

# GuideStar



May, 2013

Volume 31, #5

## *At the May 3 Meeting*

### ***Astronomical Challenges and Solutions — 54 Years and Counting***

***Fred Garcia***

In this talk, Fred will provide his analysis of astronomical telescopes and their configurations for photo/visual use. He will also show you how these are used. He'll introduce the talk by describing the design of the Houston Astronomical Society's 12 1/2 inch f/5 telescope and its intended use, followed by the manufacture, configuration and collimation of the 'scope prior to its installation at the Columbus observatory site. He'll include views of different observatory sites and installations showing how function dictates design. Telescope manufacturing methods and facilities will illustrate the hands on procedures, techniques of modern telescopes and my personal experiences in Astronomy.

#### Highlights:

President's Message	3
Adventures - Greenwich and Stonehenge	6
Exploring the Water World	7
Bill Faatz — Bino Man	9
Cosmic Droppings	11
The End of Sun-Like Stars	15
W UMa—Eclipsing Binary	16

#### 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.

**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.

#### Schedule of meeting activities:

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

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

**"Greenwich Observatory and Stonehenge "**  
— Bill Spizzirri

See page 6 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 & Past President

President: Bill Pellerin ..... C:713-598-8543  
 Vice Pres: Mike Edstrom .....  
 Secretary: Rene Gedaly .....  
 Treasurer: Don Selle .....  
 Past President: Gordon Houston .....

### Directors at Large

Greg Barolak ..... H:281-467-5780  
 Mark Holdsworth ..... H:713-478-4109  
 Mike Rao ..... 832-689-4584  
 John Haynes ..... H:802-363-8123  
 Brian Cudnik ..... H:832-912-1244

### Committee Chairpersons

Audit ..... Scott Mitchell ..... H:281-293-7818  
 Education ..... Debbie Moran .....  
 Field Tr./Obsg ..... Steve Fast ..... 713-898-2188  
 Novice ..... Debbie Moran  
 Observatory ..... Bob Rogers ..... H:281-460-1573  
 Program ..... Brian Cudnik ..... H:832-912-1244  
 Publicity ..... Mike Rao ..... 832-689-4584  
 Telescope ..... John Haynes ..... H:802-363-8123  
 Welcoming ..... Vacant  
 Membership ..... Steve Fast ..... 713-898-2188

### Ad-Hoc Committee Chairpersons

Texas Star Party ... Steve Goldberg ..... H:713-721-5077  
 AL Awards ..... Amelia Goldberg ..... H:713-721-5077  
 GuideStar ..... Bill Pellerin ..... C:713-598-8543  
 Outreach ..... Alan Rossiter ..... H:713-660-9503  
 Webmaster ..... Jeffery McLaughlin .....  
 Email: webmaster@astronomyhouston.org  
 By-Laws Review ... Scott Mitchell ..... H:281-293-7818

### 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.

## Table of Contents

3	.....President's Message
4	.....May/June Calendar
5	.....Observations of the Editor
6	.....Adventures at Greenwich and Stonehenge .....Kid's Outreach and Star Parties
7	.....Exploring the Water World
8	.....Bill Faatz - Bino Man
11	.....Cosmic Droppings
14	.....Observatory Corner
15	.....The End of Sun-Like Stars
16	.....W UMA -- Eclipsing Binary

## Other Meetings...

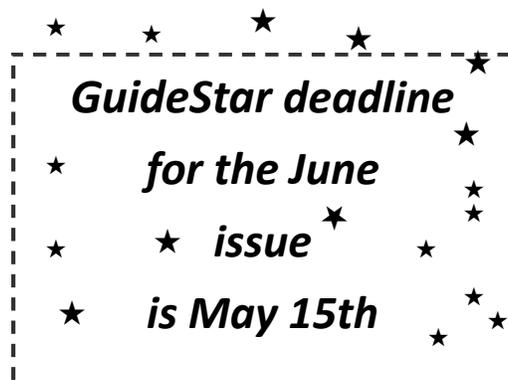
**Johnson Space Center Astronomical Society** meets in the the Lunar and Planetary Institute on the 2nd Friday of each month. Web site: [www.jscas.net](http://www.jscas.net)

**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

### What's Going on with the HAS?

HAS board meeting was on April 10, 2013.

- A lot of HAS members will be going to (and many will be working on) the **Texas Star Party** this month. I'm going, so our vice president, Mike Edstrom will be there to preside at the May meeting. Thanks to Mike for taking this on.
- The **zazzle.com/hasstore** site now has HAS Logo merchandise. Check it out and get some new duds showing your loyalty to the Houston Astronomical Society.
- **We're excited that you are a member** of the HAS and that we're doing very well indeed in attracting and keeping members. Thanks for joining if you're a new member and thanks for renewing if you were already a member. Our membership chair, Steve Fast took an active role in recruiting renewals of memberships and this effort has paid off.
- Because we had a **significant renewal rate and new member rate our budget is doing very well**. The board establishes a budget at the end of the year for the next year, and this is based on estimates of expenses and membership numbers. Don Selle, or treasurer, presents the board with a budget report at every board meeting.
- **The Observatory Committee now has commitments for four private observatories at the HAS site**. Work on these observatories will begin soon. Check with Bob Rogers if you're interested in establishing your own private observatory at the site.
- **Brian Cudnik, our program chair, is actively working with UT to get a speaker to the HAS**. This would be one more in a great series of HAS programs. Stay tuned.
- Steve Fast is planning a **picnic and observing session** for this summer at the HAS observing site. Watch for this.
- The board has agreed to post the minutes of the board meetings on the HAS web site. The minutes will be the latest ones approved by the board.

### Want to help?

There are always opportunities to help the Houston Astronomical Society. The more you are involved the more you will get out of your membership. As you get to know other members in the organization you'll share observing experiences, observing tips, solutions to equipment problems, and (perhaps) trips to the observatory site. What are the opportunities?

