Star Dust

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March Speaker: Dr. Ben Sugerman, "How Supernovae Shed Light on some 'Obscure' Questions"

Dr. Ben Sugerman, Visiting Assistant Professor of Physics and Astronomy at Goucher College in Baltimore, MD, will present the talk "How Supernovae Shed Light on some 'Obscure' Questions" at the March 10, meeting of the National Capital Astronomers, 7:30 P.M., at the University of Maryland Observatory, in College Park, Maryland.

Abstract

Supernova: even the name inspires awe. Those spectacular explosions, punctuating the final death throes of stars, more energetic than the sum total of a star's radiation over its entire lifetime, flashing like cosmic beacons and visible clear across the vastness of space, teach us the Universe's history and write its future. Less well known, and certainly far less romantic, is space dust, which permeates all parts of galaxies, and unless you are an infrared astronomer, just gets in everyone's way. Over the last 20 years, supernovae have been "illuminating" dust in some unexpected ways. I will discuss very recent work on establishing whether supernovae can explain the vast quantities of dust found in the very earliest galaxies. I will also show how supernovae can illuminate otherwise invisible dust in the form of scattered-light echoes, allowing us to probe the structure and composition of circumstellar and interstellar environment.

Biography

Ben Sugerman received his B.A. in Physics from Occidental College in 1996, and his Ph.D. in Astronomy from Columbia University in 2003. Prior to joining the Goucher community, he was a postdoctoral research assistant at the Space Telescope Science Institute in Baltimore, MD. His research focuses on using dust to trace the final stages of stellar evolution, such as light echoes to study asymmetric mass loss, or the production of dust in supernova remnants.

Ms. Brenda Corbin: "Etienne Leopold Trouvelot"

Reviewed by Alan Bromborsky

This is a review of the talk given at the February 10 meeting of National Capital Astronomers by Brenda Groves Corbin, retired head librarian at the U.S. Naval Observatory.

The second half of the Nineteenth Century was the golden age of visual (as opposed to photographic) observation in astronomy. While the first astrophotographs were taken in the 1850's, the sensitivity of film did not exceed the sensitivity of the human eye until the first decade of the Twentieth Century. Additionally, while the sensitivity of film during this period was sufficient for photography of the Sun and Moon, the fact that the available film was not panchromatic meant that even with appropriate filters, composite color photography of the Sun was not practical. During this period (1850-1900), if a color visual record of the Sun, planets, comets, stars, and nebulae was desired, an astronomer artist had to make it. The leading such artist of this period was Etienne Leopold Trouvelot.

Trouvelot emigrated to the United States from France in 1855 due to political problems with the regime in France. Upon his arrival in Massachusetts, he earned his living by producing technical illustrations for scientific books and papers. He was intensely interested in the natural sciences and before his interest in astronomy was stimulated, his major interest was in entomology. In 1860, he attempted to develop a method of producing silk in this country using the Gypsy Moth. Unfortunately, enough of the moths escaped from his experimental enclosure that they were able to breed in the wild and become an enduring pest in this country. Note that Trouvelot realized the problem of the escaped moths and tried to enlist other entomologists to contain the outbreak. Unfortunately, others did not have Trouvelot's understanding and he was not able to obtain any help. His interest in astronomy began in 1870 when he observed a spectacular aurora.

Trouvelot's professional career in astronomy began in 1872 when Joseph Witlock, director of the Harvard College Observatory, saw the quality of his illustrations. He invited Trouvelot to join their staff in 1872 and offered him the use of the observatory's famous 15-inch refractor. Using this instrument, he drew hundreds of sketches of the Sun, Moon, planets, nebulae, and stars. Thirty-five of these drawings appeared in Volume 8 of the Harvard Annals as "Astronomical Engravings from the Observatory of Harvard College" (published 1876). Most noteworthy are his illustrations of solar prominences and sunspots. In order to insure accuracy, he used

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NCA Events This Month

The Public is Welcome!

