

# Star Dust

National Capital Astronomers, Inc.  
December 2012      Volume 71, Issue 4  
<http://capitlastronomers.org>



Celebrating 75 years 1937-2012

## Next Meeting

**When:** Sat. Dec. 8, 2012  
**Time:** 7:30 pm  
**Where:** UMD Observatory  
**Speaker:** Dennis Bodewitz (UMD)

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## Directions to Dinner/Meeting

There will be a special 75<sup>th</sup> Anniversary Pot-Luck dinner at the UMD Observatory. Details are on p2.

We will resume our pre-meeting dinners at the new location at Mulligan's Grill in Jan 2013. Directions are on p7.

## 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 e-mail at [rigel1@starpower.net](mailto:rigel1@starpower.net).

## Observing after the Meeting

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.

December 2012: Dennis Bodewitz  
University of Maryland

## Ultraviolet Observations of Asteroids, Comets, and Everything in Between

**Abstract:** Swift is a space-borne observatory initially designed for rapid follow-up of gamma-ray bursts. It is equipped with co-aligned gamma-ray, X-ray, and UV telescopes, and can quickly slew between targets, allowing for rapid response observations and monitoring campaigns. In the past five years, we have used Swift to study numerous small bodies in the Solar System. I will give an overview of our results, ranging from the UV spectroscopy of many asteroids to constrain their surface composition, to the UV imaging and spectroscopy of comets that allows us to study their activity and composition up close and far from the Sun, and to the successful observations of the spectacular impact on Asteroid (596) Scheila.



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## Please Get Star Dust Electronically

NCA members able to receive Star Dust, the newsletter of the NCA, via e-mail as a PDF file attachment, instead of hardcopy via U.S. Mail, can save NCA a considerable amount of money on the printing and postage in the production of Star Dust (the NCA's single largest expense) and also save some trees. If you can switch from paper to digital, please contact Manjunath Rao, the NCA Secretary, at [kurchi@hotmail.com](mailto:kurchi@hotmail.com).

*Thank you!*

## Reminder

After the meeting, everyone is invited to join us at Plato's Diner in College Park. Plato's is located at 7150 Baltimore Ave. (US Rt. 1 at Calvert Rd.), just south of the university's campus. What if it's clear and you want to stick around and observe? No problem -- just come over when you're through. This is very informal, and we fully expect people to wander in and out.

**Biography:** Born in Hoogezand-Sappemeer, the Netherlands, I studied experimental physics and astronomy at the University of Groningen. I got my Ph.D. after writing a dissertation on charge exchange emission from solar wind ions interacting with cometary atmospheres at the Nuclear Accelerator Institute (KVI) at the University of Groningen. Being awarded a NASA Postdoctoral Program grant, I moved to Washington DC and started observing comets and asteroids with the Swift space telescope at the Goddard Space Flight Center. In 2010 I joined the Small Body Group at the University of Maryland, where I got involved in the comet fly-bys of the Deep Impact and Stardust-NEXT missions, and in the Rosetta mission that will orbit and land on a comet in 2015. I am one out of a dozen people who ever flew a man-powered helicopter (the University of Maryland's Gamera II).

## Hello NCA!

*The 75th Anniversary party will be held at the December meeting on December 8!!*

It will be in the form of a pot-luck supper, so we need the attendees to bring something to share with the others. Setup for the supper starts at 5:30 and the dinner bell rings at 6:00, giving us time to eat, talk, and clean up the room before the regular meeting begins at 7:30. If you know of any NCA members who haven't been coming to recent meetings, here's an opportunity to bring them back into the fold.

Elizabeth Warner has graciously offered both to make the Observatory's lecture hall available to us for the party, and to keep a list of who is bringing what so that we don't wind up with everybody bringing the same thing. (More on that below.)

We need to know how many people will attend and what they will bring. If you'll be at the party (and please do come!), please send an email to Elizabeth ([warnerem@astro.umd.edu](mailto:warnerem@astro.umd.edu)) saying how many people will be coming with you and what you'll be bringing. Elizabeth will publish the list of who is bringing what on the NCA web site ([capitalastronomers.org/special/NCA75th.html](http://capitalastronomers.org/special/NCA75th.html)).