- Observatory Committee — is always recruiting help for site maintenance and upgrades. Contact Bob Rogers for information.

- Outreach — see page 6 of this issue to see how you can help with outreach programs. If you can find the Moon, and you have a telescope, you can get involved. Call Alan Rossiter or Debbie Moran.
- Become our Welcoming Chair. Call the president.
- Be a speaker at the novice or general presentation. Call Brian Cudnik.
- Write for (or pick up the editing duties) for the *GuideStar*. Contact the editor for information.

### Parking — Read this...

We can continue to park in the lot across Cullen from the Science and Research Building. The spaces are marked 'Faculty' but are available to us after 6:30 p.m.

You can pay to park in the parking garage near our usual spot. This costs \$3.00. The visitor parking entrance is the one farthest from Cullen Boulevard.

*Cheers,*

*..Bill Pellerin*

*President HAS*



## Observations... of the editor

by Bill Pellerin, GuideStar Editor

### What to work on...

If you're going to the Texas Star Party you will have a lot of observing lists to work on. From the TSP web site ([www.texasstarparty.org](http://www.texasstarparty.org)) you can get the 2013 John Waggoner list and some of his lists from previous years. Complete the list and get a pin. John's 2013 list is called *I Have No Idea Where I Am*.

There's Larry Mitchell's list for those of you who want a challenge, and it's on the TSP web site as well. His list for 2013 is called *Galaxy Illusions*.

There's also the TSP Novice Club for folks who have not done observing in the past. The information on this one is on the TSP web site as well.

If you use SkyTools you can get the lists in files suitable for import into that program. The list is available in other formats as well.

Nothing stops you from attempting these lists from the HAS site, but you won't get a pin unless you do the list from the Texas Star Party.

If you're not going to make the Texas Star Party this year, there's always the HAS Texas 45 list — all observations must be made at the HAS observing site.

There are plenty of great lists on the Astronomical League web site ([www.astroleague.org](http://www.astroleague.org)). There are lists for everything, so pick one out and get to work on it. Amelia Goldberg's Universe Sampler is there, and if you're new to observing this is a great one to start on. There is a variable star club too.

Want more variable stars — check the American Association of Variable Star Observers web site [www.aavso.org](http://www.aavso.org) for information on how to get started and some great lists of variable stars to try this out.

Every month, *Astronomy* magazine and *Sky and Telescope* magazine have observing articles, so there's always something new to see if you subscribe to either or both of these magazines.

### Observing time

A couple of weeks ago, the skies looked not-so-good, but on the chance that the sky might get better I set up my telescope. It turns out that I had about 3 hours of clear, dark sky (followed by clouds). That's three hours of observing that I wouldn't have had if I wasn't ready to take advantage of it.

Can you observe from home? Sure you can. There are plenty of bright objects in the sky that are waiting for you to see. Check out the book *First Magnitude: A Book of the Bright Sky* by James Kaler

or *The Brightest Stars* by Fred Schaff. There are lots of resources for double stars (many of which are bright) and planets, too.

Saturn is available to us now and is always a pleasure to see in any telescope.

So, while during the week of the Texas Star Party (May 5-12) many HAS members will be enjoying the clear, dark, west Texas skies, there remain many opportunities for doing observations from sites as close as your back yard.

**Until next time...**

**clear skies and new moons!**

..Bill

## **Novice Presentation May, 2013**

### **Adventures at Greenwich Observatory and Stonehenge**

---

**By Debbie Moran**

Bill Spizzirri will return in May for a talk about his adventures at Greenwich Observatory and Stonehenge. Both of these observatories have terrific astronomical history lessons and Greenwich is the standard for Universal Time which is used to define astronomical events worldwide.

In June, we will have a multiple speaker program reviewing astronomy computer programs and apps. Rene Genady will discuss SkyTools and Mike Rao will cover a few apps including Sky Safari, Sky Eye and Starlog. For computer atlases plus other information, Greg Barolak will cover TheSky and Josh Babin will review Stellarium. We are expecting

some of the Science Fair winners at the main meeting and they may have particular interest in this topic at the Novice meeting, too.

Other upcoming topics will include astroimaging, observing programs, and in August Scott Mitchell will give one of his delightful sketching classes, this time on the planets.

---

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

---

**By Alan Rossiter, coordinator**

**Name:** The Houston Arboretum BBQ Star Party

**Leader:** Bill Flanagan

**Type:** Mostly Adults – Arboretum Members. An evening at the Arboretum. Food & Drink!

**Date:** Saturday, 06/01/2013

**Time:** 6:00 PM – 10:00 PM (tentative)

**Name:** Stephen F. Austin State Park Star Party

**Leader:** Bram Weisman

**Type:** Public Star Party

**Date:** Saturday, 05/18/2013

**Time:** 7:30 PM – 9:30 PM (tentative)

**Location:** Nature Center or Amphitheater (TBD) @ Stephen F. Austin State Park, Park Rd 38, Sealy, TX 77473

**Name:** Riverbend Twilight Camp

**Leader:** Debbie Moran

**Type:** Girl Scout Star Party

**Date:** Tuesday, 06/11/2013

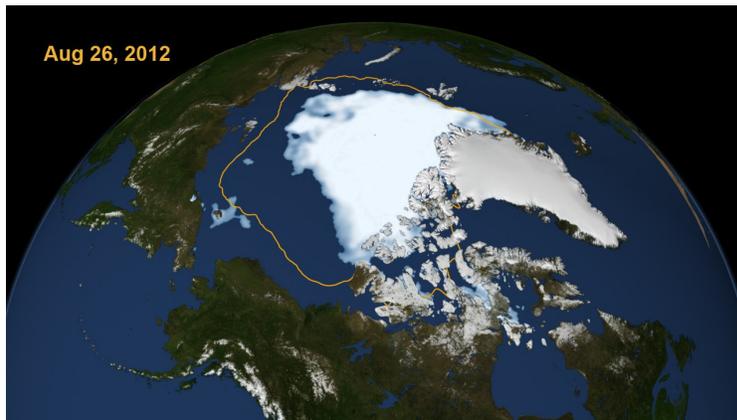
**Time:** 6:30 PM – 9:30 PM (tentative)

**Location:** East Side Free Will Baptist Church, 8825 CE King Parkway, Houston, TX 77044

# Exploring the Water World

By Diane K. Fisher

In some ways, we know more about Mars, Venus and the Moon than we know about Earth. That's because 70% of our solar system's watery blue planet is hidden under its ocean. The ocean contains about 98% of all the water on Earth. In total volume, it makes up more than 99% of the space inhabited by living creatures on the planet.



