The January meeting of the National Capital Astronomers will be held on Saturday, January 8 at 7:30 P.M. at the University of Maryland Astronomy Observatory on Metzerott Road in College Park, MD. Prior to the meeting there will a dinner with NCA members at the Garden Restaurant in the UMD University College Inn and Conference Center. Please see Page 2 for more information about dinner reservations. See Page 8 for directions on getting to the meeting or the dinner. Page 8 also contains information on obtaining a ride from Metro to the dinner or meeting. In addition, there is a map on Page 8 that can be a help in getting to the meeting by car. All NCA meeting dinners are open to NCA members and the public as well. Hope to see you there!

Although NCA meetings are normally held on the first Saturday of the month, this year the January, February and March meeting will be held on the second Saturday of the month. In April, May, and June we will return to the regularly scheduled first-of-the-month dates.

The December 4 NCA meeting featured a talk by Dr. Peter Teuben of the University of Maryland Astronomy Department. Dr. Teuben received his Ph.D. in Gronigen, the Netherlands, with research on the dynamics of a barred galaxy. He has continued his interest in n-body dynamics, but he now works as a software engineer on a radio astronomy project. As a hobby, he participates in the development of a virtual observatory.

Dr. Teuben began his talk with a slide filled with APOD – Astronomy Picture of the Day – images. (See http://antwrp.gsfc.nasa.gov/apod). He follows the example set by Virginia Trimble, where lectures are enlivened by interesting pictures. The topics he presented in these interludes are discussed at the end of this review.

A virtual observatory (VO) is collections of astronomical data and source catalogs made available as though they were all located in one facility, while in reality they are in multiple locations. With one interface, an astronomer can locate, retrieve, and analyze data from the various archives. The addition of theory to the VO lends the astronomer support to be able to compare theoretical models and simulations with observations.

Currently, VO’s are federations of observatories who have databases that can contain terabytes of data. A researcher on a project may not know the existence of relevant data. He said that typing the word “astronomy” on Google might get 5 million responses. [In fact, I found 18.3 million.] Also, once the data are located, there will likely be far too much to download via the internet to enable analysis or data mining. Astronomers realized they needed a better method of synthesizing all of this knowledge and data by providing middleware that facilitates the collection and synthesis of the data. Before the middleware can provide service though, there needs to be agreement on the format and contents of the data records.

The National Virtual Observatory (NVO) is the American program for a virtual observatory, although it is truly international in scope and in use (http://www.us-vo.org/). Its charter is to enable new science by enhancing access to data and computing resources. Each country does its own virtual observatory, with about a dozen already active.

To facilitate exchange of information, the astronomical community developed the FITS format in the 70’s. The World Coordinate System (WCS) used in FITS is still in development. It is very important to have a clear and accepted data format, since otherwise it can be impossible to exchange data. The International Astronomical Union (IAU) is very involved with these discussions and sponsors the development of the VO concept. Once the agreement on the formats is reached, the middleware can be written.

The VO has the potential for new science that has never been done, and is a high-priority item for the NSF. For the astronomer, it is like having a personal library always available for research and analysis. The field is very lively, with a lot happening. The NSF 2000 Decadal report gave the Virtual Observatory the highest priority for future development and funding.

There are a number of pre-existing data centers for various astronomical data. Dr. Teuben mentioned several programs from on-line data sets: the SkyView of the As-

(Continued on page 2)
NCA Events This Month

The Public is Welcome!

NCA Home Page: http://capitalastronomers.org

Fridays, January 14, 21, and 28,
6:30 to 9:30 P.M. NCA mirror- and telescope-making classes 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.

Saturdays January 15, 22, and 29,
Observing with NCA’s 14-inch telescope in Chevy Chase, MD. 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 301-907-9449 or email him at mcnealml@verizon.net to let him know you are coming.

University of Maryland Observatory, in College Park on the 5th and 20th of every month at 9 P.M. The talks are non-technical.

Saturday, January 8 at 7:30 P.M.
NCA meeting at the University of Maryland Astronomy Observatory on Metzerott Road in College Park, MD.

Saturday, January 8 at 5:30 P.M., preceding the meeting, dinner with NCA members at the Garden Restaurant in the UMDC College Inn and Conference Center. See map and directions on Page 8.

If you are planning to come to the dinner before the meeting, please tell Benson J. Simon, telephone: 301-776-6721, e-mail st88@ioip.com, so that we can make reservations for the right number of people.

Upcoming NCA Meetings
2005: January 8, February 12, March 12, April 2, May 7, and June 4

“Theory in a Virtual Observatory”

(Continued from page 1)

The deadline for the February Star Dust is January 15.