We don't have a formal schedule for entertainment during the dinner, but we're asking that anyone with interesting historical information about NCA, NASA, or anything else that's somehow related to astronomy would be willing to stand up and tell us what happened in "the good (or maybe bad) old days." Similarly, if you have any interesting material that could be put on a bulletin board that would be nice.

NCA and its members have been part of the astronomy and spaceflight scene in Washington for three quarters of a century. In that period we've seen – and in many cases, been part of – many extraordinary events. The anniversary dinner is an extraordinary opportunity for long time members to pass along/share their memories with the newer members.

### 2012-2013 Officers

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- Wayne Warren (2015)
- Harold Williams (2016)

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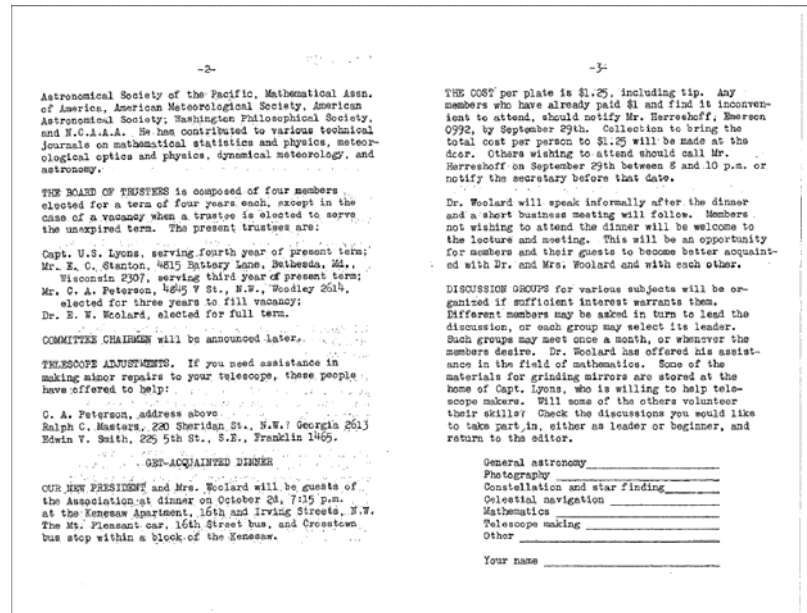
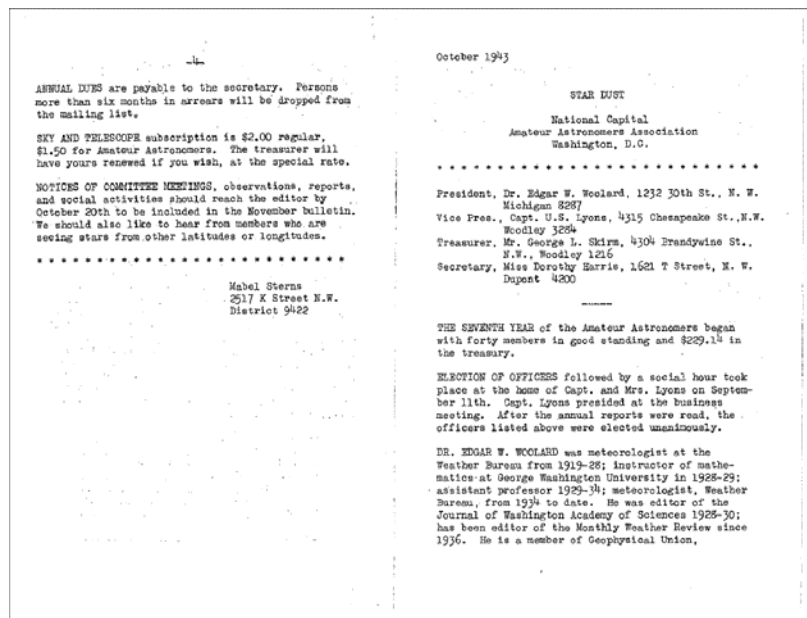
*Star Dust Editor*  
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### First Star Dust Issue

The early issues of Star Dust were scanned at the USNO by summer student Nick Kutchak under the supervision of the USNO Librarian and NCA member, Sally Bosken. We appreciate all their efforts. Later issues were scanned by Wayne Warren and other volunteers. Thanks to efforts of all of these volunteers we have a near complete digital archive.