NCA Home Page: http://capitalastronomers.org

NCA Mirror- and Telescope-making Classes: Fridays, March 9, 16, 23, and 30, 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
March 10, Dr. Ben Sugarman, Visiting Assistant Professor of Physics and Astronomy at Goucher College in Baltimore, MD, will present the talk "How Supernovae Shed Light on some 'Obscure' Questions."

April 14, Frank Summers, Space Telescope Science Institute, will speak about "Astronomical Visualizations." He directed the IMAX short feature "Hubble: Galaxies Across Space and Time."

May 12, Mercedes Lopez-Morales, Department of Terrestrial Magnetism, Carnegie Institute of Washington, "Amateur Telescopes Can Do Real Science."

June 9, Dr. Nancy Grace Roman, NASA, retired, will speak about the Hertzsprung-Russell Diagram. See Page 4 for other events this month.

Observing with the 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.

In the News

Reported by Dr. Nancy Grace Roman

LIGHT POLLUTION
From *Information Bulletin of the International Astronomical Union,*
Nigel Pollard, Bath, UK
Artificial Light has on April 5, 2006 passed into English law as a "Statutory Nuisance" which means that government must act if complaints received from the public that suggest that the light is prejudicial to health, or a nuisance. It became law in Wales, January 1. 2007. Scotland has no plans as yet. Work has also started on an Annex on Light Pollution to be added to UK Planning Law.

STRANGE NEW PLANET BAFFLES ASTRONOMERS
Based on Harvard-Smithsonian Center for Astrophysics Press Release

Using a network of small automated telescopes known as HAT, Smithsonian astronomers have discovered a planet unlike any other known world. This new planet, designated HAT-P-1, orbits one member of a pair of distant stars 450 light-years away in the constellation Lacerta.

With a radius about 1.38 times Jupiter's, HAT-P-1 is the largest known planet. In spite of its huge size, its mass is only half that of Jupiter. "This planet is about one-quarter the density of water," Gaspar Bakos, a Hubble fellow at the Harvard-Smithsonian Center for Astrophysics (CfA). said. "In other words, it's lighter than a giant ball of cork! Just like Saturn, it would float in a bathtub if you could find a tub big enough to hold it, but it would float almost three times higher."

HAT-P-1 is not alone in its low-density status. The first planet ever found to transit its star, HD 209458b, also is puffed up about 20 percent larger than predicted by theory. HAT-P-1 is 24 percent larger than expected. "Out of eleven known transiting planets, now not one but two are substantially bigger and lower in density than theory predicts," said co-author Robert Noyes (CfA). "We can't dismiss HD209458b as a fluke. This new discovery suggests something could be missing in our theories of how planets form."

SPITZER FIRST TO DECIPHER LIGHT OF FAR AWAY WORLDS
From NASA News

NASA's Spitzer Space Telescope has captured for the first time enough light from planets outside our solar system, known as exoplanets, to identify signatures of molecules in their atmospheres. The landmark achievement is a significant step toward being able to detect life on rocky exoplanets and comes years before astronomers had anticipated.

"This is an amazing surprise," said Spitzer project scientist Michael Werner of NASA's Jet Propulsion Laboratory (JPL), Pasadena, Calif. "We had no idea when we designed Spitzer that it would make such a dramatic step in characterizing exoplanets."

Spitzer obtained the detailed data for two different gas exoplanets: HD 189733b is 370 trillion miles away in the constellation Vulpecula, and HD 209458b is 904 trillion miles away in the constellation Pegasus.

The data indicate the two planets are drier and cloudier than predicted. Theorists thought hot Jupiters would have lots of water in their atmospheres, but were surprised when none was found around HD 209458b or HD 189733b. In addition, one of the planets, HD 209458b, showed hints of tiny sand grains, called silicates, in its atmosphere. This could mean the water is present in the planet's atmosphere but hidden under high, dusty clouds unlike anything seen around planets in our own solar system.

