Star Dust

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

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February Talk: Dr. Marc A. Murison, "High-Resolution White-Light Solar Imaging with Very Inexpensive Equipment"

Submitted by Gary Joaquin

Dr. Marc A. Murison will present the featured talk for the February 1 meeting of the National Capital Astronomers: "High-Resolution White-Light Solar Imaging with Very Inexpensive Equipment". The meeting will be held at 3:00 P.M. in the Bethesda-Chevy Chase Regional Services Center of Montgomery County, 4805 Edgemoor Lane (Second Floor), Bethesda, MD.

Synopsis

The ready availability of inexpensive webcams and security cameras with CCD detectors has spurred lively experimentation with astronomical imaging among amateur astronomers (of limited means or otherwise). The first goal was planetary and lunar imaging, since this does not require extremes of exposure times (long or short), and the cameras can be used essentially as-is. That effort was and continues to be very successful. An obvious follow-up goal is to enable long exposures, since webcams and security cameras are not intended for long-exposure imaging. Several determined amateurs in England and the USA eventually discovered fairly simple modifications to the most popular webcams that enable long exposures, provided one is somewhat handy with a soldering iron. This opens up deep-sky imaging for about 1/100 the usual cost of a CCD camera. A less-traveled route has been short-exposure, high-resolution white-light webcam imaging of the Sun. This talk will present my results to date on the mistakes, hardships, lessons, and eventual stunning success I encountered along a meandering path in this direction. Some results can be viewed online at http://arnold.usno.navy.mil/murison/AmateurAstronomy/observations/Sun/.

Biography

Long before becoming a professional astronomer, Dr. Murison, while in high school, ground and polished an 8-inch mirror for a home-made Newtonian. One of his favorite experiences is lugging his telescope to Mt. Palomar and seeing Pluto there with the giant 200-inch telescope a stone's throw distant. On the theoretical side, he was fascinated with celestial mechanics, to the point of hauling around and filling several pads of paper with notes and calculations while on a three-month bicycle trip in Australia with a high school buddy. College interrupted his avid amateur astronomy interest, but he did have quite a bit of fun observing photometric variables at San Diego State University's Mt. Laguna Observatory while pursuing a degree in astronomy. During his undergraduate days at SDSU, he also worked a couple of summers in Boulder, Colorado, at the High Altitude Observatory of the National Center for Atmospheric Research. His main job at NCAR/HAO was to calculate electric currents in the ionosphere during magnetic substorm events, based on ground measurements of variations in the Earth's magnetic field. (His favorite subject at SDSU was E&M.) However, while at NCAR, Dr. Murison was exposed to solar physics and thus developed a keen lifelong interest in that subject.

After graduating from SDSU in 1983, Dr. Murison left the balmy climes and palm tree-lined avenues of his native San Diego for the sub-zero winters, glacier-scarred landscape, and frozen lakes of Madison, Wisconsin, to pursue a Ph.D. in astronomy. It was quite shocking to find that all the trees there lose their leaves in October! After flirting with the notion of doing a thesis on comet plasma tails (which would combine his interests in solar and plasma physics developed at NCAR), Dr. Murison was persuaded by Art Code, his thesis advisor, to engage in a thesis on celestial mechanics, for which Murison seemed to have an aptitude. Thus, days and cloudy nights were spent investigating the chaotic and fractal dynamics of the restricted three-body problem. One of his interesting discoveries was the fractal structure of periodic orbit families and their relation to planetary satellite capture. To pay the rent, Dr. Murison spent clear nights observing on the Pine Bluff Observatory's 36-inch telescope, doing spectropolarimetry of variable stars in support of the Shuttle-based Wisconsin Ultraviolet Photo-Polarimeter Experiment (and freezing his hiney!). WUPPE was put on hold due to the Challenger disaster, but it eventually flew two Shuttle missions, as part of the ASTRO-1 and ASTRO-2 missions, making pioneering polarization and photometry observations in the UV.