Here is a copy of the first *Star Dust* issue from October, 1943. Page 4 appears at the beginning of the scan because of how our newsletter was folded at that time. *I have included both thumbnails of Wayne's scans and close-up views of each page in numerical order.*

Thank you Wayne for your many hours scanning decades of back *Star Dust* issues for the NCA website and for contributing a copy of our first issue in celebration of NCA's 75<sup>th</sup> Anniversary.



October 1943

STAR DUST

National Capital
Amateur Astronomers Association
Washington, D.C.

\*\*\*\*\*

President, Dr. Edgar W. Woolard, 1232 30th St., N. W.
Michigan 8287
Vice Pres., Capt. U.S. Lyons, 4315 Chesapeake St., N.W.
Woodley 3284
Treasurer, Mr. George L. Skirm, 4304 Brandywine St.,
N.W., Woodley 1216
Secretary, Miss Dorothy Harris, 1621 T Street, N. W.
Dupont 4200

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THE SEVENTH YEAR of the Amateur Astronomers began
with forty members in good standing and \$229.14 in
the treasury.

ELECTION OF OFFICERS followed by a social hour took
place at the home of Capt. and Mrs. Lyons on Septem-
ber 11th. Capt. Lyons presided at the business
meeting. After the annual reports were read, the
officers listed above were elected unanimously.

DR. EDGAR W. WOOLARD was meteorologist at the
Weather Bureau from 1919-28; instructor of mathe-
matics at George Washington University in 1928-29;
assistant professor 1929-34; meteorologist, Weather
Bureau, from 1934 to date. He was editor of the
Journal of Washington Academy of Sciences 1928-30;
has been editor of the Monthly Weather Review since
1936. He is a member of Geophysical Union,

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Astronomical Society of the Pacific, Mathematical Assn.
of America, American Meteorological Society, American
Astronomical Society; Washington Philosophical Society,
and N.C.A.A.A. He has contributed to various technical
journals on mathematical statistics and physics, meteor-
ological optics and physics, dynamical meteorology, and
astronomy.

THE BOARD OF TRUSTEES is composed of four members
elected for a term of four years each, except in the
case of a vacancy when a trustee is elected to serve
the unexpired term. The present trustees are:

Capt. U.S. Lyons, serving fourth year of present term;
Mr. E. C. Stanton, 4815 Battery Lane, Bethesda, Md.,
Wisconsin 2307, serving third year of present term;
Mr. C. A. Peterson, 4845 V St., N.W., Woodley 2614,
elected for three years to fill vacancy;
Dr. E. W. Woolard, elected for full term.

COMMITTEE CHAIRMEN will be announced later.

TELESCOPE ADJUSTMENTS. If you need assistance in
making minor repairs to your telescope, these people
have offered to help:

C. A. Peterson, address above.
Ralph C. Masters, 220 Sheridan St., N.W. Georgia 2613
Edwin V. Smith, 225 5th St., S.E., Franklin 1465.

GET-ACQUAINTED DINNER

OUR NEW PRESIDENT and Mrs. Woolard will be guests of
the Association at dinner on October 2d, 7:15 p.m.
at the Kenesaw Apartment, 16th and Irving Streets, N.W.
The Mt. Pleasant car, 16th Street bus, and Crosstown
bus stop within a block of the Kenesaw.

