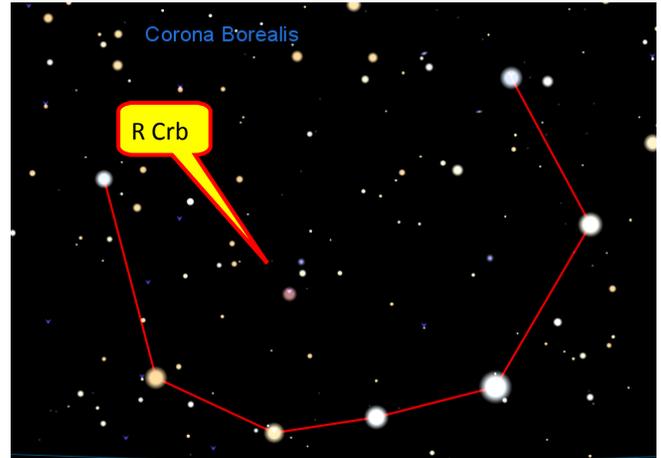
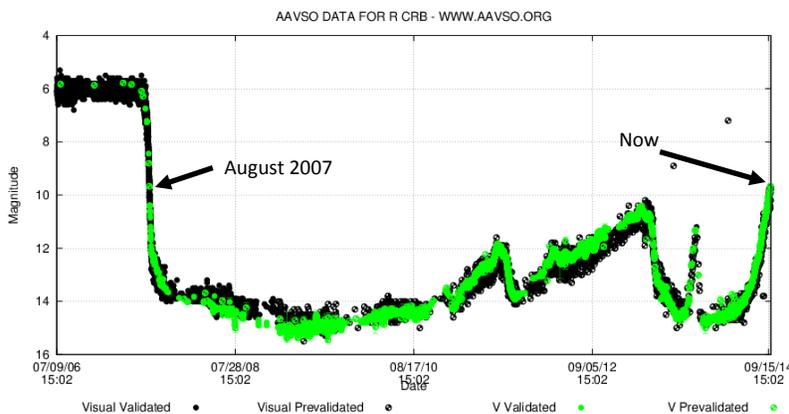
### Why this object is interesting:

This object was my 'shallow sky' object in May 2008. While I normally wouldn't repeat an object I'm making an exception here because this variable star is now brighter than it has been since the summer of 2007.

This star sets just at about 11:00 p.m. in October, so you'll have to catch it early. R Crb is an irregular variable and the system consists of a star surrounded by a cloud of gas and dust that, from time to time, obscures the star and causes its magnitude to drop from 6 to about 15. Since each magnitude drop is a factor of 2.51 in brightness the 9 magnitude drop represents an almost 250 times drop in brightness.

Stars can be variable for several reasons. They can be an eclipsing binary, where one star eclipses the other from time to time, or they can be intrinsic variable stars, in which some characteristic of the star itself changes over time. Most often these variability phases in stars occur late in the star's life when the star is unstable, perhaps throwing off its outer layers on the way to becoming a planetary nebula.

R Crb is variable because a layer of carbon dust forms



### Finder Chart

North to the top, circle is 1 degree on the sky

Star chart generated by TheSkyX © Software Bisque, Inc. All rights reserved.

[www.bisque.com](http://www.bisque.com)

either at, or at 20 radii away from the star (depending on which model of the stellar evolution of RCrB stars you like). This dust is like a cloud going overhead and it obscures and scatters the visible light from the star.

After some time, the star is believed to burn off the dust and return to full brightness. R Crb, and other similar stars, are hydrogen deficient, with a lot of carbon and nitrogen, which would indicate that they are late life stars.

This dimming cycle of R Crb is quite long.

There are short term, low amplitude, regular fluctuations in the star's brightness. It's not certain how this characteristic of the star may be related to the long-term variability, but it may be during these pulsations that the carbon soot is sloughed off the star and which later comes to obscure the star.

