SEPTEMBER 2016

★ HOUSTON ASTRONOMICAL SOCIETY ★

# GUIDESTAR

FOSTERING THE SCIENCE AND ART OF ASTRONOMY
THROUGH PROGRAMS THAT SERVE OUR MEMBERSHIP
AND THE COMMUNITY

# AT THE SEPTEMBER 2ND MEETING

## WHAT ASTRONOMERS NEED TO KNOW ABOUT NOTHING

There is a tiny amount of stuff in interstellar space that has had a profound effect on how we view the universe

Don is currently HAS Treasurer and has had a lifelong interest in all things scientific, but especially astronomy. He has been a member of HAS ever since that time in 2001, that his neighbor Kirk Kendrick (who, unbeknownst to Don was HAS President) invited him to do something astronomy related on a Friday night at U of H. Don is an engineer by training, and has been working for the last 35 years in the offshore oil and gas industry as an engineering project manager, and in engineering company management. For the past 15 years, doing and learning about things astronomical has been Don's main stress relief, and he looks forward to the point in time when it can be more of a full time avocation.

**TALK: WHAT ASTRONOMERS NEED TO KNOW ABOUT NOTHING**

To many amateur astronomers, space is the volume between the stars and other deep sky objects we love to observe which has nothing in it. It turns out that this is only mostly correct, as there is a very tiny amount of stuff in interstellar space. But the stuff that is there has had a profound effect on how we view the universe, and is hugely important to the evolution of our galaxy and even of life itself. Come take a brief tour of our home galaxy and as we travel we'll explore the (almost) nothing that is the interstellar medium.

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# NOVICE PRESENTATION BY DEBBIE MORAN

In September, Allen Wilkerson will tell you everything you need to know about the HAS Loaner Telescope Program. The HAS has a number of telescopes that have been donated over the years for the purpose of loaning out to the membership after you have been a member for a short time. Allen will tell you about these telescopes, which ones are easiest to use for novices, how to care for them and how to go about borrowing one. The Society depends upon responsible use of the program in order to be able to continue making this fantastic benefit available to members. We recommend to everyone that they take a look at the various telescopes at star parties before making a decision on buying their first telescope. For October, the All-Clubs meeting will be held in lieu of the regular HAS meeting. We will resume Novice presentations in November.

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Image of Rho Ophiuchi by HAS **MEMBER DON TAYLOR**
Displayed on his website:
**WWW.ATOMICCAFE.COM**

Image Details
OpticsTakahashi FSQ-106 at f/3.6
MountTakahashi EM-200
CameraSBIG STL-11000X
FiltersAstroDon Full Specturm
LocationHAS Dark Sky Site - Columbus Texas
Exposure L=120min, R=40min, G=40min, B=40min, All subs=10min
AcquisitionCCDSoft
ProcessingPixInsight - Photoshop CC 2014

## CALENDAR

**SEPTEMBER 1**
4:03 A.M. NEW MOON
**SEPTEMBER 2**
12:00 P.M. NEPTUNE AT OPPOSITION
7:00 P.M. HAS NOVICE MEETING, U OF H
8:00 P.M. HAS GENERAL MEETING, U OF H
**SEPTEMBER 9**
6:49 A.M. FIRST QUARTER MOON
**SEPTEMBER 16**
2:05 P.M. FULL MOON
**SEPTEMBER 20**
6:30 P.M. HAS BOARD MEETING, TRINI MENDENHALL COMMUNITY CENTER
**SEPTEMBER 22**
9:21 A.M. AUTUMN EQUINOX
**SEPTEMBER 23**
4:56 P.M. LAST QUARTER MOON
**SEPTEMBER 24**
PRIME NIGHT, COLUMBUS
**SEPTEMBER 28**
2:00 P.M. MERCURY AT GREATEST ELONGATION WEST
**SEPTEMBER 30**
7:11 P.M. NEW MOON

