Star Dust

**National Capital Astronomers, Inc.** **http://capitalastronomers.org**

Volume 65, Number 4 December 2006 ISSN 0898-7548

# December Speaker: Dr. Theodore R. Gull, "Eta Carinae: a Massive Star System in Transition"

Dr. Theodore R. Gull, NASA Goddard Space Flight Center, will present the talk "Eta Carinae: a Massive Star System in Transition" at the December 9, meeting of the National Capital Astronomers, 7:30 P.M., at the University of Maryland Observatory, in College Park, Maryland.

**Abstract**

Eta Carinae, the prototypical Luminous Blue Variable, is a massive binary of period 5.54 y. Becoming one of the brightest stars during the 1840s, it faded, then brightened briefly in the 1890s. It is now surrounded by the Homunculus, its own brilliant ejecta of at least 10 solar masses, rich in N, poor in C and in O. It exhibits thousands of metallic lines in dozens of velocity systems. At least one binary member has ended its H-burning phase. Studying Eta Carinae, we are gaining insight on how massive supergiants evolve to be intermediate-massed Wolf Rayet stars and eventually to be much less massive supernova progenitors. Massive stars apparently lose little material by their winds during their main sequence lifetime, but lose much more mass though major events well before the terminal supernova event. Gamma Ray Bursters at their optical maxima show evidence that massive ejection events precede the hypernova event and contribute to the early enrichment of our Universe.

**Biography**

Dr. Ted Gull has a B.S. in Physics (MIT 1966), a Ph.D. in Astronomy (Cornell 1971), and an M.B.A. (Loyola 1985). He has built several very important spectrographs, e.g., for the Kitt Peak and CTIO 4 meter telescopes. Since 1984 he has been Deputy P. I. of Hubble's Space Telescope Imaging Spectrograph. He was Associate Chief of the Lab for Astronomy and Solar Physics, and Mission Scientist of the Astro-1 Mission on the Columbia shuttle. He has very actively supported education, especially of Native Americans, e.g., in the NASA SKILL program with the South Dakota School of Mines and Technology and Oglala Lakota College. His honors include the Goddard Award of Merit and several NASA Distinguished Service awards and an honorary degree from SDSMT.

# APS Mid-Atlantic Senior Physicists Group December 13, 2006 Event

***by Dr. Walter Faust***

From: Walter L. Faust
To: Elliott Fein
Subject: Possible Item for Star Dust

I've attached a flyer for a talk before our retired physicists' group on December 13. This will be by the same Prof. Ted Jacobson who spoke to the NCA in October 2005. Whereas in the NCA talk "Expansion of the Universe" Dr. Jacobson spoke of General Relativity as it is expressed in the most delicate fashion, over great expanses of space and time, the coming talk will discuss circumstances where GR really gets rough — in the vicinity of a black hole. Note that these gatherings do occur at noon, but some NCA people might nonetheless be able to make it; in fact, Goddard people might even learn something of professional interest!

Walt Faust

**APS Mid-Atlantic Senior Physicists Group December 2006 Event**

Date: December 13, 2006

Speaker: Theodore Jacobson, University of Maryland, College Park, MD

Topic: The Unfinished Story of Black Hole Entropy

Time and Location: The talk will start at 1:00 p.m. with a Q&A session to follow. It will be held in one of the first floor conference rooms at the American Center for Physics, One Physics Ellipse, College Park, MD. This is located off River Road, between Kenilworth Ave. and Paint Branch Parkway. NOTE: The ACP no longer has a lunch facility.*

Abstract: There is no doubt that black holes have entropy equal to one-fourth the horizon area in Planck units. Yet, despite over thirty years of research, there remains no consensus on the most fundamental question: "What does black hole entropy count?"

*(Continued on page 2)*

# NCA Events This Month

## The Public is Welcome!

**NCA Home Page: http://capitalastronomers.org**

**NCA Mirror- and Telescope-making Classes:** Fridays, December 1, 8, 15, 22, and 29 , 6:30 to 9:30 P.M. at the Chevy Chase Community Center, at the northeast corner of the intersection of McKinley Street and Connecticut Avenue, N.W. Contact instructor Guy Brandenburg at 202-635-1860 or email him at gfbrandenburg @yahoo.com.

**Open house talks and observing** at the University of Maryland Observatory in College Park on the 5th and 20th of every month at 9 P.M. The talks are non-technical. There is telescope viewing afterward if the sky is clear.