"It is virtually impossible for water, in the form of vapor, to be absent from the planet, so it must be hidden, probably by the dusty cloud layer we detected in our

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Ms. Brenda Corbin: "Etienne Leopold Trouvelot", continued

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a method that dates back to the Renaissance. In the past, the method used to insure accuracy in drawing was to observe the view to be drawn through a regular grid of strings and have a corresponding grid drawn on the artist's paper. Trouvelot substituted a gridded reticule in the telescope's eyepiece for the string grid, and using this method produced (with regard to the location of objects in the field of view) very accurate drawings. To employ this technique, he had to guide his telescope so that either a planetary feature or a reference star was always at the intersection of two of the reticule lines while he was drawing! In evaluating Trouvelot's drawings of solar phenomena, one must realize that some aspects of the phenomena are transitory and that in trying to freeze the image in his mind, Trouvelot had a tendency to impart some structure to the image that was not present (consider Lowell and the "canals" on Mars). Also, one must consider that since the telescopes that Trouvelot used were at sea level in Boston and Washington, D.C., the effects of atmospheric fluctuations on planetary objects viewed at high magnifications could be significant.

His work at the Harvard College Observatory was of such quality that in 1875 he was invited to the U.S. Naval Observatory to use the 26-inch refractor for a year. At this time this telescope was the largest refracting telescope in the world. Of the work Trouvelot did at the USNO, three of the original sketches are still retained by the USNO: the Swan Nebula, M17, dated Sept. 1875, Saturn, and The Great Nebula in Orion, M32. These original drawings were exhibited by USNO at the Centennial Exposition in Philadelphia in 1876.

During the course of his life, Trouvelot produced about 7,000 quality astronomical illustrations. In order to reach a larger audience with his work, in 1881 he selected fifteen of his most superb pastel illustrations to be published by Charles Scribner's Sons. In order to preserve the color purity of the original illustrations, he chose chromolithography to produce the portfolio. This process is the same as used in Japanese woodcuts, except that the printing block for each color used is carved in stone rather than wood. Approximately three hundred of the portfolios were printed and were priced at $125 each. Recently, one of the portfolios sold for approximately $60,000.

In 1882, Trouvelot returned to France to work with Jules Janssen at the Observatoire de Meudon to do mostly solar observations. In 1883 he accompanied the French party to Caroline Island in the South Pacific to observe a solar eclipse. Trouvelot never returned to the United States and died in 1895 amid controversy about strains in his professional relationship with Janssen.

His astronomical legacy during and after his life includes:

- Valz prize of the French Academy of Sciences,
- election to the American Academy of Arts and Sciences in 1881,
- craters on the Moon and Mars named after him,
- fifty astronomical papers published,
- the discovery of "veiled sun spots" in 1875, and
- his surviving incomparable drawings of the heavens.

His missing legacy is the thousands of his drawings that disappeared after he died. In 1896, Trouvelot's son George wrote to Pickering at the Harvard observatory concerning "…the immense number of drawings and observations which my father left and are my property." He hoped to find a publisher for some of his father's drawings. At the current time, no trace of any of these drawings has been found.

In addition to illuminating the life of Trouvelot, Ms. Corbin spoke about the role of the USNO library in preserving the history of astronomy and critical artifacts related to that history.

A COOL SOLAR MYSTERY

From NASA Science News for February 20, 2007

One pole of the Sun is cooler than the other. That's the surprising conclusion just announced by scientists who have been analyzing data from the ESA-NASA Ulysses spacecraft.

Ulysses is the only ship in the NASA or European fleet capable of flying over the Sun's poles, a result of the spacecraft's uniquely-tilted orbit. Its ability to study the Sun's unexplored polar regions is prized by solar physicists.

Ulysses' first polar flybys in 1994 and 1995 revealed the asymmetry — "a 7 to 8 percent difference in temperature," said Ulysses science team member George Gloeckler of the University of Maryland. The measurement was both mysterious and a little hard to believe. What would make the Sun lopsided in this way?