After obtaining his Ph.D., Dr. Murison spent an additional year in Madison working with the HST WF/PC team, of which

(Continued on page 4)

NCA Events This Month

The Public is Welcome!

NCA Home Page: http://capitalastronomers.org

Fridays, February 7, 14, 21, and 28, 6:30 to 9:30 P.M., NCA Telescope-making Classes at the Chevy Chase Community Center, at the northeast corner of the intersection of McKinley Street and Connecticut Avenue, N.W. For more information, see Page 5. Contact instructor Guy Brandenburg at 202-635-1860 or email him at gfbrandenburg@yahoo.com.

Saturday, February 1 and Fridays, February 7, 14, 21 & 28, 8:30 P.M. Open nights with NCA's 14-inch telescope at Ridgeview Observatory near Alexandria, Virginia. For more information, see below.

Saturday, February 1, 3:00 P.M. NCA meeting in the Bethesda-Chevy Chase Regional Services Center of Montgomery County, 4805 Edgemoor Lane, (Second Floor), Bethesda, MD. See map and directions on Page 6. Dr. Marc A. Murison will give the featured talk, "High-Resolution White-Light Solar Imaging with Very Inexpensive Equipment"

Saturday, February 1, following the meeting, dinner with the speaker and NCA members at

Raku
7240 Woodmont Ave.
Bethesda, MD
301-718-8681
(A Japanese restaurant.)

See Other National Capital Area Meetings, Page 3.

Observing with the NCA C-14

Bob Bolster

Date, Time: All 8:30 p.m.	Prime Objects
Saturday, February 1	Saturn, M31, M42, Double Cluster
Friday, February 7	Saturn, 1st Quarter Moon
Friday, February 14	Saturn, Gibbous Moon, Jupiter
Friday, February 21, 28	Saturn, Jupiter, M42, Double Cluster

At Ridgeview Observatory in Bob Bolster's backyard, 6007 Ridge View Drive, Franconia, Virginia (off Franconia Rd. between Telegraph Rd. and Rose Hill Dr.). Call Bob at 703-960-9126 before 6:00 p.m., to let him know you are coming.

Nanosatellites

Reviewed by Nancy Grace Roman

(Extracted from an article in the AU AstroNews – from the Santa Barbara club)

A trio of nanosatellites is slated for launch in 2004 on the back of a rocket used for a more major payload as part of NASA's New Millennium Program. This is a program to test new space technology concepts. Each nanosat will be about the size of a birthday cake and will measure the magnetic field in the earth's magnetosphere in its vicinity. The trick is to send them away from the rocket spinning, to allow the proper measurement of the field and to be sure sun hits the solar cells uniformly. They must also be launched in such a way that they maintain a formation as they orbit the earth.

The deadline for the March *Star Dust* is February 15. (Please send your material to Elliott Fein by that date to ensure inclusion.)

Please send submissions to Elliott Fein at elliott.fein@erols.com.
Text must be in ASCII, MS Word (97 or earlier), or WordPerfect.
All articles submitted may be edited to fit the space available.

NCA Telescope/ Mirror-Making Workshop

Guy Brandenburg

The NCA mirror-making class continues during February at the Chevy Chase Community Center at the northeast corner of Connecticut Avenue and McKinley Street, N.W., in Washington, D.C. Sessions are every Friday evening from 6:30 to 9:30 P.M., and are very informal. We have all the materials needed, and cheerful, knowledgeable instruction. Dates this month will be February 7, 14, 21, and 28. For more information, call Guy Brandenburg at 202-635-1860 or email him at gfbrandenburg@yahoo.com.

Star Dust is Now Available 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).

"Giant X-Ray Disk Sheds Light on Elliptical Galaxies"

Reviewed by Nancy Grace Roman

(from *Astronomy Now and Spaceflight Now*) Astronomers have discovered the largest disk of hot, X-ray emitting gas ever observed in the universe: At 90,000 light years in diameter, it's about 100,000 times the size of any comparable object. The disk, spinning through a distant galaxy, is more than just an interstellar oddity, the researchers say. The object could offer new information about the way certain galaxies form and evolve. http://spaceflightnow.com/news/n0212/27chandra/

Other National Capital Area Meetings

Attention: Access to Goddard Space Flight Center is limited to those holding Goddard badges or official visitors. You can become an official visitor by finding a badged Goddard employee to escort you.