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THE COST per plate is \$1.25, including tip. Any
members who have already paid \$1 and find it inconven-
ient to attend, should notify Mr. Herreshoff; Emerson
0992, by September 29th. Collection to bring the
total cost per person to \$1.25 will be made at the
dcor. Others wishing to attend should call Mr.
Herreshoff on September 29th between 8 and 10 p.m. or
notify the secretary before that date.

Dr. Woolard will speak informally after the dinner
and a short business meeting will follow. Members
not wishing to attend the dinner will be welcome to
the lecture and meeting. This will be an opportunity
for members and their guests to become better acquaint-
ed with Dr. and Mrs. Woolard and with each other.

DISCUSSION GROUPS for various subjects will be or-
ganized if sufficient interest warrants them.
Different members may be asked in turn to lead the
discussion, or each group may select its leader.
Such groups may meet once a month, or whenever the
members desire. Dr. Woolard has offered his assist-
ance in the field of mathematics. Some of the
materials for grinding mirrors are stored at the
home of Capt. Lyons, who is willing to help tele-
scope makers. Will some of the others volunteer
their skills? Check the discussions you would like
to take part in, either as leader or beginner, and
return to the editor.

- General astronomy \_\_\_\_\_
Photography \_\_\_\_\_
Constellation and star finding \_\_\_\_\_
Celestial navigation \_\_\_\_\_
Mathematics \_\_\_\_\_
Telescope making \_\_\_\_\_
Other \_\_\_\_\_

Your name \_\_\_\_\_

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ANNUAL DUES are payable to the secretary. Persons
more than six months in arrears will be dropped from
the mailing list.

SKY AND TELESCOPE subscription is \$2.00 regular,
\$1.50 for Amateur Astronomers. The treasurer will
have yours renewed if you wish, at the special rate.

NOTICES OF COMMITTEE MEETINGS, observations, reports,
and social activities should reach the editor by
October 20th to be included in the November bulletin.
We should also like to hear from members who are
seeing stars from other latitudes or longitudes.

\*\*\*\*\*

Mabel Sterns
2517 K Street N.W.
District 9422

## Occultation Notes

D following the time denotes a disappearance, while R indicates that the event is a reappearance.

When a power (x; actually, zoom factor) is given in the notes, the event can probably be recorded directly with a camcorder of that power with no telescope needed.

The times are for Greenbelt, MD, and will be good to within +/-1 min. for other locations in the Washington-Baltimore metropolitan areas unless the cusp angle (CA) is less than 30 deg., in which case, it might be as much as 5 minutes different for other locations across the region.

Some stars in Flamsteed's catalog are in the wrong constellation, according to the official IAU constellation boundaries that were established well after Flamsteed's catalog was published. In these cases, Flamsteed's constellation is in parentheses and the actual constellation is given in the notes following a /.

Mag is the star's magnitude.

% is the percent of the Moon's visible disk that is sunlit, followed by a + indicating that the Moon is waxing and - showing that it is waning. So 0 is new moon, 50+ is first quarter, 100+ or - is full moon, and 50- is last quarter. The Moon is crescent if % is less than 50 and is gibbous if it is more than 50.

Cusp Angle is described more fully at the main IOTA Web site.

Sp. is the star's spectral type (color), O,B,blue; A,F,white; G,yellow; K,orange; M,N,S,C red.

Also in the notes, information about double stars is often given. "Close double" with no other information usually means nearly equal components with a separation less than 0.2". "mg2" or "m2" means the magnitude of the secondary component, followed by its separation in arc seconds ("), and sometimes its PA from the primary. If there is a 3rd component (for a triple star), it might be indicated with "mg3" or "m3". Double is sometime abbreviated "dbl".

Sometimes the Watts angle (WA) is given; it is aligned with the Moon's rotation axis and can be used to estimate where a star will reappear relative to lunar features. The selenographic latitude is WA -270. For example, WA 305 - 310 is near Mare Crisium.