**Upcoming NCA Meetings—Saturdays**
December 9, Ted Gull. Astrophysicist, Astrophysics Science Division, Goddard Space Flight Center, "Eta Carinae: a Massive Star System in Transition"
January 12: TBA.

See Page 3 for other events this month.

# Observing with NCA C-14

### *Mike McNeal*

Schedule is open, generally, Saturdays at 7:30 P.M. Call to set up a time.

In Mike McNeal's backyard, 5410 Grove St, Chevy Chase, MD, (Friendship Heights Metro).

Please make reservations by 10 p.m. the Friday before. Call Mike at 301-526-2648 or email him at mcnealmi@verizon.net.

We need a new volunteer to house NCA's C-14, make it available for weekly viewing, and transport it to other sites, e.g., Exploring the Sky and star parties.

# Senior Physicists Group December Event

*(Continued from page 1)*

I will review the discovery of this entropy and some of the controversy of its meaning, and implications that persist to this day.

Biography:
Theodore Jacobson is Professor of Physics at the University of Maryland, College Park. He earned a B.A. degree in physics and mathematics at Reed College, and a Ph.D. in physics at the University of Texas at Austin in 1983. He is a fellow of the American Physical Society, and has written or co-authored over 90 scientific publications. He has served on the Editorial Boards of *Physical Review D* and *Physical Review Letters*, and on the Scientific Advisory Board of the Kavli Institute for Theoretical Physics. His current research interests include black hole thermodynamics, the microstructure of space-time, and the possible breakdown of relativity theory.

# In the News

### *Reported by Dr. Nancy Grace Roman*

NASA'S CHANDRA FINDS BLACK HOLES ARE "GREEN"
*NASA News*

Black holes are the most fuel efficient engines in the universe, according to a new study using NASA's Chandra X-ray Observatory. By making the first direct estimate of how efficient or "green" black holes are, this work gives insight into how black holes generate energy and affect their environment. The new Chandra finding shows most of the energy released by matter falling toward a supermassive black hole is in the form of high-energy jets traveling at near the speed of light away from the black hole. This is an important step in understanding how such jets can be launched from magnetized disks of gas near the black hole's event horizon. "Just as with cars, it's critical to know the fuel efficiency of black holes," said lead author Steve Allen of the Kavli Institute for Particle Astrophysics and Cosmology at Stanford University and the Stanford Linear Accelerator Center, Stanford, Calif. "Without this information, we cannot figure out what is going on under the hood, so to speak, or what the engine can do."

Allen and his team used Chandra to study nine super-massive black holes at the centers of elliptical galaxies. These black holes, from .2 to 3 billion times the mass of our Sun, are relatively old and generate much less radiation than quasars, the rapidly growing super-massive black holes seen in the early universe. The surprise came when the Chandra results showed these quiet black holes are all producing much more energy in jets of high-energy particles than in visible light or X-rays. These jets create huge bubbles, or cavities, in the hot gas in the galaxies.

The efficiency of black hole energy-production was calculated in two steps. First, Chandra images of the galaxies' inner regions were used to estimate how much fuel is available for the black hole. Then, Chandra images were used to estimate the power required to produce the cavities. The galaxies were found to produce a lot of jet power with a surprisingly small amount of fuel. "If a car was as fuel-efficient as these black holes, it could travel over a billion miles on a gallon of gas," said co-author Christopher Reynolds of the University of Maryland, College Park. Some of the gas first attracted to the black holes may be blown away by the energetic activity before it gets too near the black hole, but a significant fraction must eventually approach the event horizon, where it is used with high efficiency to power the jets. The study also implies that matter flows towards the black holes at a steady rate for several million years.

NASA'S FUSE FINDS INFANT SOLAR SYSTEM AWASH IN CARBON
*NASA News*

Scientists using NASA's Far Ultraviolet Spectroscopic Explorer, or FUSE, have discovered abundant amounts of carbon

*(Continued on page 3)*

# In the News, continued

*(Continued from page 2)*
gas in a dusty disk surrounding a young star named Beta Pictoris.

The star and its emerging solar system are less than 20 million years old, and planets may have already formed. The abundance of carbon gas in the remaining debris disk indicates that Beta Pictoris' planets could be carbon-rich worlds of graphite and methane, or the star's environs might resemble our own solar system in its early days.