*This image from September 2012, shows that the Arctic sea is the smallest recorded since record keeping began in 1979. This image is from NASA's Scientific Visualization Studio at Goddard Space Flight Center.*

As dominant a feature as it is, the ocean—at least below a few tens of meters deep—is an alien world most of us seldom contemplate. But perhaps we should.

The ocean stores heat like a “fly wheel” for climate. Its huge capacity as a heat and water reservoir moderates the climate of Earth. Within this Earth system, both the physical and biological processes of the ocean play a key role in the water cycle, the carbon cycle, and climate variability.

This great reservoir continuously exchanges heat, moisture, and carbon with the atmosphere, driving our weather patterns and influencing the slow, subtle changes in our climate.

The study of Earth and its ocean is a big part of NASA's mission. Before satellites, the information we had about the ocean was pretty much “hit or miss,” with the only data collectors being ships, buoys, and instruments set adrift on the waves.

Now ocean-observing satellites measure surface topography, currents, waves, and winds. They monitor the health of phytoplankton, which live in the surface layer of the ocean and supply half the oxygen in the atmosphere. Satellites monitor the extent of Arctic sea ice so we can compare this important parameter with that of past years. Satellites also measure rainfall, the amount of sunlight reach-

## NASA Space Place

ing the sea, the temperature of the ocean's surface, and even its salinity!

Using remote sensing data and computer models, scientists can now investigate how the oceans affect the evolution of weather, hurricanes, and climate. In just a few months, one satellite can collect more information about the ocean than all the ships and buoys in the world have collected over the past 100 years!

NASA's Earth Science Division has launched many missions to planet Earth. These satellites and other studies all help us understand how the atmosphere, the ocean, the land and life—including humans—all interact together.

Find out more about NASA's ocean studies at <http://science.nasa.gov/earth-science/oceanography>. Kids will have fun exploring our planet at The Space Place, <http://spaceplace.nasa.gov/earth>.

*This article was written by Diane K. Fisher and provided through the courtesy of the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.*

## Just Looking

A GuideStar Interview by Clayton L. Jeter

### Bill Faatz — Bino-Man



There are a few of us out there that have a real passion about observing the cosmos with a nice binocular. It's such a wide field, low power view....totally breathtaking. The bigger the objective the better the view.

While browsing the April 2013 Sky and Telescope, I read Gary Seronik's "Telescope Workshop" and saw that he did a story on a guy who made his own 5" Binos! This article is a must read for any Bino or ATM'ers out there. Hence, meet Bill Faatz from northern California. Enjoy this month's read. Here's Bill...

#### The Bill Faatz bio...

My interest in astronomy really started in earnest when I moved to California from Illinois after getting a job at Lawrence Livermore Nat'l Lab in 1976. The job turned out to be a 25 year career supporting various projects as an electronic engineering technician. My assignments included working on ultra precision machine tools that use diamond cutters that provide microinch profiles and finish. I got to see up close several projects such as Star Wars, cruise missile development, laser fusion, weapon development and the early Genome research. I took early retirement at 55 and moved with my wife Jo to rural northeast California on 10 view acres overlooking the Sierras and Cascades. My backyard night sky is green/blue with gray/black an hour up the road north. Much of my summer observing is under very dark skies in central Nevada.



In 1979 I bought an Edmund Astroscan and that started a love of observing that has persisted to this day. I soon moved up to a 6 inch f/5 reflector and in 1982 I bought a 12 1/2 inch f/4.5 custom dob reflector called a Volkscope made by Dave Chandler. This was just before Coulter flooded the market with Dobs. I went to the Texas SP in 1982 and met David Eicher who really taught me the technique of serious observing. I belonged to the TriValley Stargazers in Livermore and was fortunate to spend many nights observing with Jack Marling (Lumicon) and Steve Gottlieb (now contributing editor S&T magazine) using the club's 17 1/2 inch reflector at our dark sky site. The Bay area skies became increasingly light polluted during the 90s and I took a hiatus from observational astronomy for a few years.

My interest was rekindled after moving to the relatively pristine skies at my present location. I bought a Fujinon 25x150 binocular on a parallel-

ogram mount. This provided jaw dropping views of the summer Milky Way and I became a confirmed binocular junkie. Since the Fujis (which I have since sold) I acquired an Oberwerk BT 100 45 degree binocular that gives great views with 24mm and 19mm TV Panoptic eps. In addition, I have built a 5 inch binocular that uses mirrors instead of prisms and was featured in Gary Seronik's Telescope Workshop column in the April 2013 Sky and Telescope magazine. Besides these I use both 10x50 and 16x70 Fujinon binoculars as well as a 10 inch Meade SCT, a 6 inch f/5 rich field refractor, and a 10 inch and 15 inch reflector ....too much stuff!

Recently, I gave talks on EE Barnard and his early photographs of the Milky Way, my homemade binoculars, and this year will make a presentation on raytracing design at the Golden State SP.

#### The Bill Faatz interview...

**Clayton:** What scopes do you use and what techniques for observing?

**Bill:** My style of observing is to set up several instruments.....I try to maintain an exit pupil of 4-5mm and change magnifications by changing apertures rather than eyepieces. My current favorites are my 5 inch bins with the 24mm Pans which give me almost 5 mm exit pupil. I also use 19mm Pans and 14mm Denkmeier eps with the BinoBox.