There's still no definitive answer to that question, but now at least researchers know the effect is real. Ulysses has returned to the Sun's South Pole in 2007 and "recent observations show that the average temperature ... is virtually identical to what we saw 12 years ago," said Gloeckler.

Taking the Sun's temperature is tricky business. The spacecraft can't descend to the surface and insert a thermometer. Instead, Ulysses samples the solar wind at a safe remove of 300 million km. "We measure the abundance of two oxygen ions found in the solar wind. The ratio O^{6+}/O^{7+} tells us the temperature of the gas," explained Gloeckler. He is the principal investigator of the instrument onboard Ulysses that does this, the Solar Wind Ion Composition Spectrometer or "SWICS."

According to SWICS, the average temperature of the Sun's polar wind is about one million degrees C. But over one pole the wind is about 80,000 degrees cooler than over the other pole.

Researchers believe the solar wind at Ulysses is telling them something about polar conditions close to the surface of the Sun. "The solar wind comes from the poles," explained Arik Posner, Ulysses Program Scientist at NASA headquarters. "The Sun's magnetic field opens up over the poles and allows some of the Sun's atmosphere to escape." These openings are called "coronal holes," and the hot atmosphere that rushes out is the solar wind.

Back to the original question: What does the temperature difference mean? "Perhaps the structure of the Sun's atmosphere over the two poles is different," he speculated.

We have an analogy here on Earth. The stratosphere over the South Pole is colder, on average, than the stratosphere over the

(Continued on page 4)

Other National Capital Area Meetings

NOVAC

Upcoming Meetings
March meeting topic not available as we went to press.

Great Meadow Observing Schedule
NOVAC has finalized an observing schedule with Great Meadow.

NOVAC Garage Sale!
Meade 10" SCT and other astro gear for sale!

Congratulations to Esther Li for winning 2nd place in the 2006 Jack Horkheimer Service Award.

The NOVAC Store is open for business! Get your NOVAC t-Shirts, hats, mugs and other official NOVAC gear and support the club at the same time. Many thanks to Kim Bieler for her new designs.

General Membership Meetings
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. If you come earlier, you can do a little socializing. 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.

There's a good deal of socializing before and after meetings, allowing members to put faces with the voices they've heard in the dark.

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/

In the News, cont.

(Continued from page 2)
spectrum," said Richardson, the lead author of a paper that describes a spectrum for HD 209458b.

Spitzer teased out spectra from the feeble light of the two planets through the "secondary eclipse" technique. In this method, the telescope monitors a planet as it transits, or circles behind its star, temporarily disappearing from view.

By measuring the dip in infrared light that occurred when the planets disappeared, Spitzer's spectrograph was able to obtain spectra of the planets alone. The technique will work only in infrared wavelengths, where the planet is brighter than in visible wavelengths and stands out better next to the overwhelming glare of its star.

Previous observations of HD 209458b measured changes in the light from the star, not the planet, as the planet passed in front. Those observations revealed individual elements, such as sodium, oxygen, carbon and hydrogen, which bounce around the very top of the planet.

The deadline for the April Star Dust is March 28. 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.

A COOL SOLAR MYSTERY, continued

(Continued from page 3)
North Pole. The reason has to do with the uneven distribution of land on Earth (most land is in the north) plus complex atmospheric circulation patterns.

In the case of the Sun, the difference is not land but magnetism. Apparently, something about the Sun's north magnetic pole keeps the solar atmosphere above it a trifle cooler. Proof: The "cool spot" follows the north magnetic pole when the Sun's poles flip.

"The Sun's magnetic poles have reversed polarity since the 1994 flyby — an effect of the 11-year sunspot cycle," noted Posner. Lo and behold, "the temperature asymmetry has also reversed. So it appears to be a magnetic phenomenon."

When Ulysses finishes its current South Pole flyby, it will proceed to the other end of the Sun for a North Pole flyby in early 2008. This will provide more clues to what's shaping up to be a very cool solar mystery.