The new measurements make Beta Pictoris the first disk of its kind whose gas has been comprehensively studied. The discovery settles a long-standing scientific mystery about how the gas has lingered in this debris disk, yet raises new questions about the development of solar systems.

"There is much, much more carbon gas than anyone expected," said Aki Roberge, a NASA postdoctoral fellow and lead author on a Nature report. "Could this be what our own solar system looked like when it was young? Are we seeing the formation of new types of worlds? Either prospect is fascinating."

The carbon gas detected by the spacecraft comes from unseen asteroids or comets orbiting the star that collide with each other and release material. The mere presence of gas in the Beta Pictoris disk has been a mystery. Theoretical models predict that intense light from the young star should rapidly blow the gas away. The overabundance of carbon, discovered now for the first time, explains why the disk retains so much gas. Carbon is less susceptible to expulsion than other elements, and it retards the clearing effect. Asteroids and comets orbiting Beta Pictoris might contain large amounts of carbon-rich material, such as graphite and methane. Planets forming from or impacted by such bodies would be very different from those in our solar system and might have methane-rich atmospheres, like Titan, a moon of Saturn.

NASA SPACECRAFT HELPS RESEARCHERS SEE THE SUN'S FAR SIDE

*NASA News*

NASA researchers using the Solar and Heliospheric Observatory (SOHO) spacecraft have developed a method of seeing through the Sun to the star's far side. "This new method allows more reliable advance warning of magnetic storms brewing on the far side that could rotate with the Sun and threaten the Earth," said NASA-supported scientist Phil Scherrer of Stanford University, Stanford, Calif.

Magnetic storms resulting from violent solar activity disrupt satellites, radio communications, power grids and other technological systems on Earth. Advance warning can help planners prepare for operational disruptions. Many of these storms originate in groups of sunspots, or active regions - areas with high concentration of magnetic fields. Active regions situated on the near side of the Sun can be observed directly. However, traditional methods provided no information about active regions developing on the other side of the Sun. Knowing whether there are large active regions on the opposite side of the Sun may greatly improve forecast of potential magnetic storms.

The new observation method uses SOHO's Michelson Doppler Imager (MDI) instrument to trace sound waves reverberating through the Sun to build a picture of the far side. The Sun is filled with many kinds of sound waves caused by the convective motion of gas in its surface layers. The far side imaging method compares the sound waves that emanate from each small region on the far side with what was expected to arrive at that small region from waves that originated on the front side. An active region reveals itself because its strong magnetic fields speed up the sound waves. The difference becomes evident when sound waves originating from the front side and from the back side get out of step with one another.

*The deadline for the January Star Dust is December 27. Please send your material to Elliott Fein by that date to ensure inclusion. Send submissions to Elliott Fein at elliott.fein@verizon.net.*

*Articles submitted may be edited to fit the space available.*

# Other National Capital Area Meetings

## Northern Virginia Astronomy Club

**Information about the December speaker and topic were unavailable as we went to press.**

General membership meetings are open to the public, and are held at Enterprise Hall, Room 80, on the campus of George Mason University in Fairfax, Virginia. The meeting hall is in the basement floor of the building. It is best to park in Parking Lot B and walk up the hill to the rear of Enterprise Hall.

Meetings start at 7:00 P.M., on the second Sunday of every month. The first part of the meeting is club business, during which the officers make reports about their activities and areas of responsibility. The next part of the meeting usually includes:

- Show and Tell, where members share gadgets, books, techniques, etc.
- The Observing Report, describing the astronomical events for the next month.
- Q&A, where beginning astronomers are encouraged to ask questions to be answered by more experienced members.
- The Sky Tour, describing what's where in the sky for the next month.

The final part of the meeting is a program, usually by one of the members, but sometimes by "outside experts." We've had presenters from all aspects of Astronomy.

**Please Join Us for Dinner!**

Since February 1995, a number of NOVAC members have been congregating on the night of our regular meetings for dinner. Hopefully this assists in getting to know one another, at a more relaxed location than at the meeting itself. It's also nice to see who it is you're talking to for a change and be able to connect faces with names - unlike the usual observing situation. All are welcome to attend, whether NOVAC members or prospective members, guests or whoever — just be prepared to discuss a little astronomy or any other topic that pops up!

If you'd like to join us, stop by the Red, Hot and Blue restaurant at 5:30 P.M. See you there!