Also my 6 inch f/5 refractor with either a 21mm Ethos or 26mm Nagler, and my 10 inch reflector with a Paracorr which yields f/5.4.

I find a 4-5mm exit pupil suit my eyes and also maximize contrast of Milky

(Continued on page 9)

(Continued from page 8)

Way structure which is my current interest of study.

**Clayton:** I loved the S&T article about your 5" binos. Ever use filters when observing with it? Looks like lots of man-hours were put into this 5".

**Bill:** I use UHF and OIII filters. Actually the construction took less than a week once I had raytraced and laid out the components... Istar 127mm f/5.5 objectives feed a 3.1 inch mirror feeding a 2 inch diagonal which in turn feeds an 1 ¼ inch diagonal. The three mirror design gives an erect, mirror image just like a diagonal in a refractor or SCT. The use of first surface mirrors instead of prisms gives these binoculars brighter, crisper images and better contrast which is of the greatest importance when teasing detail out of Milky Way bright/dark nebulae.

**Clayton:** How are the views through your 5 inch binos?

**Bill:** As far as views, here is a post I did on the BinoBox on Cloudy Nights...

Had a chance now to put some time on the Bino Box observing MW structure.

What is it like....like putting an image intensifier on the BT100s!

Starclouds that were a uniform grey without stars in the BTs now show structures of tiny stars as I can now go 1/2 mag deeper...in other words, structure in the structure.

I spent an hour examining the M24 star cloud. B92 and 93 and the "forks" were no longer black but also showed internal structure; the blackness was replaced with a range of grays with a gauzy appearance...in other words very similar to a photo image.

Putting UHC filters on both eyepieces further enhanced the contrast and the Lagoon and Swan and Eagle were outstanding in the 19mm Pans.

Moving up through Scutum to the area around M11 showed enormous detail previously unseen in the BTs...sinuous strings of tiny stars interwoven in the dark nebulae.

Aquila did not disappoint...the area north of Gamma showed B142 and 143 as an interesting weave of dark nebulosity that reminded me of the letter E.

Moving on to Cygnus, the area around Gamma Cygni showed a wealth of bright/dark detail that was dimly seen with the BTs on the best of nights, and this night was good but not the best.

Some time was spent on the Veil using both 24mm (29x) and 19mm(36x) Pan eps with UHC filters. Lots of detail in both halves and also much structure in the form of bits and pieces of bright nebulosity including a well defined Pickering's Wisp.

Finally, my test object for transparency, 6822 (Barnard's Galaxy) was easily viewed continuously with some granularity noted. This object was a challenge for the BTs.

To sum it up....

Larger image scale, brighter views, much better contrast and structure with many "new" tiny stars popping out of the background than with the BT100s.

I attribute much of this to, of course, larger aperture, but also the veiling effects present in any prism binocular was replaced with a brightness and clarity obtained by using mirrors.

I feel like I'm seeing these same objects viewed many times before for the first time.

Oh yeah, I like the Bino Box..."

**Clayton:** I too have Panoptic 19mm and 24mm eyepieces. How do rate this design that you use? What other set of doubles do you use in your binocular?

**Bill:** IMO, the 24mm Pans are the best 1 ¼ wide field ep available...and I've looked though lots. They give the widest field of view that can be had in the 1 ¼ inch format. The eye relief is very good and edge of field correction is excellent. The 19mm Pans are also optically as good, but the eye relief is a bit tight. I have a pair of 14mm Denkmeier eps which are quite good.

**Clayton:** As many know, I'm a SCT junkie. You said you own a 10" Meade....ever use it? How are its views?

**Bill:** As far as my Meade ACF 10 inch...I use it mainly for planetary viewing with my Denk Binoviewers. For Milky Way wide field work, f/10 is definitely too slow.

**Clayton:** Ever attempt your luck at sketching or astrophotography?

**Bill:** Back "in the day" I tried my hand at AP using an OM-1 camera and hypersensitive film. I lost interest when the pictures I spent hours taking hand guiding one night were ruined in the darkroom. I guess lots of folks today have never used emulsion film or hand guided; a whole different animal.

**Clayton:** What charts and books do you use at the telescope?

**Bill:** When I first started observing in the 80s, Atlas of the Heavens by Becvar. I

(Continued on page 10)

*(Continued from page 9)*

also used the Revised NGC catalog by Sulentic and Tifft.

My current chart and reference collection is the SkyAtlas 2000, NSOG Vol I-III, Uranometria 2000 and also EE Barnard's excellent work A Photographic Atlas of Selected Regions of the Milky Way, a reprint in 2011 from his 1923 opus.

**Clayton:** How would you like to see your own astronomy grow? What's new for you?

**Bill:** When I started observing, I pursued hunting down lists of objects...I completed the Herschel 400 and that cured me of lists. After that, I decided that that was too much like work and then picked regions of the sky most favorable and swept up objects. My attitude toward observing these days is more from an aesthetic point of view....I "compose" landscapes of Milky Way structure and my observing technique would be closest to comet hunting; sweeping the fields left to right in overlapping patterns.

**Clayton:** Will we see you at TSP this Spring? What others do you attend?

**Bill:** Haven't been out to TSP since the late 80s but would consider going if I was asked to present.

Tom Dennis contacted me a few weeks ago about presenting at Okie-Tex this year, but its a long drive from northeastern California and frankly, the skies I observe in out here are darker than what I saw at Okie-Tex.

I went out in 2011 because I was curious about Okie-Tex and I combined it with a trip to visit my mother in the Denver area.

I presented talks on EE Barnard at both the Golden State SP and Okie-Tex SP in 2011, last year presented a talk on the BinoBox at GSSP and this year I am scheduled to present a talk on Raytrace Design at GSSP.

**Clayton:** It seems in recent years that the younger people are not that interested in amateur astronomy, or any of the sciences. Are you guys attaining any young club members? How can we turn this around?