Stellar & Extragalactic Astronomy Lunch
Talks are Wednesdays at 12:00 Noon, in Room 242 of Building 21. BWSS talks are in the Aerospace Building (see below).
February 12 Mousumi Das, UMD, "Dynamics of Bars in Spiral Galaxies" (BWSS)
February 19 Randy Kimble, GSFC, "Status of WFC3 for HST"
February 26 Susan Neff, GSFC, "Super-Eddington X-ray Sources in Merging Galaxies"
Talks labeled BWSS are part of the Baltimore-Washington Starburst Seminar Series. The BWSS talks are in the Aerospace building at 10210 Greenbelt Road, Room 408. To get to the Aerospace building, go out the main gate of GSFC, turn left and go about 3/4 mile. The Aerospace building will be on your left, just after a Lutheran church.
If you have any questions, please contact Jon Gardner, gardner@harmony.gsfc.nasa.gov
Source: http://hires.gsfc.nasa.gov/~gardner/seal

Solar Physics Talk Calendar
Talks are Wednesdays at 3:30 in Building 26, Room G10 of Goddard Space Flight Center, unless otherwise specified.
February 12 Jeff Brosius, CUA, GSFC, Chromospheric Evaporation and Warm Rain During a Solar Flare"
February 26 Doug Rabin, GSFC, "The Extreme Ultraviolet Normal Incidence Spectograph (EUNIS) Sounding Rocket Experiment"
Source: http://orpheus.nascom.nasa.gov/~kucera/solar_talks/

Department of Terrestrial Magnetism
Carnegie Institution of Washington
5241 Broad Branch Road, N.W., Washington, D.C. 20015. (202) 478-8820.
CIW/DTM SEMINARS
Seminars are held on Wednesdays at 11:00 a.m. in the Seminar Room of the Main (old) Building. Coffee and tea will be served at 10:45 a.m. Please call or email Brooke Hunter to confirm that there have been no cancellations.
February 12 Chris Marone, Pennsylvania State University
February 19 David Hogg, New York University
February 26 Qing-zhu Yin, Harvard U.
Source: http://www.ciw.edu/DTM-seminars.html

Northern Virginia Astronomy Club
February 9 Harold Geller (GMU Professor of Astronomy), "Amateur Radio Astronomy". Some amateur astronomers like to do more than just look at the sky in what scientists call visible light, which is but one small portion of the electromagnetic spectrum. Some amateur astronomers also look at the sky in the radio wave region of the spectrum. Learn something about what these amateurs do and how they see and hear the sky a little differently. See what some objects look like in radio and how you, too, can enjoy the sky with big dishes, ears and computers.
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.
Source: http://novac.com

Space Telescope Science Institute (STScI) Open Night
Come to the free public lectures at the Space Telescope Science Institute (STScI). Each month a noted scientist discusses a different cosmic topic. Lectures are at 8 p.m. the first Tuesday of every month in the STScI auditorium, on the campus of Johns Hopkins University. Free parking is available. For directions, call 410-338-4700.
February 4 Dr. Bill Blair, JHU, "The FUSE Satellite: A New Tool for Exploring the Ultraviolet Universe".
Want to see some of the wonders of our universe? Come peer into the heavens with the Johns Hopkins University's Bloomberg telescope. The telescope is open to the public every Friday evening, weather permitting. For more information, contact the observatory at (410)-516-6275 or via email at altan@pha.jhu.edu.
Source: http://hubble.stsci.edu/about_us/open-night.shtml