Author: Dr. Tony Phillips

Mid-Atlantic Occultations and Expeditions to Mid-April

by Dr. David Dunham

Asteroidal Occultations

Date	Day	EDT	Star	Mag	Asteroid	dmag	dur. s	Ap. in.	Location
Mar 19	Mon	22:04	TYC54341873	10.5	Sadeya	3.5	7	5	eVA,DC,MD,ePA
Mar 28	Wed	0:53	SAO 140433	8.5	1988 CA	7.6	2	3	eNC,VA,WV,OH
Apr 2	Mon	5:45	ZC 1825	5.9	1977 UO5	11.2	1	1	NJ,MD?,PA,nOH
Apr 4	Wed	2:08	TYC02720774	12.3	Fortuna	0.3	18	10	VA,sMD,DC,OH
Apr 6	Fri	23:58	BD +20 1339	9.7	Zenobia	5.9	2	4	KY,swVA,eNC
Apr 7	Sat	23:40	TYC08650092	10.3	Belgica	5.1	1	5	sVA,nKY
Apr 9	Mon	22:34	2UC39104329	11.8	Iris	0.21	6	8	sOH,WV,VA,neNC
Apr 10	Tue	1:35	2UC36634523	11.8	Benjamina	3.2	6	10	MD,swPA,OH-low
Apr 13	Fri	1:05	TYC02720940	11.0	Fortuna	0.9	22	6	nNC,VA,WV,OH

Lunar Grazing Occultations

Date	Day	EDT	Star	Mag	% alt	CA	Location
Mar 22	Thu	22:41	SAO 75991	8.3	21+ 15	9N	Duncannon &Kennett Square,PA
Mar 24	Sat	22:54	SAO 77349	8.4	42+ 37	12N	Nokesville, VA& Nanjemoy, MD
Mar 25	Sun	1:26	SAO 77498	8.4	44+ 9	10N	Bowling Green, VA
Jun 19	Tue	21:20	Regulus	1.4	26+ 35	16N	S. Carolina; Sun alt. -9 deg.

Detailed interactive path maps & other details are at
http://www.fingerlakessythetics.com/occultations/GrazeMaps.html .

Total Lunar Occultations

Date	Day	EDT	Ph	Star	Mag	%	alt	CA	Sp.	Notes
Mar 11	Sun	3:50	D	tau Sco	2.8	58-	13	-53S	B0	Az. 145 deg.
Mar 11	Sun	5:03	R	= ZC 2383	2.8	57-	20	73S	B0	good graze in Florida
Mar 13	Tue	4:31	R	ZC 2681	7.8	37-	5	44N	A1	Az. 133; close double?
Mar 13	Tue	5:20	R	ZC 2688	7.0	37-	10	42S	G6	Azimuth 142 deg.
Mar 20	Tue	20:36	D	SAO 92500	8.0	5+	10	87N	K0	Azimuth 279 deg.
Mar 22	Thu	21:31	D	ZC 512	8.1	21+	27	8S	F5	Close double?
Mar 22	Thu	22:12	D	SAO 75990	7.5	21+	20	47S	K0	Close double?
Mar 22	Thu	22:32	D	SAO 75991	8.3	21+	17	31N	B9	
Mar 22	Thu	23:45	D	ZC 522	7.8	22+	4	63N	G5	Azimuth 298 deg.
Mar 23	Fri	22:39	D	ZC 694	8.1	32+	28	68N	K2	
Mar 23	Fri	23:16	D	ZC 701	6.6	32+	21	70S	F2	mg2 7.3 4.2",PA 191dg
Mar 25	Sun	19:33	D	49 Aurigae	5.3	52+	79	67N	A0	ZC 1008; Sun alt. -3dg
Mar 25	Sun	21:45	D	SAO 78580	7.3	53+	61	76N	A2	mg2 10.2 29",PA 132dg
Mar 26	Mon	2:33	D	ZC 1042	6.7	55+	8	62N	A2	Azimuth 299 deg.
Mar 27	Tue	0:28	D	SAO 79610	7.2	64+	39	34S	F8	
Mar 29	Thu	20:49	D	ZC 1481	7.4	88+	53	25S	A5	
Mar 30	Fri	3:03	D	ZC 1501	7.2	90+	29	48N	G5	
Apr 5	Thu	2:31	R	ZC 2084	6.5	94-	31	81N	A3	
Apr 7	Sat	2:00	R	ZC 2334	7.5	82-	16	78S	G1	
Apr 9	Mon	3:50	R	SAO 186391	7.8	64-	15	88S	A2	Close double?
Apr 10	Tue	2:59	R	tau Sgr	3.3	54-	3	29N	K1	Az129;ZC2784;double?
Apr 13	Fri	5:18	R	ZC 3217	7.4	22-	8	72N	A2	mg2 10.9,18",PA 323dg