**Bill:** That's a tough one....public outreach is probably the best approach. OTOH, I've seen encouraging signs of younger people (20s-30s) getting involved in especially AP at recent star parties I have attended. A major problem is the amount of light pollution which discourages people living in urban/suburban areas from visual astronomy, especially Milky Way viewing.

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

**Bill:** [bfaatz@windjammercable.net](mailto:bfaatz@windjammercable.net) Always happy to answer questions.

**Clayton:** Thanks Bill 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. Please come visit our

society when in the Houston area, we'd love to see you.

Bill: I'd love too...maybe we'll meet at TSP one of these years.

---

*Clayton L. Jeter 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)*

# Cosmic Droppings

by Don Selle

At first glance, space is a very empty place. The average density of the Milky Way galaxy, is so low, that on average there is only about one atom in each cubic centimeter of space. This is so, because the volume of space in the Milky Way is so vast, that it can encompass a hundred billion suns, and massive clouds of interstellar gas and dust and still on average be virtually empty.

Fortunately for us (for we could not exist without it) there is attractive force of gravity, which brings this material together. It is gravity, balanced by the repulsive electromagnetic, atomic and nuclear forces which resists the crunch of gravity, that gives and helps to give the universe form. Stars are created when small density fluctuations form in massive interstellar gas clouds allowing gravity to concentrate the gas. It is gravity which works to form the planets out of the nebula of material from which their parent star was born.

Here in our Solar neighborhood the mass of our Sun (like all stars), creates a dimple in the fabric of space-time. This "gravity well" holds the planets and planetary material close to the Sun. As the Sun orbits our galaxy, the gravity well may scoop up interstellar gas dust and debris which gets too close. As Earth orbits the Sun, its own mass can capture material dropping it into Earth's own (much smaller) gravity well.

That space is not really empty was emphatically demonstrated on the morning of February 15, 2013. At 9:20 am local time, a brilliant flash of light and huge explosion occurred over the city of Chelyabinsk Russia.



Vapor Trail from Chelyabinsk Meteor

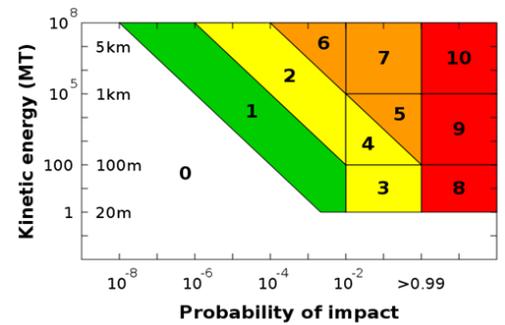
The source of the explosion was a small meteor entering the Earth's atmosphere at an estimated speed of 40,000 miles per hour. The meteor, estimated to be 55 ft. in diameter and weighing about

10,000 tons, disintegrated at an altitude of about 20-24 kilometers above the ground.

Its detonation released the energy equivalent of a 500 kiloton bomb in a fireball and shockwave which slammed into the ground and buildings below. As many as 1500 people were injured by breaking glass and flying debris and 7,200 buildings were reported to have been damaged. Fortunately there were no fatalities.

Ironically, the astronomy community was more concerned about tracking asteroid 2012DA14 which was to make its close approach 15 hours after the explosion above Chelyabinsk occurred. 2012DA14 is 2

to 3 times the size of the Chelyabinsk meteor and perhaps as much as ten times its mass. At its closest approach, 2012DA14 was at an altitude of more than 1,000 times the altitude of the blast over Chelyabinsk. The two events were totally unrelated because the



Torino Scale (size and energy vs. probability of impact)

orbits of the two asteroids were completely unrelated.

In order to put this event into perspective, it is important to know a few things about meteors. It is estimated that about 500 Meteors reach the ground in an average year, including some big ones. A meteor of about 3 meters in diameter impacts Earth on average of once per year, while meteors of one meter or less in diameter (called meteoroids) rarely make it to the ground. So far, all of the meteors found and analyzed have proven to be of solar system origin, debris left over from the formation of the planets, or rocks blasted off the surfaces of the inner planets by large impactors.

The Chelyabinsk meteor impact was quite unusual in that it occurred over a populated area and the damage and injuries that occurred were well documented. A meteor of its size is expected to impact Earth on average of once every 37 years. The fact that more than 85% of Earth's surface is either water or uninhabited by humans means that a documented impact in a populated locality

(Continued on page 12)

(Continued from page 11)

of this type will happen only once every 246 years.<sup>1</sup>

The size of the Chelyabinsk meteor was large enough so that it detonated at a low enough altitude and with a high enough energy to cause the damage it did. Yet it was small enough that it went virtually unnoticed by any of the surveys tracking NEOs (Near Earth Objects).

Even if it had been tracked, the Chelyabinsk meteor would fall below an 8 on the Torino Scale, a logarithmic scale like the Richter scale for earthquakes, which gives an indication of the likelihood and consequence of a meteor impact. This rating of 8, indicating that impact of the asteroid with Earth is certain and will cause local destruction is reserved for asteroids the size of 2012DA14 (40m). An impact of a meteor this size would be expected to occur once every 410 years somewhere on earth, and in a populated area only once every 2740 years<sup>2</sup>.

The bigger the meteor, the much rarer its impact with Earth will be. An impact from 5 km diameter asteroid, a 10 on the Torino scale, would be expected to occur about once every 20 million years, while a meteor as large as that which is believed to have caused the extinction of the dinosaurs might be expected every 100-200 million years.

Meteors are obviously on the large end of the scale when it comes to cosmic material dropping on Earth. There is also quite a bit of material in the form of "dust particles" in our solar system and in interstellar space as well. However it makes up just a tiny fraction of the mass of the interstellar medium.

When astronomers talk about dust, they typically mean solid particles of about 1 micron (one millionth of a meter) in diameter or smaller with smaller grains being much more common. The dust grains are typically composed of either silicate (think sand) materials or carbon compounds (think soot).