University of Maryland at College Park Astronomy Colloquia
Coming from off-campus? Please note parking information at the bottom of this announcement. All astronomy colloquia are held in room CSS 2400 at 16:00-17:00 (4:00-5:00 p.m.) unless otherwise noted.
February 12 Alice Quillen, University of. Rochester.
February 26 Paul Goldsmith, Cornell, "Inappropriate Probes of Dense Molecular Clouds"
Special accommodations for individuals with disabilities can be made by calling (301) 405-3001. It would be appreciated if we are notified at least one week in advance. Parking for visitors is available in the Cashier-Attended Parking Lot at the intersection of Paint Branch & Technology Drive. It is a 5-10 minute walk from the parking lot to the Computer & Space Sciences Building. There are a limited number of parking meters in Lot DD; there are no parking meters in Parking Garage 2. Parking at non-metered spaces in Lot DD and PG2 is free after 4 p.m. and on weekends. More information is available from the Department of Campus Parking. Comments and questions may be directed to webmaster@astro.umd.edu
Source: http://www.astro.umd.edu/colloquia/colloquium.html

Montgomery College's Planetarium
at Takoma Park, Maryland. Astronomy is one of the few sciences accessible to any inquiring mind. Astronomy is the oldest science and one of the few sciences that welcomes amateurs. Please come to a public planetarium program and explore the universe with us. Everyone who looks up at the stars with wonder is an astronomer. The planetarium is open from the last week in August until the Friday before Memorial day in May.

(Continued on page 4)

Other National Capital Area Meetings, continued

(Continued from page 3)

The planetarium shows 1,834 naked-eye stars, the Milky Way (the diffuse band of light caused by the disk of our own galaxy), and the five naked eye planets (Mercury, Venus, Mars, Jupiter, and Saturn) under a twenty-four-foot dome with forty-two comfortable chairs. The planetarium is located on Fenton Street on the Takoma Park campus of Montgomery College. It is attached to the Science South building on the ground level and has a conspicuous silver colored domed roof.

The stars are the province of all of mankind. An astrophysicist will answer questions about the universe.

All planetarium programs and shows are free,

Monthly Public Planetarium astronomy shows, grade specific shows for school groups, scout and other youth group programs, senior citizen and other adult group programs, music/laser light shows, college astronomy courses, summer teacher workshops, summer youth courses, all from within a planetarium

Public Planetarium Programs:

Saturday, February 15 at 7:00 P.M., "African Skies"

African Skies

This planetarium show will explore the African Skies and African astronomical mythology. The diverse African peoples have a large body of cosmological legendary tales which are short, often humorous, and always educational. The sun, moon, and stars were used to keep calendars which were used to determine planting, fishing, hunting, and yearly festivals. The tradition of using songs to convey information about the sky that would be useful to people on earth saw further development in the "Follow the Drinking Gourd" song. African-American slaves used this navigation song to determine the direction of their flight to freedom from slavery. Come to the planetarium and you, too, will learn that the night sky still has useful information about life on earth.

Wednesday, March 19 at 7:00 P.M. "The Rites of Spring, the Vernal Equinox".

Saturday, April 19 at 7:00 P.M. "Black Holes, Gravity to the Max".

Contact Dr. Harold Williams, hwilliam@mc.cc.md.us or 301-650-1463.

Source: http://www.mc.cc.md.us/Departments/planet/

Goddard Engineering Colloquia

All colloquia are held at 3:30 p. m. on Mondays in either the Building 3 Auditorium or the Building 8 Auditorium, as indicated below.

February 3 (Building 3 Auditorium) Francis Everitt, Stanford University, "The Gravity Probe B Mission: A Marriage of Physics and Technology"

February 10 (Building 3 Auditorium)? Tim Menzies, NASA Independent Verification and Validation (IV&V) Facility "What can software engineering learn from physics?"