Please send your material to Elliott Fein by that date to ensure inclusion.

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.

The Public is Welcome!

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Astronomical Tidbits
Nancy Grace Roman

Not so Cosmic Microwaves
from Science Now – Nov 30
In the past two years, astrophysicists and cosmonologists have nailed down the age and composition of the universe by studying the all-pervading radiation left over from the Big Bang. But subtleties in that cosmic microwave background (CMB) suggest that our own solar system may be producing or absorbing some of the microwaves, a team of astrophysicists reports. If the finding holds up, researchers may have to rethink their theory of how the universe ballooned into existence.

But the intriguing correlations that appear to relate some aspects of the CMB to the plane of the solar system may still be a product of chance, says Charles Bennett, a cosmologist at NASA’s Goddard Space Flight Center in Greenbelt, Maryland, and leader of the WMAP team. “Improbable things happen all the time.”

China, India Set Sights on the Moon
From Science Now – Nov. 30
Udaipur, India--The new kids on the block are having their own race to the Moon. Last week, Chinese scientists presented details of the country’s planned lunar orbiter mission, named Chang’e, to be launched sometime in 2007. Not to be outdone, Indian space officials revealed at the same time that they have added a probe to the suite of instruments aboard Chandrayaan-1, which is headed to the Moon the same year.

Both countries unveiled their plans here at the International Conference on Exploration and Utilization of the Moon. “It has all the makings of a new race,” says German high-energy physicist Horst Uwe Keller of the Max Planck Institute for Solar System Research in Katlenburg-Lindau, which hopes to build a payload for the Indian spacecraft. “And that’s good. Healthy competition has never killed anybody.”

The Chinese mission, the country’s first outside Earth’s orbit, hopes to put a 2-ton satellite into a 200-kilometer, circular polar orbit for a year’s worth of exploration. Its 150-kg scientific payload will include a camera to map the terrain of the Moon in stereo for the first time. It will also carry a gamma and x-ray spectrometer to study its elemental and mineral composition, as well as instruments to measure solar winds and spot high-energy particles from deep space. The Chang’e mission will also carry a microwave radiometer to analyze the density, depth, and composition of the lunar soil, the first time such an instrument has been trained on the moon.

Neither country has plans for human lunar exploration.

Alien Worlds Invade the Kuiper Belt
from Science Now

Like fleas jumping from dog to dog, frozen miniplanets may hop from one star to another, astronomers have proposed. Computer simulations show that some of the icy objects in the outermost reaches of our solar system may actually be alien invaders that originally orbited another star. The exchange would have occurred when the other star had a close encounter with our newborn Sun.

Beyond the orbit of Neptune, tens of thousands of icy bodies, with diameters between 100 and 1500 kilometers, constitute the so-called Kuiper belt. These Kuiper belt objects are thought to be leftovers from the formation of our solar system. However, the remote and extremely elongated orbits of some of these objects are hard to explain. Take Sedna, for example. The mysterious mini-planet, whose discovery was announced earlier this year, takes 11,000 years to complete one orbit and never gets closer to the Sun than 10.5 billion kilometers—almost twice the average distance of Pluto.

Now, at least two groups of scientists suggest that Sedna-like objects may have crossed over from another star to our Sun during a close encounter. This likely took place when both stars were only a few tens of millions of years old and still resided in a densely populated cluster.

Astronomers Discover Planet Building is Big Mess
NASA Press Release

New observations from NASA’s Spitzer Space Telescope reveal surprisingly large dust clouds around several stars. These clouds most likely flared up when rocky, embryonic planets smashed together. The Earth’s own Moon may have formed from such a catastrophe. When embryonic planets, the rocky cores of planets like Earth and Mars, crash together, they are believed to either merge into a bigger planet or splinter into pieces. The dust generated by these events is warmed by the host star and glows in the infrared, where Spitzer can see it.
# Mid-Atlantic Occultations and Expeditions

*by David Dunham*

## Asteroidal Occultations

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<tr>
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<td>7</td>
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<td>SAO 96450</td>
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## Grazing Occultations

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<td>n. Lexington, VA; Sun</td>
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<td>6</td>
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<td>18</td>
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<td>Jan 14</td>
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<td>19:25</td>
<td>X 53895</td>
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<td>26+</td>
<td>31</td>
<td>Hughesville, MD</td>
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</table>