## Mid-Atlantic Occultations and Expeditions

David Dunham

### Asteroidal and Planetary Occultations

Date	Day	EST	Star	Mag.	Asteroid	dur. dmag	Ap. s	Location
2012								
Dec 7	Fri	0:40	2UC35161440	12.4	Hyperborea	2.0	5 9	DE, sMD, VA; DC?
Dec 7	Fri	19:30	TYC18811547	9.6	McDonalda	6.5	2 4	UK, seVA, eNC, SC
Dec 15	Sat	5:24	2UC44658753	13.2	Lomia	0.5	25 10	neNC, eVA, DC, MD
Dec 15	Sat	23:40	SAO 116757	8.5	Fukushima	7.8	4 3	seVA, NC, nSC, nGA
Dec 17	Mon	18:04	46 Tauri B	6.0	Philippina	0.7	5 1	eNC, seSC; seVA?
Dec 18	Tue	0:03	TYC24670054	11.1	1988 AK	4.9	6 7	VA, WV; NC, MD, DC?
Dec 21	Fri	4:17	TYC13461285	9.5	Ferrari	6.5	1 4	sNJ, MD; DC, nVA?
Dec 21	Fri	21:14	TYC13191629	9.4	Kathy	5.5	1 4	cVA, sWV, nKY; sMD?
Dec 25	Tue	17:53	2UC26811537	11.7	Eunike	0.8	16 7	VA, WV; MD?, Sun-11
Dec 26	Wed	4:54	2UC41698108	11.9	Metis	0.05	23 7	eNC, cVA, WV, OH
2013								
Jan 6	Sun	2:05	PPMX4956407	14.0	2003 TG58	9.1	6 10	TNO; sPacO; NAmEr?
Jan 8	Tue	2:16	TYC13591073	10.5	Gostin	3.8	1 6	cVA, sWV, sOH, sIN
Jan 8	Tue	19:24	TYC07431761	11.0	Hugo	4.2	2 6	DE, MD, nVA; DC?

### Lunar Grazing Occultations (\*, Dunham plans no expedition)

Date	Day	EST	Star	Mag.	% alt	CA	Location
2012							
Dec 6	Thu	3:46	SAO 118450	8.2	52- 44	7S	HopewelObs, Woodb, VA; Husvil, MD
Dec 9	Sun	5:22	ZC 1919	6.9	21- 22	7S	Corning, NY; wCaldwell, NJ; NYC
Dec 14	Fri	17:55	SAO 162140	8.9	4+ 6	3S	*Lewisbury, Pennsylvania

2013 - No useful grazes in Mid-Atlantic region in early January  
Interactive detailed maps at <http://www.timerson.net/IOTA/>