**OCTOBER 7**
7:00 P.M. ANNUAL REGIONAL ALL CLUBS MEETING, HMNS
**OCTOBER 8**
3:00 P.M. ASTRONOMY DAY, GEORGE OBSERVATORY
11:33 P.M. FIRST QUARTER MOON
**OCTOBER 15**
6:00 A.M. URANUS AT OPPOSITION
11:23 P.M. FULL MOON
**OCTOBER 20**
8:00 P.M. ASTEROID 1 CERES AT OPPOSITION
**OCTOBER 21**
ORIONID METEORS
**OCTOBER 22**
2:14 P.M. LAST QUARTER MOON
4:30 P.M. HAS ANNUAL PICNIC & OBSERVATORY OPEN HOUSE, COLUMBUS
**OCTOBER 29**
PRIME NIGHT, COLUMBUS
**OCTOBER 30**
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SEND CALENDAR EVENTS TO DOUG MCCORMICK SKYGAZER10@SBCGLOBAL.NET FOR THE LATEST INFORMATION ON CLUB EVENTS, GO TO **ASTRONOMYHOUSTON.ORG**

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

**NOVICE MEETING**
7:00 P.M.
**GENERAL MEETING**
8:00 P.M

We want to spotlight the astronomical projects and observations that you are working on. Send us an email at **GUIDESTAR@ASTRONOMYHOUSTON.ORG** and tell us.

THE GUIDESTAR IS THE WINNER OF THE **2012 ASTRONOMICAL LEAGUE** MABEL STERNS NEWSLETTER AWARD

## OTHER MEETINGS

**JOHNSON SPACE CENTER ASTRONOMICAL SOCIETY** | jscas.net
Meets in the the Lunar and Planetary Institute on the 2nd Friday of each month.

**FORT BEND ASTRONOMY CLUB** | fbac.org/club_meetings.htm.
Meets the third Friday of the month at 8:00 p.m. at the Houston Community College Southwest Campus in Stafford, Texas.

**NORTH HOUSTON ASTRONOMY CLUB** | astronomyclub.org
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.

**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.

# ABOUT THE HOUSTON ASTRONOMICAL SOCIETY

## CHECK THE WEBSITE

ASTRONOMYHOUSTON.ORG

The HAS website not only has news and information about our society, but also a variety of features to manage your membership and connect with other club members.

Current members can post photos, trade gear, pay dues, manage discount magazine subscriptions, swap stories in the forum, and more.

Questions about the site? Need a hand to get your account set up? Contact webmaster@astronomyhouston.org.

The HAS web site is the winner of the 2012 Astronomical League award for excellence

Houston Astronomical Society

GuideStar_HAS

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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.

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

You can join (or renew at the organization web site, www.astronomyhouston.org. Click the 'Join HAS' Tab.

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.

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## EVENT NOTIFICATION OR CANCELLATION

HAS uses 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.

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.

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

**OUTREACH** Public Outreach Events
**STARPARTY** Members only star Parties
**URBAN** Urban Observing Events
**MEETINGS** HAS Meetings

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

For more information, please visit www.RainedOut.net.

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## HAS BOARD MEETING

HAS Board meetings are scheduled regularly. 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 Trini Mendenhall Community Center (1414 Wirt Road) at 6:30 p.m. on the date specified the calendar.

# PRESIDENT'S LETTER

## BY RENE GEDALY

### ART IN ASTRONOMY: MEMBER PHOTO GALLERIES

One of the things you miss as a website lurker is the personal photo galleries of HAS members. The post-processing required of the imager reminds me too much of a day job. Still, it doesn't keep me from appreciating the artistry of many of our members. If you're a member, log in and see what your clubmates are doing. If you're not a member, dues are pro-rated your first year, so now's a great time to try us out. Click the Join HAS tab on the website.

### OBSERVE SELFISHLY. JOIN AN OUTREACH EVENT

That's right. By giving others a look through your scope, you've carved out precious time for your own observing. It attracts the community, sure, but it also keeps your own skills sharp.

Or maybe you don't know your way around the skies or don't have your own telescope. Show up and look through what's already there and find out which type of telescope you do like. It's like speed dating the loaner telescope program and the scopes are lined up for you.

### I STILL THINK BIGGER IS BETTER, BUT...

Aperture fever, the bane of the amateur astronomer! I made a short list of candidates and then decided my next scope, my last scope, would either be a 14.5" or 18" Webster truss telescope with Zambuto optics. The Argonavis and Servocat thrown in for good measure.