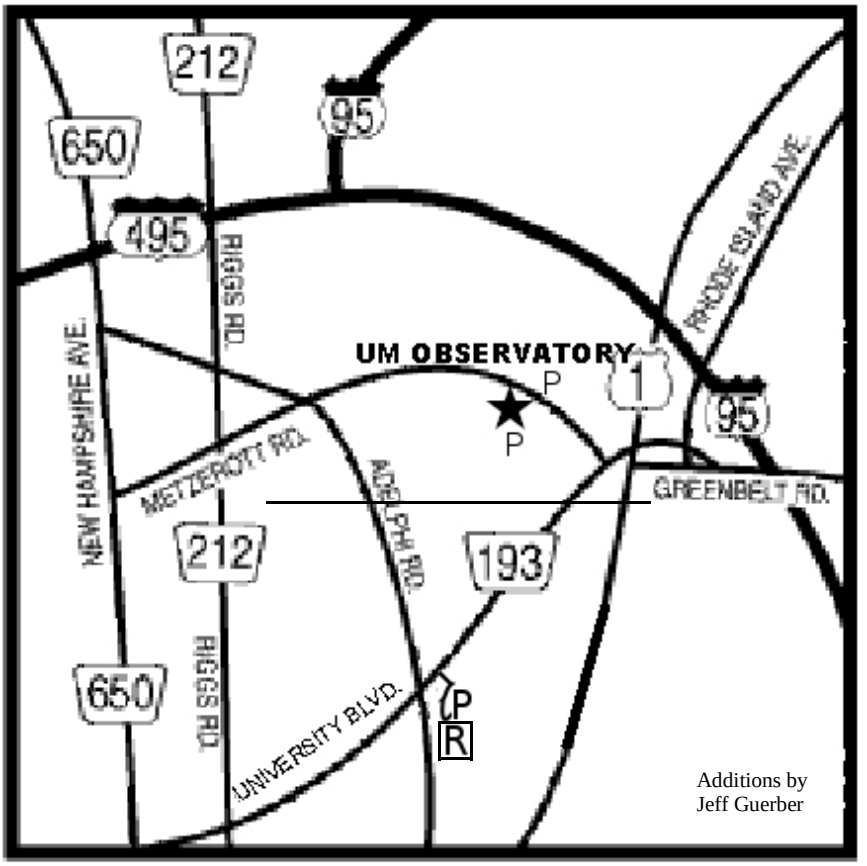
Source: http://novac.com/

# Getting to the NCA Monthly Meeting and the Dinner Before the Meeting

***Jeff Guerber***

NCA meetings are now held at 7:30 p.m. at the University of Maryland Observatory, in College Park on Metzerott Rd. between University Blvd. (MD-193) and Adelphi Rd. To get there from the Capital Beltway (I-495), either take US Rt. 1 south about a mile, turning right onto MD-193 West, then at the first light turn right onto Metzerott; or, take New Hampshire Ave. (MD-650) south, turn left at the second light onto Adelphi Rd., two more lights, turn left onto Metzerott, and proceed about a mile to the observatory. The observatory is on the south side of Metzerott Rd., directly opposite the UM System Administration building; you can park there if the observatory lot is full, but be careful crossing Metzerott Rd.

**At 5:30 p.m., before the meeting,** please join us for dinner at the Garden Restaurant in the UMD University College Inn and Conference Center, 3501 University Blvd. East at Adelphi Rd. From the Beltway, either take New Hampshire Ave. south, turn left onto Adelphi, and at the third light (passing Metzerott) turn left onto University then immediately right into the garage; or, take US-1 south, turn right onto University Blvd. west, and take it to the intersection with Adelphi Rd. Park either in the garage (costs), or in Lot 1 nearby (free). To get to the Observatory, exit to the right onto University Blvd. (MD-193) east, and at the second light turn left onto Metzerott Rd.




Getting to the NCA Meeting
Star=Observatory R=Restaurant P=Parking

# Observing after the Meeting

***Elizabeth Warner***

Following the meeting, members and guests are welcome to tour through the Observatory.

Weather permitting, several of the telescopes will also be set up for viewing.

# Are You Coming to Dinner?

If you are planning to come to the dinner before the meeting, please tell Benson J. Simon, telephone: 301-776-6721, e-mail bjs32@cornell.edu so that we can make reservations for the right number of people.