### Total Lunar Occultations

DATE	Day	EST	Ph	Star	Mag.	% alt	CA	Sp.	Notes
2012									
Dec 9	Sun	3:42	R	ZC 1913	7.3	21- 9	13N	A2	Az113,mg2 11 3.5", PA274
Dec 9	Sun	3:52	R	SAO 157848	7.6	21- 11	62S	A0	Azimuth 115 deg.
Dec 9	Sun	3:52	R	SAO 157848	7.6	21- 11	62S	A0	Azimuth 115 deg.
Dec 14	Fri	17:25	D	ZC 2773	6.2	4+ 11	89N	K0	Sun-8, Az234, mg2 9, sep8"
Dec 14	Fri	17:35	D	ZC 2774	6.4	4+ 9	61N	F5	Sun -9, Az. 236, double??
Dec 15	Sat	18:41	D	SAO 163258	8.4	10+ 11	39N	G3	Azimuth 240 degrees
Dec 18	Tue	18:21	D	ZC 3340	7.7	37+ 45	65N	F5	mag.2 9.5, sep. ".05
Dec 19	Wed	18:50	D	16 Piscium	5.7	47+ 51	42N	F6	ZC 3482, close double
Dec 19	Wed	21:51	D	SAO 128329	7.5	48+ 25	79S	K2	
Dec 21	Fri	0:14	D	51 Piscium	5.8	59+ 9	13S	B9	Az272, ZC68, close triple
Dec 21	Fri	18:06	D	ZC 173	6.5	67+ 58	85S	G5	
Dec 24	Mon	17:11	D	ZC 519	7.6	90+ 32	42N	K5	Sun altitude -4 degrees
Dec 26	Wed	22:13	D	ZC 808	6.8	98+ 68	72S	B0	
Dec 27	Thu	3:56	D	ZC 837	6.2	99+ 28	81N	B6	
Dec 29	Sat	23:00	R	1 Cancri	5.8	97- 50	87S	K3	AA 281 deg., ZC 1197
Dec 30	Sun	21:10	R	45 Cancri	5.6	93- 19	75S	A3	AA 264, ZC1309, double?
Dec 31	Mon	0:06	R	FX Cancri	6.7	92- 51	38N	M3	ZC 1320
2013									
Jan 1	Tue	2:24	R	SAO 117836	7.2	86- 58	50N	G5	
Jan 2	Wed	1:01	R	RX Sex	6.7	78- 39	65S	A3	ZC1528; mg2 9 117", PA192
Jan 5	Sat	1:37	R	SAO 139061	7.3	48- 11	48N	F5	Az.112, mg2 11 2", PA 285
Jan 6	Sun	6:54	R	ZC 2009	8.1	35- 36	68N	K0	Sun altitude -6 degrees
Jan 7	Mon	3:08	R	ZC 2119	6.6	26- 3	87S	F6	Azimuth 116 degrees
Jan 7	Mon	5:09	R	SAO 158899	8.4	25- 21	37S	G8	
Jan 13	Sun	17:32	D	ZC 3154	7.4	6+ 22	90S	G0	Sun -5, close double??
Jan 13	Sun	18:33	D	SAO 145483	7.9	6+ 12	59S	B9	Azimuth 248 degrees

Explanations & more information are at <http://iota.jhuapl.edu/exped.htm>.

David Dunham, [dunham@starpower.net](mailto:dunham@starpower.net),  
phone 301-526-5590

Thank you Nancy Grace Roman  
for finding this article.

## Fossil Star Light

From NASA News

[hqnews@mediaservices.nasa.gov](mailto:hqnews@mediaservices.nasa.gov)

11/1/2012

"The optical and ultraviolet light from stars continues to travel throughout the universe even after the stars cease to shine, and this creates a fossil radiation field we can explore using gamma rays from distant sources," said lead scientist for this investigation, Marco Ajello,

Gamma rays are the most energetic form of light. Since Fermi's launch in 2008, its Large Area Telescope (LAT) has observed the entire sky in high-energy gamma rays every three hours, creating the most detailed map of the universe ever known at these energies.

The total sum of starlight in the cosmos is known to astronomers as the extragalactic background light (EBL). To gamma rays, the EBL functions as a kind of cosmic fog. Ajello and his team investigated the EBL by studying gamma rays from 150 blazars, galaxies powered by black holes, that were strongly detected at energies greater than 3 billion electron volts (GeV), or more than a billion times the energy of visible light. Gamma rays at these energies are few and far between. Therefore it took four years of data to analyze the scattering of these gamma rays as they traversed the intervening space.