### WHAT DID I GET INSTEAD? A 7.5" SKY-WATCHER MAK-NEWT. AND I LOVE IT.

You're no doubt familiar with the Schmidt-Cassegrain design, although my dentist recently told me he was interested in astronomy and asked if I had a reflector or a refractor, the two designs he knew about. You may also know about the Maksutov-Cassegrain if you are a Questar devotee. Or what many assume to be a Schmidt-Cass from Meade. But the Maksutov-Newtonian design is one I hadn't come across yet. Turns out the David Levy Comet Hunter is of that design.

Optical layout of a typical Maksutov-Newtonian. Note the meniscus corrector lens. The primary mirror is spherical and the secondary is attached directly to the corrector—no diffraction spikes from spider vanes

Now, my favorite go to scope is a 90 mm refractor on a simple tripod with an alt-az, non-computerized mount. "Go to" in this case being the scope I go to most often. The optics are superb and it's easy to transport and set up. The Zambuto optics on the Webster would be more than a match, but traveling with such a large reflector, who was I kidding?

Still, I wanted to reach farther than 3.5 inches could send me but not sacrifice the wide contrast-y views of the apochromat. Could a Maksutov-Newtonian really give refractor-like contrast and widefield views at a much better price point for the aperture? The Mak-Newt is not a widely known or manufactured design. But definitely worth a look as the short answer is Yes. Oh, Yes.

## OBSERVATORY CORNER

BY: MIKE EDSTROM

The roof is now on and one of the a/c units is installed so inside work can begin in comfort. Hopefully we can get the insulation installed and then the siding done soon. We will continue updating the process as milestones are achieved.

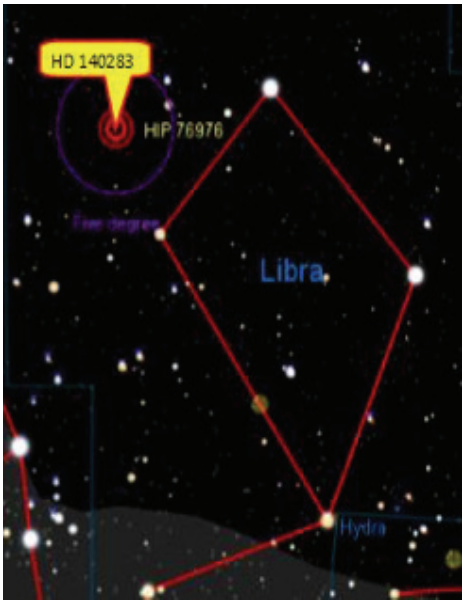
Please watch the web site for future announcements as the training sessions on the new MX and 12" RC scope in the observatory which everyone that has been trained on using the observatory must take has been finalized and will be announced soon.

Summer constellations are up and waiting for you at the Columbus Dark Site, hope to see you there soon.

SHALLOW SKY OBJECT OF THE MONTH

## THE METHUSELAH STAR – OLDEST STAR IN THE MILKY WAY

BY BILL PELLERIN




*Finder chart circle is 5 degrees. Star charts generated by TheSkyX © Software Bisque, Inc. All rights reserved. www.bisque.com*

**OBJECT:** HD 140283, HIP 76976
**CLASS:** Metal Poor Sub-Giant Star
**CONSTALLATION:** Libra
**MAGNITUDE:** 7.26
**R.A.:** 15 h, 43 m, 1.86 s
**DEC:** -10° 56' 5.62"
**SIZE/SPECTRAL:** F3
**DISTANCE:** 190 ly
**OPTICS NEEDED:** A small telescope, binoculars

Here's an odd one. I first heard of this star while watching a Great Course lecture in the series 'The Life and Death of Stars' by Keivan Stassun. Interestingly, to me, I had never heard of this star before, but it may be one of the more

fascinating stars in the sky. The very early universe had much smaller quantities of the heavy chemical elements in it. Why? Because the heavy elements are created (fused, actually) in stars and in the early universe there had not been enough time for stars to form, live their lives, and seed the universe with these heavier elements. By 'heavier', I mean those elements in the periodic table beyond hydrogen and helium. This star has .4% of the quantity of heavy elements as our Sun (a 5 billion year old star).