February 24 (Building 3 Auditorium) Arthur A. Morrish, DARPA, "DARPA Space Initiative"

http://ecolloq.gsfc.nasa.gov/index.html

Source:http://ecolloq.gsfc.nasa.gov/sched.html

Dr. Marc A. Murison's February Talk

(Continued from page 1)

Dr. Code was a member. He worked on a radiative transfer code that simulated WF/PC observations of ionized nebulae, as part of a pre-launch effort to understand and characterize the camera. The following year, his thesis celestial mechanics work landed him a job at the Harvard-Smithsonian Center for Astrophysics (CfA). He spent the first year and a half there working on PEP, the Planetary Ephemeris Program, an effort that was funded by the U.S. Naval Observatory. The Navy funding was subsequently cut due to the break up of the Soviet Union, so Dr. Murison then joined the Precision Astronomy Group at CfA, headed by Robert Reasenberg. For the next several years, Dr. Murison did ultra-high precision analysis of the interferometric optics of POINTS (Precision Optical INTerferometry in Space), a proposed space astrometry mission in direct competition with JPL's Space Interferometry Mission (SIM). One of Murison's achievements was to create a computer algebra program that does symbolic ray tracing. The equations and expressions output by this program can be used to analyze optical systems in ways that cannot be done with purely numerical programs.

POINTS funding ended in 1995, after the (unfortunately, purely political) conquest of SIM over common sense. Dr. Murison then went to the Naval Observatory in Washington, DC. At the USNO, he has worked on solar system dynamics, various incarnations of a USNO space astrometry satellite, and a Fourier transform spectrometer. In the area of solar system dynamics, he investigates the "dynamical noise" effects of the asteroids on the motions of the inner planets, as well as the very complex resonance environment of the inner solar system. He also uses computer algebra to develop new symplectic integration methods. His duties on the space astrometry side of things include analysis of the spacecraft optical systems, drawing on his earlier experience with the POINTS project. He is also the resident space astrometry satellite dynamicist, in charge of analyzing the dynamics of scanning, spin-stabilized astrometry satellites and the effects of the dynamics on the precision of astrometric observations. Most recently, Dr. Murison joined a small group developing a new Fourier transform spectrometer (FTS). The FTS is an instrument intended for precise radial velocity studies using Doppler spectroscopy. (Think "extrasolar planetary detection".) The capabilities of the USNO FTS have been hugely enhanced over traditional FTS designs by the addition of a dispersing element, a laser metrology system, and a clever sparse-sampling algorithm, allowing orders of magnitude increases in sensitivity.

Recently, Dr. Murison bought one of the inexpensive small refractors manufactured in China, thus (finally!) resuming his amateur astronomy passion. Being ever interested in the Sun, he set about the process of refining solar observing techniques, both at the telescope and on the computer. Using an inexpensive webcam, he is now able to capture high-resolution white-light images of granulation and sunspot features at arcsecond detail, despite serious limitations imposed by the very modest equipment used and the less than ideal observing locations.

Mid-Atlantic Occultations and Expeditions

by David Dunham

Asteroidal Occultations

Date	Day	EST	Star	Mag	Asteroid	dmag	dur. s	Ap. in.	Location
Jan 30	Thu	6:19	SAO 42228	9.5	Swings	5.6	3	4	NJ, e.PA, w.NY
Feb 1	Sat	7:15	SAO 59230	6.7	Paracelsus	9.8	4	2	Ariz., Nev.
Feb 4	Tue	5:44	TAC+6d 8271	11.5	Carina	3.3	5	8	Ontario
Feb 6	Thu	23:15	TYC01520745	11.6	Tyche	1.5	8	8	Georgia
Feb 8	Sat	1:36	TAC+17d3130	10.6	Sapientia	1.5	10	6	Virginia
Feb 9	Sun	0:43	TAC+0d 3533	11.7	Joella	3.4	4	8	n. Virginia
Feb 11	Tue	21:24	TYC33611769	11.6	Catriona	2.2	4	8	Connecticut
Feb 26	Wed	21:53	TYC13572222	11.7	Alagasta	3.4	29	8	s. Maine
Mar 1	Sat	6:03	TYC49440158	10.3	Atalante	3.1	8	5	n. Maryland