## Total Lunar Occultations

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<td>13-</td>
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<td>13-</td>
<td>17</td>
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<td>D</td>
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<td>2.9</td>
<td>12-</td>
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<td>6-</td>
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<td>9+</td>
<td>20</td>
<td>25N A0 Sun-7;2nd*4&quot;, D 6s later</td>
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<td>D</td>
<td>X 53895</td>
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<td>26+</td>
<td>31</td>
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<td>68+</td>
<td>36</td>
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<td>Botein</td>
<td>4.4</td>
<td>68+</td>
<td>22</td>
<td>74N K2 delta Arietis = ZC 465</td>
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<td>33 Tauri</td>
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<td>76+</td>
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<td>3.9</td>
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<td>27-</td>
<td>17</td>
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David Dunham, e-mail dunham@starpower.net, more info. http://iota.jhuapl.edu
Phone home 301-474-4722; office 240-228-5609; car 301-526-5590
NATIONAL CAPITAL ASTRONOMERS
MEMBER INTEREST SURVEY

Name: ________________________________________________________ Date: ___/___/___
Address: ________________________________________________________ ZIP Code: _______
Home Phone: ______-____-______ E-mail: ___________________________
Present or Former Occupation (Or, If Student, Field of Study): ___________________________
Academic Degrees: ______________________ Field(s) of Specialization: ______________________
Employer or Educational Institution: ________________________________________________

We Need To Know What You Would Like NCA To Do FOR YOU

Please rate each of the activities below where:

1. means “Very important TO ME, and I will participate regularly”;
2. means “Somewhat important TO ME, and I will sometimes participate”; and
3. means “Not important TO ME”.

___ Provide a monthly talk by a professional astronomer about the latest developments in astronomy
___ Show me interesting objects through the telescopes after the monthly talk
___ Provide opportunities to socialize with other astronomers, as at the pre-meeting dinners
___ Teach me how to set up and use my own telescope
___ Teach me how to select a telescope for purchase
___ Teach me how to build a telescope
___ Teach me how to photograph the stars
___ Organize drives/rides to distant, darker sites for an evening of observing
___ Organize occultation timing expeditions

We Need To Know What YOU Can Do For Your Fellow Member of NCA

NCA needs you! For more than ½ century, amateur and professional astronomers have given generously of their time to build NCA and to support its members’ interests. But every year new people must assume support and leadership roles to maintain services to our members and to the community. Please put check marks alongside the activities to which you can contribute.

___ Help with NCA management:
    ___ General operations management
    ___ Financial management
    ___ Program organization and planning
    ___ Scheduling speakers
    ___ Administrative management
    ___ Program publicity
    ___ Website and list-serve management

___ Newsletter preparation and production
___ Help with the post-meeting observing sessions
___ Teach telescope setup and use and astrophotography
___ Help with telescope-making classes
___ Help maintain NCA’s 14-inch telescope

Please return this to Benson J. Simon, former NCA president, at the next NCA meeting, or mail it to the NCA Treasurer, Jeffrey Norman. No envelope is needed, just fold this page in half, this side inside, tape the ends together, affix a 37-cent postage stamp, and drop it into a mailbox. Many thanks to the many members who already completed this survey at the December 4, 2004 meeting.
Mr. Jeffrey Norman
5410 Connecticut Avenue, NW #717
Washington, D.C. 20015
“Theory in a Virtual Observatory”

(Continued from page 2)

a special computer chip developed to compute the Newtonian force model efficiently. The GRAPE-6 and Baby-GRAPE compute the forces for 100,000 and 60,000 stars efficiently. This design has been awarded the Gordon Bell prize three times at annual super computing conferences. Their most recent was for achieving a computation rate of 32 Tflops, 32 thousand billion floating point operations per second. The bottleneck for computations with these chips then becomes communicating the positions of the particles to the chip. Dr. Teuben showed us a picture of one set-up with four computers attached to the chip. The GRAPE developers are now working on the GRAPE-8.

The Hayden Planetarium projection system is available to astronomers (and others) after hours for use of its projectors. The n-body analysts used it to “fly” through their simulated galaxy and watch it evolve. Dr. Teuben and his colleagues had a problem in seven dimensions of time and space, six for position and velocity and the seventh that of time. Their simulation included simulating the evolution of the stars as they orbit in the galaxy. They found that visualization of the problem was helped by illuminating one stellar orbit, with markers for time, with all the other stars moving, as well as evolving. Stellar evolution has an influence on the dynamics of the cluster, as stars enlarge or become supernovae. They were studying the impact of stellar evolution on the dynamics of globular clusters.