So, any stars that are still around that formed in the early universe would be expected to have low quantities of these heavier elements. In fact, astronomers use the chemical contents of stars as a clue to the age of the star.

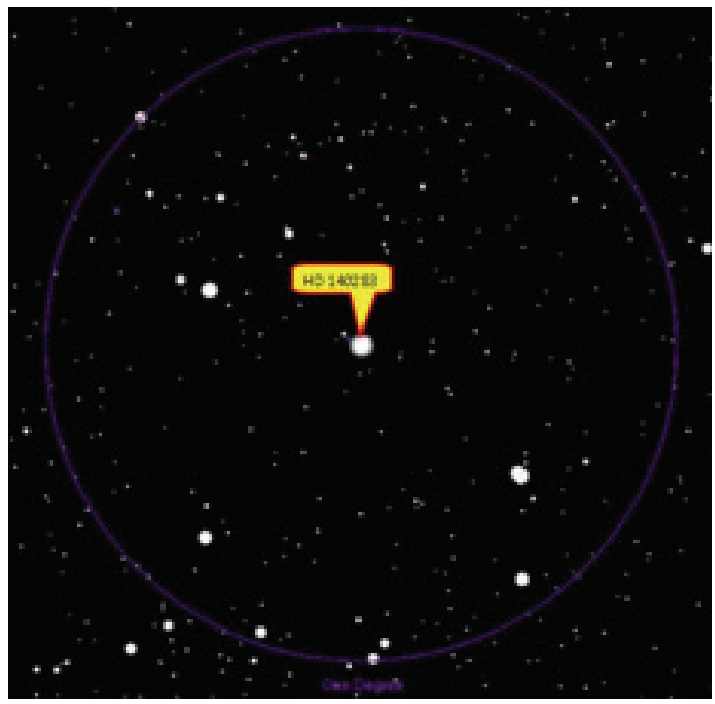
This star is deficient in these heavier elements that astronomers call 'metals' although these aren't metals in the way we normally think of them. This low-metallicity star had to have begun shining in a very early era of the universe. Astronomers call this type of star a 'Population II' star (stars that formed much later are called 'Population I' stars… go figure). If you really want to investigate the earliest stars in the universe, these would be called Population III stars. For these stars there are no heavy elements at all; they're all hydrogen and helium. No Population III stars have been identified.

**ASTRONOMERS NOW KNOW THAT THE AGE OF THE UNIVERSE IS 13.8 (LATEST ESTIMATE) BILLION YEARS OLD. INTERESTINGLY, THE AGE OF THIS STAR IS ESTIMATED AT 14.46 +/- .8 BILLION YEARS, SO THE LOW END OF THE RANGE IS 13.66 BILLION YEARS.**

It is relatively bright to earth-based observers because it is relatively close to us (as these things go) at 187 light-years. While there's some uncertainty in the age, clearly the star can't be older than the universe. What we can say for sure is that this was an early forming star.

This star also has a very high proper motion. Proper motion is its real motion across our sky and this star is moving at .13 milliarcseconds per hour, about 11.4 arcseconds in a year. This amount of motion could easily be detected astrometrically by amateurs. It would be fun to image the star field today, and do the same again and see the proper motion of the star.

This is a low-mass star with only about 85% of the mass of our Sun. Not until the 'helium flash' event at the end of the red giant phase does helium begin burning. Remember that the lower the mass of a star the longer it lives, and this one is an example of such a low mass star. It's not a main-sequence star any more, and it's not yet a red giant star, but it's on the path leading from the main-sequence to the red-giant phase. Even though the star has moved off the main sequence, it's still burning (fusing) hydrogen to helium. The age of the star is inferred from its