There is so little of this material in our galaxy, that there is only one grain (0.1 micron dia.) in every million cubic meters of space. That's one tiny spec of dust in a cube that is one football field long, wide and



Witch Head Reflection Nebula

high. While the atoms of gas in an interstellar cloud may be less than an inch apart, the dust grains in and interstellar cloud will typically be hundreds of feet apart.

If there is so little of it, and cosmic dust impacting the Earth should have little effect, why should we care?

"Dust grains have an importance in astronomy out of all proportion to their size. Although they comprise less than 1% (by mass) of the interstellar medium, their effect on the flow of radiation in the Galaxy, is far greater than that of the gas. They absorb

much more light, and emit far more infrared power. They play major roles in the heating of interstellar clouds, and in the formation of new

stars. They assist in the synthesis of molecules and in their subsequent protection from ultraviolet radiation. They provided the material out of which the Earth is made. They are also among the most frustrating objects in astronomy, both for what they hide of the universe and for what they fail to reveal about their own nature."<sup>3</sup>

Cosmic dust is typically divided into three main categories based on where it is found. Circumstellar or planetary as the name implies is found around stars and in planetary systems. It is typically the remnant of the stars formation, and may also be formed by the collision of bodies in the planetary system. Interstellar dust is found between star systems, though some makes its way into planetary systems. It is typically formed by the action of stars and can include all elements forged in stars and expelled by them at the ends of their lives. Intergalactic dust would be found in the space between galaxies. It is clear that many galaxies have "jets" of hot and ionized gases spewing into intergalactic space, so dust is also presumed to be present. The problem is that it is very difficult to observe partly because the dust inside our own galaxy obscures it, making measurements very difficult.

Most of what we know about interstellar dust comes from two sources, radio astronomy collecting spectra of radiation scattered or emitted by the dust when it is illuminated by bright stars. These are confirmed and interpreted by laboratory work where the spectra of likely candidates are collected in the lab and compared to the data collected by radio telescopes. In many cases, the physical and chemical conditions of some locations in space (like the Sun's coronasphere or ice particles in the Oort cloud) are reproduced to see what types of compounds may be formed there.

Interstellar dust is responsible for the "extinction" of starlight, as it both blocks its travel and selectively scatters different wavelengths of light. This selective scattering of different wavelengths is what causes reflection nebula to be visible. Many of these like the Horsehead nebula are the showpieces of astronomy.

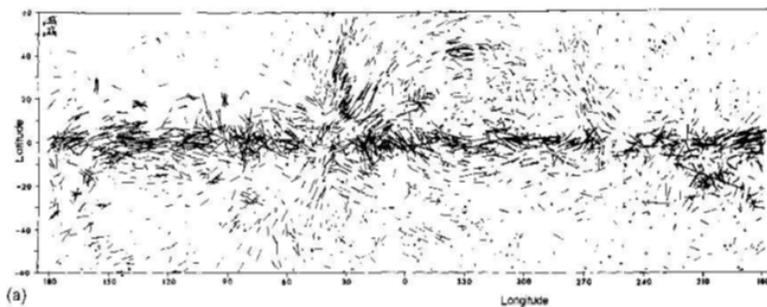
(Continued on page 13)

(Continued from page 12)

One property of interstellar dust is that due to its size and shape, it scatters light in a preferred direction. When the grains are aligned, such as when they are in a magnetic field. This selective scattering leads to the light (or radio waves) becoming polarized. The amount and direction of this polarization can be measured, and as a result, astronomers are able to indirectly observe and measure the magnetic field at many points in our galaxy.

The planetary dust in our solar system orbits the Sun in the same way that the asteroids do. In fact much of the dust in our planetary system has been generated by the impact between asteroids.

As a remnant of the birth of the Sun, much of this dust orbits in the form of a disc around the Sun, on the ecliptic. When the ecliptic intersects the horizon at a steep angle in Spring and Fall, and the sky conditions are right, it is not too uncommon after sunset or before sunrise to see the Zodiacal Light. This takes the form of a cone or triangle of light, extending from where the Sun is below the horizon much of the way up to the zenith. The Zodiacal Light is the result of light reflection off the dust grains orbiting the sun on the ecliptic.



*Dust Aligns with Magnetic Fields in the Galaxy*

The Zodiacal Light is often seen at the Texas Star Party due to the quality of the skies there. It is also possible to observe it at the Columbus dark sky site and I personally observed it there this spring.

Because the planetary dust orbits the Sun, it can, like a meteor get pulled into Earth's gravity well and eventually drops to the ground. Though there is not a consensus on exactly how much dust enters Earth's atmosphere and makes it to the ground, estimates range as high as 300 tons per day. Many of these grains have been isolated from sediments and captured in the upper atmosphere for direct study. It is not clear at this time what if any impact this influx of cosmic dust has on our weather currently or if it had an effect in the past

Research and observations since the 1950s have confirmed that not only are individual elements found in the interstellar dust but so are many chemical compounds found there. In fact, many carbon compounds have been found in the interstellar medium, including some that are the direct building blocks of life.

Discovery of carbon compounds in the interstellar medium and the recognition that the infrared signature of some types of dust resem-

bled what might come from bacterial spores in interstellar space led astronomer Sir Fred Hoyle and his colleague Chandra Wickramasinghe to propose that life actually began in interstellar space, perhaps inside comets, and was seeded on Earth in a rain of cosmic dust. It then continued to evolve to fit Earth's environment.

The two extended this hypothesis called Panspermia to conclude that evolution on Earth had been effected over history when viruses of interstellar origin found their way to Earth. This line of reasoning was highly criticized at the time and much of it has been discredited. The concept that life may not have originated on Earth though is still a very active theory.