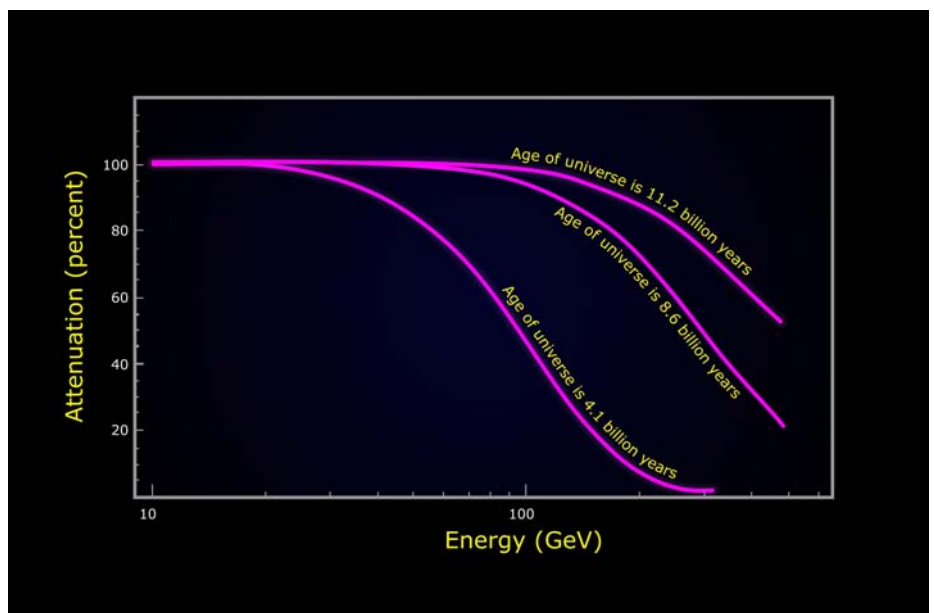
Continued on next column

Gamma rays produced in blazar jets travel across billions of light-years to Earth. During their journey, the gamma rays pass through an increasing fog of visible and ultraviolet light emitted by stars that formed throughout the history of the universe. Occasionally, a gamma ray collides with starlight and transforms into a pair of particles -- an electron and its antimatter counterpart, a positron. Once this occurs, the gamma ray is lost. In effect, the process dampens the gamma ray signal in much the same way as fog dims light from a distant lighthouse.

From studies of nearby blazars, scientists have determined how many gamma rays should be emitted at different energies. More distant blazars show fewer gamma rays at higher energies -- especially above 25 GeV -- thanks to the conversion by the cosmic fog. The farthest blazars are missing most of their higher-energy gamma rays.

The researchers determined the average gamma-ray attenuation across three distance ranges between 9.6 billion years ago and today. From these measurements, the scientists were able to estimate the fog's thickness. To account for the observations, the average stellar density in the cosmos is about 1.4 stars per 100 billion cubic light-years, which means the average distance between stars in the universe is about 4,150 light-years.

"The Fermi result opens up the exciting possibility of constraining the earliest period of cosmic star formation, thus setting the stage for NASA's James Webb Space Telescope," said Volker Bromm, who commented on the findings. "In simple terms, Fermi is providing us with a shadow image of the first stars, whereas Webb will directly detect them." Measuring the extragalactic background light was one of the primary mission goals for Fermi.



### Directions to Mulligan's Grill and Pub

<http://mulligans.umd.edu/directions>

Take I-66 East -or- I-270 South to the Washington, D.C. Beltway (I-495).

Proceed East on I-495 toward Baltimore / Silver Spring.

Take Exit #25 (US 1) South toward College Park.

Proceed approximately 2 miles on US 1.

Exit right onto route 193 West (University Blvd).

Second stop light (Golf Course Road); turn right.

Proceed into the Golf Course parking lot.

For those of you using a GPS unit you can input: the intersection of 193 and Stadium Dr or 38.990987,-76.954399.

### Calendar of Events

**NCA Mirror- and Telescope-making Classes:** Tuesdays Dec. 4, 11, 18, 25 and Fridays, Dec. 7, 14, 21, 28, 6:30 to 9:30 pm 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 [gbrandenburg@yahoo.com](mailto:gbrandenburg@yahoo.com). In case there is snow, call 202-282-2204 to see if the CCCC is open.

**Open house talks and observing** at the University of Maryland Observatory in College Park on the 5th and 20th of every month at 8:00 pm (Nov.-Apr.) or 9:00 pm (May-Oct.). Details: [www.astro.umd.edu/openhouse](http://www.astro.umd.edu/openhouse)

**Dinner:** NCA's 75<sup>th</sup> Anniversary Party, Saturday, Dec. 8. (See page 2.) Setup for pot-luck supper begins at 5:30 and eating at 6:00, with the meeting to follow at 7:30pm.