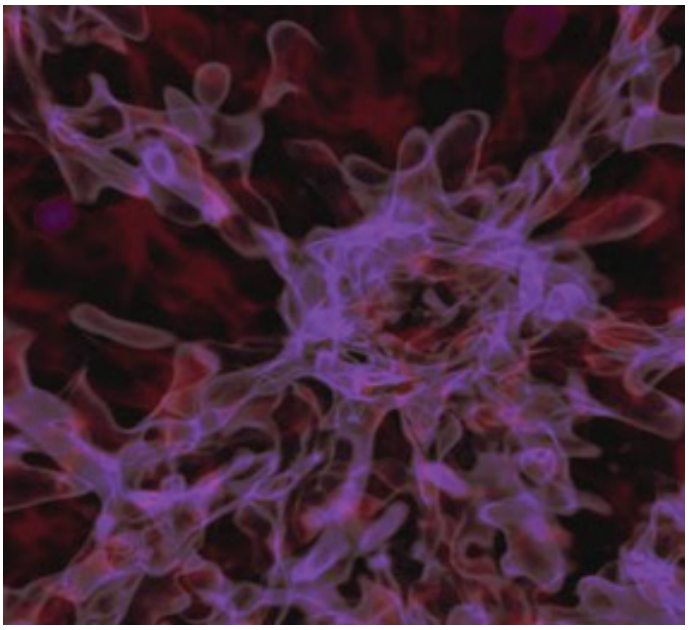


*Eyepiece chart circle is 1 degree. Star charts generated by TheSkyX © Software Bisque, Inc. All rights reserved. bisque.com*

position on the HR (Hertzsprung-Russell) diagram employing standard stellar evolution models.

For HAS observers, you'll want to catch this one early in the evening in September. By mid-month it sets at about 22:45. It'll be an easy observation, though, and one you can catch just after you get your telescope set up or your binoculars out of the bag.

# A NEW KIND OF BLACK HOLE, ONCE A THEORY, NOW FIRMLY WITHIN OBSERVERS' SIGHT



AUSTIN — Astronomers Aaron Smith and Volker Bromm of The University of Texas at Austin, working with Avi Loeb of the Harvard-Smithsonian Center for Astrophysics, have discovered evidence for an unusual kind of black hole born extremely early in the universe. They showed that a recently discovered unusual source of intense radiation is likely powered by a "direct-collapse black hole," a type of object predicted by theorists more than a decade ago. Their work is published today in the journal Monthly Notices of the Royal Astronomical Society.

"It's a cosmic miracle," Bromm said, referring to the precise set of conditions present half a billion years after the Big Bang that allowed these behemoths to emerge. "It's the only time in the history of the universe when conditions are just right" for them to form.

These direct-collapse black holes may be the solution to a long-standing puzzle in astronomy: How did supermassive black holes form in the early epochs of the universe? There is strong evidence for their existence, as they are needed to power the highly luminous quasars detected in the young universe. However, there are several problems that should prevent their formation, and the conventional growth process is much too slow.

**ASTRONOMERS THINK THEY KNOW HOW SUPERMASSIVE BLACK HOLES WEIGHING IN AT MILLIONS OF SUNS GROW IN THE HEART OF MOST GALAXIES IN OUR PRESENT EPOCH.**

They get started from a "seed" black hole, created when an extremely massive star collapses. This seed black hole has the mass of about 100 suns. It pulls in gas from its surroundings, becoming much more massive, and eventually may merge with other seed black holes. This entire process is called accretion.

The accretion theory does not explain supermassive black holes in extremely distant — and therefore young — quasars. Visible to us despite its distance of billions of light-years, a quasar's incredible brightness comes from matter spiraling into a supermassive black hole, heating to millions of degrees, creating jets that shine as beacons across the universe.

These early galaxies may have contained the first generation of stars created after the Big Bang. And although these stars can collapse to form black holes, they don't work as early quasar seeds. There is no surrounding gas for the black hole to feed on. That gas has been blown away by winds from the hot, newly formed stars. "Star formation is the enemy of forming massive black holes" in early galaxies, Bromm said. "Stars produce feedback that blows away the surrounding gas cloud."

For decades, astronomers have called this conundrum "the quasar seed problem."

In 2003, Bromm and Loeb came up with a theoretical idea to get an early galaxy to form a supermassive seed black hole, by suppressing the otherwise prohibitive energy input from star formation. Astronomers later dubbed this process "direct collapse."