So the next time you are out stargazing, enjoying the Zodiacal Light as the Sun sets, or the beauty of a reflection nebula remember that cosmic dust is responsible for this splendor of the night. And when you see a shooting star, keep in mind that there is a chance (admittedly a very small one) that the flash of light you see is announcing the arrival of a distant relative, dropping in to stay for a while.

#### Notes

1. Calculated using Earth Impact Effects Program – Imperial College London <http://impact.ese.ic.ac.uk/ImpactEffects/> with projectile diameter =16.8m projectile density = 2600kg/m<sup>3</sup> velocity of 17km/s and entry angle of 45 degrees. Return period = (1/37 x 0.15) or 246 yrs.
2. Ibid – substitute 40m for theprojectilediameter.
3. Gareth Wynn-Williams – 1992 – The Fullness of Space – pg 64, Cambridge University Press

# Observatory Corner

*By Bob Rogers, Observatory Chairman*



The following is a partial list of completed work at the HAS Observing site between February 2013 and April 2013:

The finishing deck has now been completely stripped, refurbished, lubricated, and tested (functioning fine).

The C14 communication malfunction to the computer is confirmed.

All lock combinations have been changed.

The F5 has been fitted with a Sky Commander and is now a push to (thanks to Ed Frani).

The parts for the finishing mower have been delivered to shop for refurbishment – the blades have been mounted on the deck.

The bricks have been removed from the north road side and sorted, grouped, and stacked behind the Dob shed.

The burn pile was burned with the help of Boy Scout Troop 404 from Pearland.

The fire extinguishers have been surveyed. The observing field and one pole extinguishers need recharging. The Bunkhouse, Trailer shed, and Observatory extinguishers are in the green zone to upper green zone. Noted that we need an additional 4 extinguishers for the trailer poles.

We finished the bunkhouse. The walls are painted, the door is stained, the counters are mounted, the chairs are assembled, the base and door trim are mounted, the carpet is cleaned and sanitized, the wood floor is waxed. The light fixtures are changed, the bulletin board is mounted, the fire extinguisher is mounted, and the last bunk has a modesty curtain.

Did the bi-monthly maintenance on the observatory of greasing the roof rollers and motor, cycling the roof and south window, and lubricating the outside sheaves.

Delivered the cargo trailer tires to the tire guy - he will have them ready for pickup soon.

Chris Ober's wife runs a sign shop and made the site new signs. Chris, Bill K., and I installed them – they look really nice. Bill also cleared the brush around the exit road so the signs are easily visible. This debris was hauled to the new burn pile.

Installed the door bottom sweeps for the East side Observatory doors.

Corrected the problem with the C14 – the program was set to the wrong com port – once correct the C14 became a go-to again.

Put the internet connection back on the C14 after taking it off. The C14 computer performed correctly for the party.

Assisted the star party picnic and assisted cleaning up afterwards.

Removed the log sheets from the Observing field and Observatory to put in Bob's trailer and restocked the pad supply.

Picked up and installed the tires on the Murray trailer so it's ready to go.

Sowed 10 lbs of Bermuda grass on the observing field to help choke out the grass burrs.

Pressure washed the bunkhouse exterior.

We received the auger and stored it in the shed.

Thanks to the Observatory Committee for all their hard work.

*Bob Rogers*

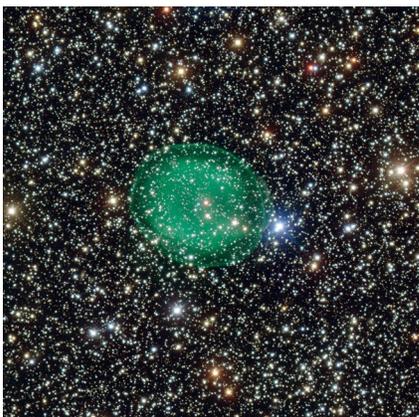
**Observatory Chairman**  
**281-460-1573**  
**siteworkerbob@hotmail.com**

# The End of Sun-Like Stars

C. C. Petersen, *the Spacewriter's Ramblings*, <http://thespacewriter.com/wp>

Several times a year I go out and give public talks about astronomy and one of the questions I get a lot is, “What will happen to the Sun?” Sometimes people have this idea that the Sun will blow up in a huge explosion and overtake Earth. Others worry about something hitting the Sun and causing it to do something. Actually, things DO hit the Sun— comets do this, for example. But so far, none has made a difference in how the Sun behaves.

What DOES make a difference in how the Sun (and other stars) acts are age and mass. Stars with masses ranging from one solar mass to



*This intriguing new picture from ESO's Very Large Telescope shows the glowing green planetary nebula IC 1295 surrounding a dim and dying star located about 3300 light-years away in the constellation of Scutum (The Shield). This is the most detailed picture of this object ever taken.*

about 8 solar masses have fairly quiet deaths — that is, they don't blow up in titanic explosions so much as they just “puff out” their outer atmospheres to space and then fade away.

The Sun is the one we care the most about. It is about 4.6 billion years old and it will likely live another four billion years before it starts to age and die. That aging process is of great interest to astronomers and so they study other stars as they die to see how the Sun will do it. The Sun and stars like it (similar in mass and luminosity) shine for billions of years

before they hit retirement age and start to swell up.

As they do this, their atmospheres get “huffed off” by a stellar wind similar to our solar wind. It's almost as if the star is gently sneezing its outer layers to space. This takes a while — and all that material eventually ends up in a cloud of gas and dust that surrounds the cloud. That cloud (with the dying star at the center) is what's called a “planetary nebula”. The name was bestowed by William Herschel, who thought they looked similar to a distant gas giant planet. There's nothing planetary about these things — they're really stars like the Sun moving through an important step in the aging and death process.

Planetary nebulae come in many different shapes. This image comes from the European Southern Observatory's Very Large Telescope. It's of a nebula called IC 1295, and since the image is such high reso-

lution, you can actually make out multiple shells of material surrounding the dying star. This implies the atmosphere blew out in episodes as the star's faltering core emitted sudden bursts of energy.