**Montgomery College Planetarium:** 7621 Fenton Street, Takoma Park, MD (240) 567-1463. Friday, Saturday, and Sunday, 21, 22, 23 Dec. 2012 at 3:00 pm. "Mayan Calendars" in the Planetarium. [www.montgomerycollege.edu/Departments/planet/planet/MayanAstronomy.html](http://www.montgomerycollege.edu/Departments/planet/planet/MayanAstronomy.html)

**Owens Science Center Planetarium:** "Rudolph Flu" Fri. Dec. 14 at 7:30 pm. [www1.pgcps.org/howardbowens](http://www1.pgcps.org/howardbowens)

**MASPS:** 19 Dec, Ian B. Spielman, Joint Quantum Institute, NIST and UMD, "Observations of Zitterbewegung in a Degenerate Quantum Gas"

- Upcoming NCA Meetings** at the University of Maryland Observatory
- Dec. 8, 2012 Dennis Bodewitz (UMD) – Ultra-Violet Observations of Asteroids
  - Jan 12, 2012 Abderahmen Zoghbi (UMD), X-ray Echoes Map the Environment of a Black Hole
  - Feb 09 **Lindy Elkins-Tanton** (DTM), Magma and Water Oceans in the Early Solar System

### National Capital Astronomers Membership Form

**Name:** \_\_\_\_\_ **Date:** \_\_\_/\_\_\_/\_\_\_

**Address:** \_\_\_\_\_ **ZIP Code:** \_\_\_\_\_

**Home Phone:** \_\_\_ - \_\_\_ - \_\_\_ **E-mail:** \_\_\_\_\_ **Print / E-mail Star Dust (circle one)**

**Membership (circle one):** Student..... \$ 5 Individual / Family.....\$10 Optional Contribution.....\$\_\_\_

**Please indicate which activities interest you:**

- Attending monthly scientific lectures on some aspect of astronomy \_\_\_\_\_
- Making scientific astronomical observations \_\_\_\_\_
- Observing astronomical objects for personal pleasure at relatively dark sites \_\_\_\_\_
- Attending large regional star parties \_\_\_\_\_
- Doing outreach events to educate the public, such as Exploring the Sky \_\_\_\_\_
- Building or modifying telescopes \_\_\_\_\_
- Participating in travel/expeditions to view eclipses or occultations \_\_\_\_\_
- Combating light pollution \_\_\_\_\_

Do you have any special skills, such as videography, graphic arts, science education, electronics, machining, etc.?

Are you interested in volunteering for: Telescope making, Exploring the Sky, Star Dust, NCA Officer, etc.?

Please mail this form with check payable to National Capital Astronomers to:  
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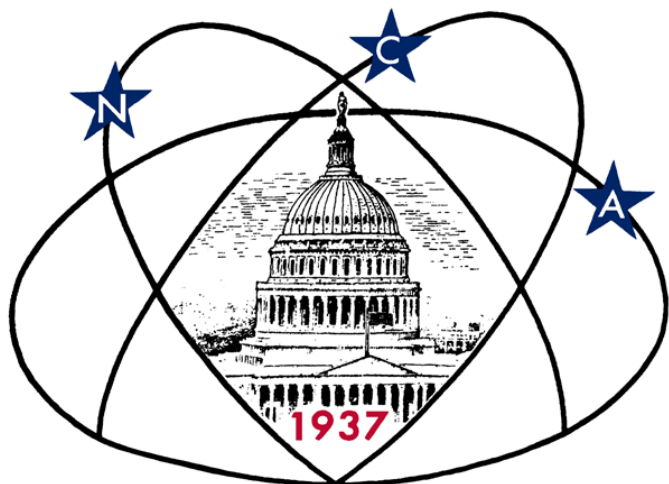
NCA c/o Elizabeth Warner

400 Madison St #2208

Alexandria, VA 22314

**First Class**

**Dated Material**



Next NCA Mtg:

**Dec. 8**

**7:30 pm**

**@ UMD Obs**

**Dr. Dennis Bodewitz  
(UMD)**

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