Begin with a "primordial cloud of hydrogen and helium, suffused in a sea of ultraviolet radiation," Bromm said. "You crunch this cloud in the gravitational field of a dark-matter halo. Normally, the cloud would be able to cool, and fragment to form stars. However, the ultraviolet photons keep the gas hot, thus suppressing any star formation. These are the desired, near-miraculous conditions: collapse without fragmentation! As the gas gets more and more compact, eventually you have the conditions for a massive black hole."

This set of cosmic conditions is exquisitely sensitive to the time period in the universe's history — this process does not happen in galaxies today.

According to Loeb, "The quasars observed in the early universe resemble giant babies in a delivery room full of normal infants. One is left wondering: what is special about the environment that nurtured these giant babies? Typically the cold gas reservoir in nearby galaxies like the Milky Way is consumed mostly by star formation.

"The theory we proposed when Bromm was my postdoc [at Harvard] suggested

that the conditions in the first generation of galaxies were different," he said. "Instead of making many normal stars, these galaxies formed a single supermassive star at their center that ended up collapsing to a seed black hole. Hence the gas in these environments was used to feed this seed black hole rather than make many normal stars."

Bromm and Loeb published their theory in 2003. "But it was all theoretical back then," Bromm said.

Fast-forward a dozen years, and Bromm is now a professor at The University of Texas at Austin with post-docs and graduate students of his own. That's where Aaron Smith comes in.

Smith, Bromm, and Loeb had become interested in a galaxy called CR7, identified from a Hubble Space Telescope survey called COSMOS (in a paper led by Jorryt Matthee of Leiden University). Hubble spied CR7 at 1 billion years after the Big Bang.

David Sobral of the University of Lisbon had made follow-up observations of CR7 with some of the world's largest ground-based telescopes, including Keck and the VLT. These uncovered some extremely unusual features in the light signature coming from CR7. Specifically a certain hydrogen line in the spectrum, known as "Lyman-alpha," was several times brighter than expected. Remarkably, the spectrum also showed an unusually bright helium line.

"Whatever is driving this source is very hot — hot enough to ionize helium," Smith said.

Bromm agreed. "You need it to be 100,000 K — very hot, a very hard UV source" for that to happen, he said.

These and other unusual features in the spectrum, such as the absence of any detected lines from elements heavier than helium (in astronomical parlance, "metals,") together with the source's distance — and therefore its cosmic epoch — meant that it could either be a cluster of primordial stars or a supermassive black hole likely formed by direct collapse.

Smith ran simulations for both scenarios using the Stampede supercomputer at UT Austin's Texas Advanced Computing Center.

"We developed a novel code," Smith said, explaining that his code modeled the system differently than previous simulations.

"The old models were like a snapshot; this one is like a movie," he explained.

The type of modeling Smith used is called "radiation hydrodynamics," Bromm said. "It's the most expensive approach in terms of computer processing power."

The new code paid off, though. The star cluster scenario "spectacularly failed," Smith said, while the direct collapse black hole model performed well.

Bromm said their work is about more than understanding the inner workings of one early galaxy.

"With CR7, we had one intriguing observation. We are trying to explain it, and to predict what future observations will find. We are trying to provide a comprehensive theoretical framework."

In addition to Smith, Bromm, and Loeb's work, NASA recently announced the discovery of two additional direct-collapse black hole candidates based on observations with the Chandra X-ray Observatory.

It seems astronomers are "converging on this model," for solving the quasar seed problem, Smith said.

This research is supported by the National Science Foundation (NSF), grant numbers AST-1413501 and AST-1312034, and by an NSF graduate research fellowship to Aaron Smith.

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# IS THERE A SUPER-EARTH IN THE SOLAR SYSTEM OUT BEYOND NEPTUNE? BY ETHAN SIEGEL

This article is provided by NASA Space Place. With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology. Visit spaceplace.nasa.gov to explore space and Earth science!