Grazing Occultations

DATE	Day	EST	Star	Mag	% alt	CA	Location
Feb 21	Fri	0:26	ZC 1996	6.7	77- 20	14S	New Freedom, PA; Aberdeen, MD

Total Lunar Occultations

DATE	Day	EST	Ph	Star	Mag	%	alt	CA	Sp.	Notes
Feb 6	Thu	19:32	D	ZC 0202	6.9	27+	35	55N	G5	
Feb 8	Sat	21:04	D	SAO 093166	7.5	46+	40	59N	M	
Feb 8	Sat	22:12	D	ZC 0431	7.8	46+	28	87S	A0	
Feb 9	Sun	19:49	D	SAO 093538	8.2	55+	63	65S	G5	very close double
Feb 10	Mon	18:33	D	ZC 0665	5.7	64+	71	64S	A	very close double
Feb 10	Mon	19:22	D	SAO 076626	8.3	65+	73	69N	K7	
Feb 10	Mon	23:45	D	SAO 076665	8.2	66+	32	47S	K0	
Feb 12	Wed	1:57	D	ZC 0835	7.0	75+	18	54N	B8	
Feb 12	Wed	2:39	D	SAO 077276	6.8	76+	10	45S	K0	azimuth 293 deg.
Feb 13	Thu	23:28	D	57 Gem	5.0	90+	66	36S	G8	ZC 1117; maybe double
Feb 16	Sun	0:49	D	ZC 1393	6.5	99+	67	75N	G7	lat.+8; 16" to term.
Feb 22	Sat	1:03	R	SAO 158842	7.2	66-	14	69N	K1	azimuth 123 deg.
Feb 22	Sat	1:19	R	SAO 158856	8.1	65-	17	65N	K1	
Feb 22	Sat	2:00	R	ZC 2122	7.7	65-	22	85S	F2	
Feb 22	Sat	3:51	R	SAO 158903	8.0	65-	33	44N	G0	
Feb 23	Sun	2:17	R	SAO 183829	7.7	54-	13	75S	K0	azimuth 130 deg.
Feb 23	Sun	3:28	R	SAO 183864	7.7	53-	22	68S	B9	2nd mag. 11.7,sep.0.4"
Feb 23	Sun	5:29	R	X40153	8.0	53-	30	77N	M	
Feb 23	Sun	7:06	R	ZC 2282	5.8	52-	28	50N	B3	Sun alt. +3 deg.
Feb 26	Wed	4:39	R	ZC 2740	6.3	22-	4	70N	G8	azimuth 129 deg.
Feb 26	Wed	5:41	R	SAO 187438	7.8	21-	12	69S	B7	

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. 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 http://www.lunar-occultations.com/iota. Sp. is spectral type-color, O,B,blue; A,F,white; G,yellow; K,orange; M,N,S,C red

Phone the IOTA occultation line, 301-474-4945, for updates (but there have been problems with it recently), or check the local IOTA Web site at http://iota.jhuapl.edu
David Dunham, e-mail dunham@erols.com, phone 301-474-4722