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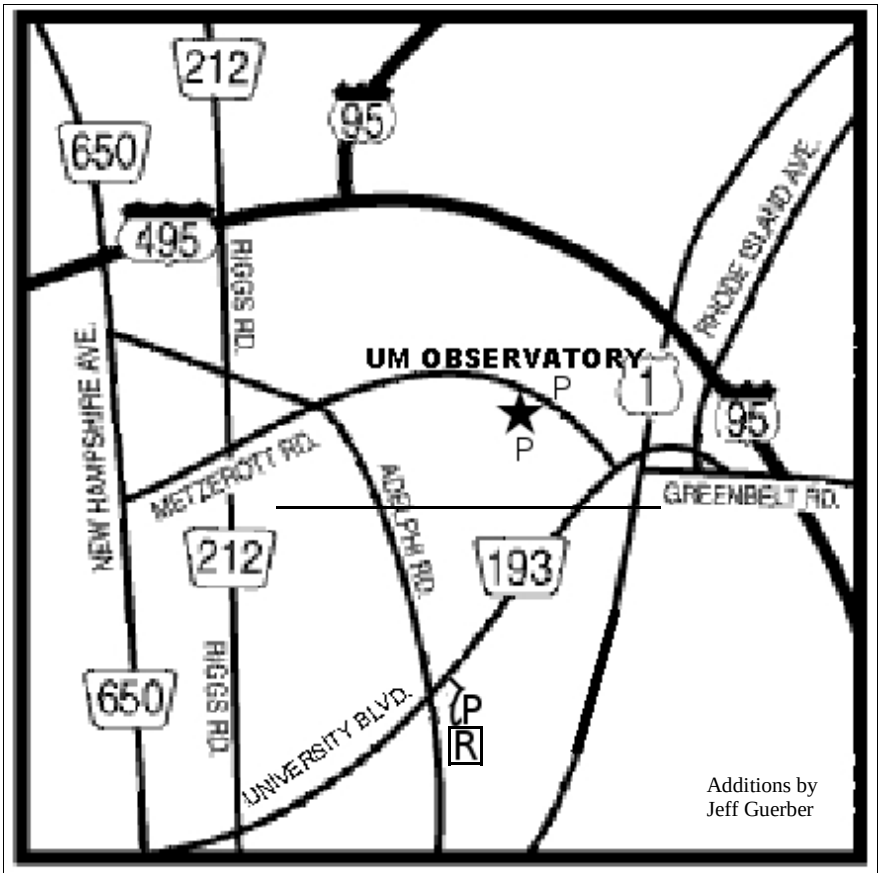
More information is at http://iota.jhuapl.edu/exped.htm .
David Dunham, dunham@starpower.net, phone 301-474-4722

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 e-mail at rigel1@starpower.net.)

Support the IDA

Join the International Dark-Sky Association

3225 N. First Avenue Tucson, AZ 85719-2103

www.darksky.org

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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."

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.
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