Image credit (left): AAVSO.org

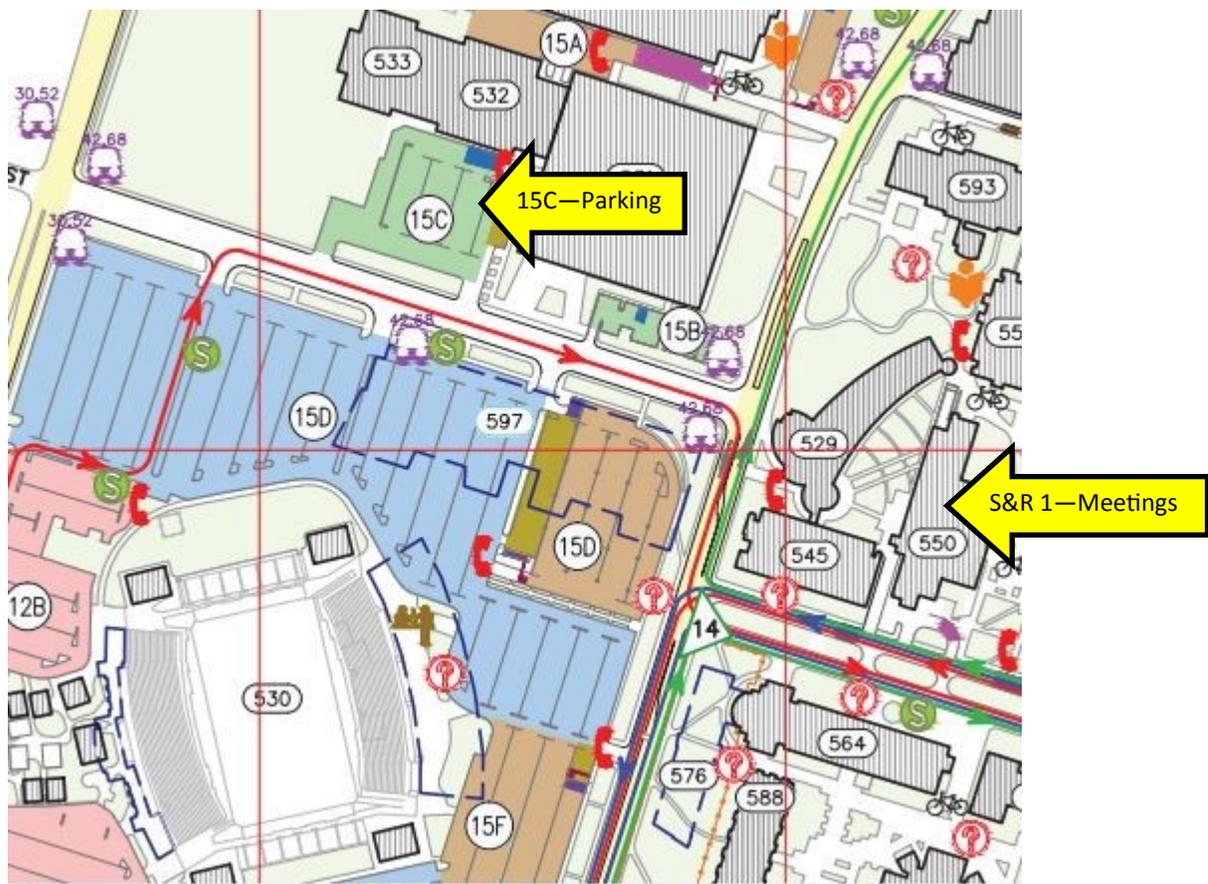
## ***Parking at the University of Houston Main Campus***

### ***For the monthly Houston Astronomical Society Meeting***

The map below shows the location of the 15C parking lot, west of Cullen Boulevard on Holman Street..

The map is from the University of Houston web site and identifies the lot that is available for parking while attending the Houston Astronomical Society monthly meeting. This parking is available from 6:30 p.m. until 10:00 p.m. on the Friday night of the HAS meeting (usually the first Friday of the month).

This parking is free. If you get a notice from the UH campus police on the night of the meeting, call the UH Security office and let them know that this area has been made available on HAS meeting night by the Parking Department.



# **Houston Astronomical Society**

P.O. Box 800564

Houston, TX 77280-0564

## **General Membership Meeting**

The Houston Astronomical Society holds its regular monthly General Membership Meeting on the first Friday of each month, unless rescheduled due to a holiday or a conflict with other events at the University of Houston.

## **Board of Directors Meeting**

The Board of Directors Meeting is held on dates and at locations scheduled by the board. Information provided to *GuideStar* will be published. The meetings are open to all members of the Society in good standing. Attendance is encouraged.

## **GuideStar Information**

The H.A.S. *GuideStar* is published monthly by the Houston Astronomical Society. All opinions expressed herein are those of the contributor and not necessarily of Houston Astronomical Society. The monthly Meeting Notice is included herein. *GuideStar* is available on the HAS web site to all members of H.A.S., and to persons interested in the organization's activities. Contributions to *GuideStar* by members are encouraged. Electronic submission is helpful. Submit the article in text, MS-Word format via email [GuideStar@astronomyhouston.org](mailto:GuideStar@astronomyhouston.org). Copy must be received by the 15th of the month for inclusion in the issue to be available near the end of the same month. Or, bring copy to the General Membership Meeting and give it to the Editor, or phone to make special arrangements.

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The Houston Astronomical Society welcomes you to our organization. The HAS is a group of dedicated amateur astronomers, most of whom are observers, but some are armchair astronomers.

The benefits of membership are:

- Access to our 18 acre observing site west of Houston -- a great place to observe the universe!
- A telescope loaner program -- borrow a HAS telescope and try observing for yourself!
- A monthly novice meeting, site orientation meeting, and general meeting with speakers of interest. Access to meeting videos on the HAS web site.
- Opportunities to participate in programs that promote astronomy to the general public (such as Star Parties at schools)
- A yearly all-clubs meeting for Houston area organizations
- Meet other amateurs and share experiences, learn techniques, and swap stories

***You're invited to attend our next meeting.***

***You'll have a great time.***

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## ***Houston Astronomical Society***

**Meeting on Friday, October 3, 2014**

**7:00 Novice Meeting, room 116 Science & Research 1 Bldg**

**8:00 General Meeting, room 117 Science & Research 1 Bldg**

### **University of Houston**

#### **Directions to meeting:**

#### **From I-45 going south (from downtown)**

- exit at Cullen Boulevard
- turn right on Cullen
- turn right on Holman Street; the parking lot is past the Hofheinz Pavilion
- Science and Research is across the street (2nd building back)

#### **From I-45 going north (from NASA/Galveston)**

- exit at Cullen Boulevard
- turn left on Cullen
- turn right on Holman Street; the parking lot is past the Hofheinz Pavilion
- Science and Research is across the street (2nd building back)

#### **Parking:**

**There is Free Parking. See Parking map and detailed information on parking on the preceding page.**