Getting to the NCA Monthly Meeting

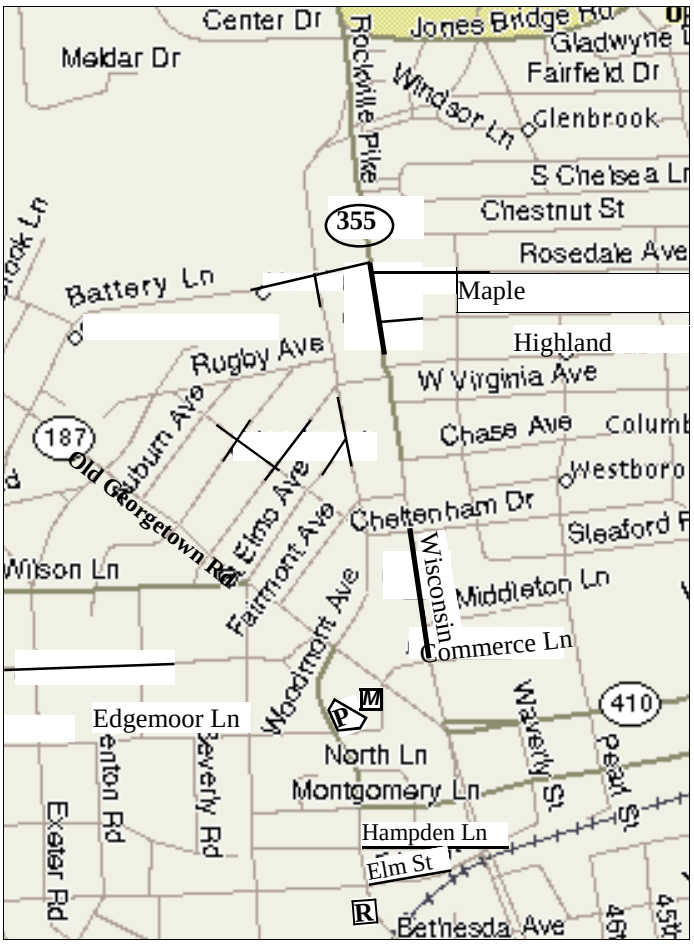
Saturday, February 1

3:00 P.M. - NCA Meeting in the Bethesda-Chevy Chase Regional Services Center of Montgomery County, 4805 Edgemoor Lane **(2nd Floor)**, Bethesda, MD.

Dr. Marc A. Murison will give the featured talk, "High-Resolution White-Light Solar Imaging with Very Inexpensive Equipment".

Following the meeting, dinner with the speaker and NCA members at

Raku
7240 Woodmont Ave
Bethesda, MD
301-718-8681



Directions to the Meeting Place

in the Bethesda-Chevy Chase Regional Services Center of Montgomery County, 4805 Edgemoor Lane, (Second Floor), Bethesda, MD.

From North of Bethesda

1. Take Rockville Pike/MD-355 South.
2. Rockville Pike/MD-355 S becomes MD-355/ Wisconsin Ave.
3. Shortly after Cheltenham Dr. (and one block before reaching Rt. 410), turn right onto Commerce Lane.
4. Commerce Lane becomes Edgemoor Lane.
5. After crossing Old Georgetown Rd., 4805 is the second entrance on the right. (See **M** on map.)
6. To get to public parking, continue on Edgemoor Lane, which will make a sharp right turn. The parking garage is then on your right. See note below.

From South of Bethesda

1. Take MD-355/Wisconsin Ave. North.
2. Turn slight left onto MD-187/Old Georgetown Rd.
3. Turn next left onto Edgemoor Ln. 4805 is the second entrance on the right. (See ***M*** on map.)
4. To get to public parking, continue on Edgemoor Lane, which will make a sharp right turn. The parking garage is then on your right.

Note: there are two parking lots. The one on Woodmont is for the apartments and may have a fee. The one on Edgemoor is marked "Public" and does not charge on weekends.

Directions to the Restaurant

1. Following the meeting, go South on Woodmont Ave.
2. Continue on Woodmont past Montgomery Lane, Hampden Lane and Elm St.
3. The restaurant is on the west side of the street, in the middle of the block. (See **R** on map.)

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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. 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. Most of these NCA members are also members of the International Occultation Timing Association (IOTA).

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 semiannual 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). Some NCA members are also individual members of IDA.

Classes: Some NCA members are available for educational programs for schools and other organizations. The instruction settings include star parties, classroom instruction, and schoolteacher 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. Contact: Sue Bassett wb3enm@amsat.org

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 the NATIONAL CAPITAL ASTRONOMERS **Date:**

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Other family members who should receive a membership card: _____

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___ $27 With *Star Dust* ONLY.
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___ $150 Sustaining member (with *Sky & Telescope*) ($93 tax-deductible).

Junior members only: Date of Birth: _____ Only members under the age of 18 may join as juniors.

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