The gas surrounding the dying star (which is the small blue-white spot in the heart of the nebula next to a reddish spot) is bathed in strong ultraviolet radiation from the aging star, which makes the gas glow. Different chemical elements glow with different colors, and the green color you see here comes from ionized oxygen (that is, oxygen gas heated by radiation from the central star and is now emitting greenish light).

This cloud won't last forever. In a few tens of thousands of years, the clouds will slowly dissipate. Eventually only the remains of the star will be left behind as a white dwarf. It will continue to shrink a bit longer, but eventually that will stop and the white dwarf will continue to cool for billions of years. I read somewhere that in the entire history of the universe, not one white dwarf has yet cooled to completion. There hasn't been time in the 13.8-billion-year age of the cosmos for them do that.

So, that's the fate of the Sun in general. It won't blow up as a supernova (because it doesn't have the mass to do so). It will gently (for a star) sigh its life away. Hopefully by that time, humanity will have found other worlds to live on.

---

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

## Shallow Sky Object of the Month

# W UMa — Eclipsing Binary

**Object:** W UMa  
**Class:** Double Star  
**Constellation:** Ursa Major  
**Magnitude:** 7.75-8.48  
**R.A.:** 9 h 43 m 46 s  
**Dec:** 55 deg 57 min 09 sec  
**Size/Spectral:** F class (white)  
**Distance:** 170 ly  
**Optics needed:** Small telescope

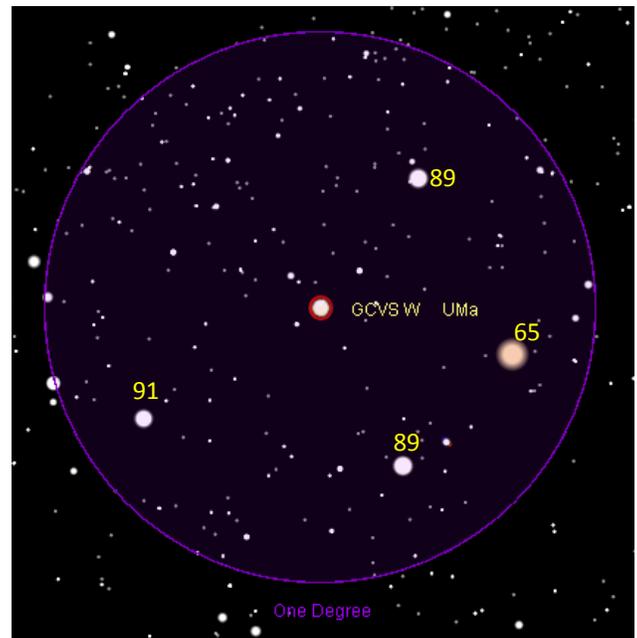


### Why this object is interesting

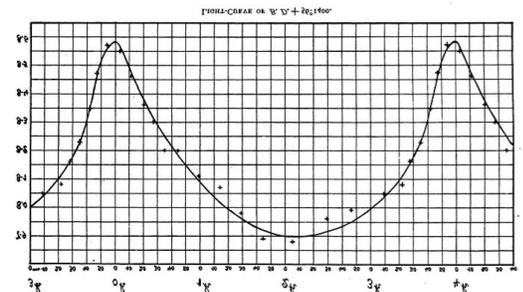
The name of this star gives it away as a variable star. (A star that has a letter of the alphabet, or two, starting with R preceding the name of the constellation identifies a variable. This one, with W as the designator is the 6th variable identified in this constellation). One of the things that scientists of all kinds do is to put items in categories. It helps these scientists understand and organize information. This happens with variable stars, too and there are lots of categories for variable stars. The star that defines that category is called the 'prototype' star. This star is the prototype for other variables which are thus called W UMa variables.

W UMa is an eclipsing variable with a period of .3336 days, so the star goes through a complete cycle from dimmest, to brightest, to dimmest three times in one day. Could you detect this variability by watching it with your small telescope. Yes, you can. It is generally agreed that you can estimate star brightness within .1 magnitude visually. Finder charts can be produced at AAVSO.org although comparison stars are rare in this area.

So, what is the source of the variability for this star? It turns out that this star is actually a double star with the two stars so close that they are touching each other. They are both known to be F (color) stars so we should not expect a change in color of the star as it goes from brightest to dimmest. There is thought to be a significant amount of mass transfer between the two stars. The stars are believed to be just over 1 solar mass for the larger star and just over .5 solar masses for the secondary star. A .5 solar mass star is too small to be a F star, but this color is accounted for by the mass transfer between the stars. The period of variability has changed over time; it is now longer due to the braking affect of the mass transfer between the two stars.



*Finder chart and 1 degree circle chart. North is up.  
 Comparison stars (not from AAVSO, from TheSky Decimal point omitted)  
 Star chart generated by TheSkyX © Software Bisque, Inc. All rights reserved. [www.bisque.com](http://www.bisque.com)*



*The original light curve of the discoverers (Muller and Kempf) in 1903 — from AAVSO.org*

# Houston Astronomical Society

P.O. Box 20332

Houston, TX 77225-0332

## 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 BillPellerin@sbcglobal.net. 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.

Editing & Production: Bill Pellerin,

713-880-8061

Email: BillPellerin@sbcglobal.net

Advertising: Advertisers may inquire concerning ad rates and availability of space.

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.
- 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.***

## ***Houston Astronomical Society***

### **Meeting on Friday, May 3, 2013**

**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 into the parking lot (by the stadium)
- 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 into the parking lot (by the stadium)
- Science and Research is across the street (2nd building back)

#### **Parking:**

There is Free Parking, **BUT DO NOT PARK IN ANY RESERVED PARKING SPACES AT ANY TIME.**  
U of H parking enforcement will ticket your vehicle.

**UPDATE — Use entrances 15D and 15F. You can park in this area, but NOT in a RESERVED space. If spaces are full, park in 16B lot near Elgin**