When the advent of large telescopes brought us the discoveries of Uranus and then Neptune, they also brought the great hope of a Solar System even richer in terms of large, massive worlds. While the asteroid belt and the Kuiper belt were each found to possess a large number of substantial icy-and-rocky worlds, none of them approached even Earth in size or mass, much less the true giant worlds. Meanwhile, all-sky infrared surveys, sensitive to red dwarfs, brown dwarfs and Jupiter-mass gas giants, were unable to detect anything new that was closer than Proxima Centauri. At the same time, Kepler taught us that super-Earths, planets between Earth and Neptune in size, were the galaxy's most common, despite our Solar System having none.

*A possible super-Earth/mini-Neptune world hundreds of times more distant than Earth is from the Sun. Image credit: R. Hurt / Caltech (IPAC)*

**THE DISCOVERY OF SEDNA IN 2003 TURNED OUT TO BE EVEN MORE GROUNDBREAKING THAN ASTRONOMERS REALIZED.**

Although many Trans-Neptunian Objects (TNOs) were discovered beginning in the 1990s, Sedna had properties all the others didn't. With an extremely eccentric orbit and an aphelion taking it farther from the Sun than any other world known at the time, it represented our first glimpse of the hypothetical Oort cloud: a spherical distribution of bodies ranging from hundreds to tens of thousands of A.U. from the Sun. Since the discovery of Sedna, five other long-period, very eccentric TNOs were found prior to 2016 as well. While you'd expect their orbital parameters to be randomly distributed if they occurred by chance, their orbital orientations with respect to the Sun are clustered extremely narrowly: with less than a 1-in-10,000 chance of such an effect appearing randomly.

Whenever we see a new phenomenon with a surprisingly non-random appearance, our scientific intuition calls out for a physical explanation. Astronomers Konstantin Batygin and Mike Brown provided a compelling possibility earlier this year: perhaps a massive perturbing body very distant from the Sun provided the gravitational "kick" to hurl these objects towards the Sun. A single addition to the Solar System would explain the orbits of all of these long-period TNOs, a planet about 10 times the mass of Earth approximately 200 A.U. from the Sun, referred to as Planet Nine. More Sedna-like TNOs with similarly aligned orbits are predicted, and since January of 2016, another was found, with its orbit aligning perfectly with these predictions.

Ten meter class telescopes like Keck and Subaru, plus NASA's NEOWISE mission, are currently searching for this hypothetical, massive world. If it exists, it invites the question of its origin: did it form along with our Solar System, or was it captured from another star's vicinity much more recently? Regardless, if Batygin and Brown are right and this object is real, our Solar System may contain a super-Earth after all.

## 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, unformatted MS-Word format via email 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. Contact the editor for writting guidelines.


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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!

**MEETING THE 1ST FRIDAY OF EVERY MONTH**

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

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

University of Houston

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## GUIDESTAR ADVERTISING POLICIES

**PERSONAL ADVERTISEMENTS**

- Members in good standing of the Houston Astronomical Society (HAS) may request that an ad be placed in the GuideStar for personal items (for sale or wanted).
- Items offered for sale must be of interest to amateur astronomers.
- No more than two telescopes may be advertised within any calendar year.
- Ads will not run for more than 3 consecutive months
- Ads will be run on a space-available basis.
- Ads must be provided to the editor in electronic format (email, text file) by the 15th of the month preceding the month-of-issue.

**COMMERCIAL ADVERTISEMENTS**

- Advertisement sizes:

o Full page = 6.875"w x 9"h

o Half page = 6.875"w x 4.25" h

o Quarter page = 3.31" w x 4.25" h (allows for column gutter)

- Commercial advertisements will be run in the GuideStar at the following fee schedule:

| Size | One time | One quarter (3 consecutive months) |
|---|---|---|
| Full page | $100.00 | $250.00 |
| Half page | $50.00 | $125.00 |
| Quarter page | $25.00 | $62.50 |

- Artwork provided must be in electronic format (image file, PDF, etc.) and must be in the correct proportions to fit the space provided. Contact editor with questions.
- Artwork may be in color or in black and white.
- Items or services advertised must be of interest to amateur astronomers
- Payment for advertisements must be done in advance (pay to the 'Houston Astronomical Society')

# PARKING AT THE UNIVERSITY OF HOUSTON MAIN CAMPUS

## 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 Hoffeinz 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 Hoffeinz Pavilion
- Science and Research is across the street (2nd building back)

## 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.