# Do You Want to Get *Star Dust* Electronically?

Any member wishing to receive *Star Dust*, the newsletter of the National Capital Astronomers, via e-mail as a PDF file attachment, instead of hardcopy via U.S. Mail, should contact Nancy Grace Roman, the NCA Secretary, at nancy.roman6 @verizon.net or 301-656-6092 (home).

# Do You Need a Ride?

Please contact Jay Miller, 240-401-8693, if you need a ride from the metro to dinner or to the meeting at the observatory. (Please try to let him know in advance by email at rigel1@starpower.net.)

*Star Dust* is published ten times yearly, September through June, by the National Capital Astronomers, Inc. (NCA).
Editor: Elliott Fein, Co-editor: Adele Fein, Editorial Advisor: Nancy Byrd. Consultant: Jeffrey Norman


## National Capital Astronomers, Inc. **http://capitalastronomers.org**



**SERVING SCIENCE & SOCIETY SINCE 1937**

NCA is a nonprofit, membership-supported, volunteer-run, public-service corporation dedicated to advancing astronomy, space technology, and related sciences through information, participation, and inspiration, via research, lectures, presentations, publications, expeditions, tours, public interpretation, and education. NCA is the astronomy affiliate of the Washington Academy of Sciences. NCA is an IRS Section 501(c)(3) tax-deductible organization. All are welcome to join NCA.

**SERVICES & ACTIVITIES:**

**Monthly Meetings** feature presentations of current work by researchers at the horizons of their fields. All are welcome; there is no charge. *See* monthly *Star Dust* for time and location.

**NCA Volunteers** serve in a number of capacities. Many members serve as teachers, clinicians, and science fair judges. Some members observe total or graze occultations of stars occulted by the Moon or asteroids.

**Publications** received by members include the monthly newsletter of NCA, *Star Dust*, and an optional discount subscription to *Sky & Telescope* magazine.

**Consumer Clinics:** Some members serve as clinicians and provide advice for the selection, use, and care of binoculars and telescopes and their accessories. One such clinic is the semi-annual event held at the Smithsonian Institution National Air and Space Museum.

**Fighting Light Pollution**: NCA is concerned about light pollution and is interested in the technology for reducing or eliminating it. To that purpose, NCA is an Organization Member of the International Dark Sky Association (IDA).

**Classes:** Some NCA members are available for educational programs for schools and other organizations. The instruction settings include star parties, classroom instruction, and school-teacher training programs that provide techniques for teaching astronomy. NCA sponsors a telescope-making class, which is described in the *Star Dust* "Calendar of Monthly Events."

**Tours:** On several occasions, NCA has sponsored tours of astronomical interest, mainly to observatories (such as the National Radio Astronomy Observatory) and to the solar eclipses of 1998 and 1999.

**Discounts** are available to members on many publications, products, and services, including *Sky & Telescope* magazine.

**Public Sky Viewing Programs** are offered jointly with the National Park Service, and others. Contact: Joe Morris, joemorris@erols.com or (703) 620-0996.

**Members-Only Viewing Programs** periodically, at a dark-sky site.

**NCA Juniors Program** fosters children's and young adults' interest in astronomy, space technology, and related sciences through discounted memberships, mentoring from dedicated members, and NCA's annual Science Fair Awards.

**Fine Quality Telescope,** 14-inch aperture, see "Calendar of Monthly Events."

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## Yes, I'd like to join NATIONAL CAPITAL ASTRONOMERS!

Name: _____ Date: ____/____/_____
Street address: _____
City/State/ZIP: _____
Telephone: ____-____-_____ E-mail: _____
Other family members who should receive a membership card: _____
Would you prefer to get *Star Dust* by e-mail? ____

**MEMBERSHIP CATEGORIES AND ANNUAL DUES RATES**

*All members receive* Star Dust*, the monthly newsletter announcing NCA activities. As an added optional benefit to extend your knowledge of astronomy you may also choose* Sky and Telescope *magazine at the discounted rate of $33.*

Student Membership: ……..… $5 ……..with *Sky and Telescope*....$38
Standard Individual or Family Membership: …… $10 ……..…..with *Sky and Telescope*....$43

You are welcome to make contributions in any amount in addition to the dues shown above.
Contribution amount:_____

Please mail this form with your check payable to National Capital Astronomers, to:
Mr. Michael L. Brabanski, NCA Treasurer; 10610 Bucknell Drive, Silver Spring, MD 20902-4254

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**FIRST CLASS**
**DATED MATERIAL**

# *NCA Will Meet on December 9!*

***Inside this issue:***