Simulations and projections in a planetarium are often supported by the Virtual Director (VirDir) a piece of software written by NCSA, which works in a CAVE as well as a planetarium. It is used, for example, in making IMAX movies. The NCSA does not make VirDir available to others but Partiview is a version of the Virtual Director that is available as open source software. The database of objects can be logged into Partiview and the analyst can fly through it. Partiview is now publicly available in both Macintosh and Windows versions, thanks to the Hayden Planetarium (see http://www.manybody.org/).

The VO and theory in a VO is a hobby for Dr. Teuben. He is a software engineer for CARMA, the Combined Array for Research in Millimeter-wave Astronomy. This is being formed by combining three existing microwave programs into one. The Berkley Illinois Maryland Array (BIMA) of ten 6-meter dishes and the Owens Valley Radio Observatory (OVRO) an array of 6 10-meter antennas planned to merge to become CARMA, with first light planned for 2005 (http://www.mmarray.org/). The University of Chicago then also suggested their Sunyaev-Zeldovich Array (SZA), six smaller dishes of 3 meters, also combine, so that CARMA = OVRO + BIMA + SZA. The arrays are being moved to a location in the Inyo Mountains at a higher elevation than their current sites in the Owens Valley of California. Nine of the 10 BIMA dishes have been moved to the new site (The 10th will not be moved.) and the antennas from OVRO will move. The SZA array will join the rest of CARMA in three years after its current observing program completes.

Astronomy is one science where amateurs can still make real contributions. For example, one can download data for SETI and participate in the search for signals in the data. The VO is a tool amateurs can use as well as professionals to search through data to discover how we have to put the data into the VO and how to use it.

The pictures Dr. Teuben showed included the following (all available on APOD):

- The International Space Station crossing the Sun during the transit of Venus.
- Supernova, Cas A, an image 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.

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 st88@ioip.com, so that we can make reservations for the right number of people.

Do You Need a Ride?
Please contact Jay Miller, 301-530-7942, 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 rigell1@starpower.net.)

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.

“Theory in a Virtual Observatory”

(Continued from page 7)

posed of pictures in different wavelengths.
• Recently discovered galaxy hidden behind our galaxy.
• Edge on galaxy with a peanut shaped bulge. The theory is that this type of a galaxy is a barred galaxy.
• The Moon, at apogee and perigee, and a series through a lunation, showing the librations.
• Picture of a sonic boom
• Picture of a plane passing in front of the Sun as observed with an h-alpha filter.
• Gamma ray observatory, composed of many computer-controlled elements.
• Eagle nebula

The URLs are:
http://www.mmarray.org/ - CARMA
http://www.us-vo.org/ - US National Virtual Observatory
http://www.ivoa.net/ - International Virtual Observatory Association
http://bima.astro.umd.edu/nemo/tvo/ - Theory in a Virtual Observatory
http://heasarc.gsfc.nasa.gov/cgi-bin/vo/datascope/init.pi - Datascope
http://irsa.ipac.caltech.edu/applications/Oasis/ - On-line Archive Science Information Services (OASIS)
**National Capital Astronomers, Inc.**  
http://capitalastronomers.org

Jay H. Miller, NCA President, rigel1@starpower.net, 301-530-7942 (home).  
Jeff Guerber, NCA Vice-president, jeff.guerber@gsci.nasa.gov, 703-281-4980 (home).  
Dr. Nancy Grace Roman, NCA Secretary, nancy.roman6@verizon.net, 301-656-6092 (home).  
Jeffrey Norman, NCA Treasurer, jeffrey.norman@att.net, 5410 Connecticut Avenue, NW, Apt. #717,  
Washington, DC 20015-2837, 202-966-0739  
Trustees: Guy Brandenburg, Gladys Fuller, Gary Joaquin, Dr. Wayne H. Warren,  
NCA Webmaster, Dr. Harold Williams, hwilliam@mc.cc.md.us, 301-650-1463 (planetarium), 301-565-3709 (home).  
Elliott Fein, NCA Star Dust Editor, elliott.fein@erols.com, 301-762-6261 (home), 5 Carter Ct. Rockville, MD 20852-1005.  
Appointed Officers and Committee Heads: Exploring the Sky - Joseph C. Morris; Meeting Facilities - Jay H. Miller;  
Observing - Michael McNeal, mcnealmi@verizon.net; Telescope Making - Guy Brandenburg; Star Dust Editor - Elliott Fein

**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.

**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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**MEMBERSHIP CATEGORIES AND ANNUAL DUES RATES**

*All members receive Star Dust, the monthly newsletter announcing NCA activities.*

<table>
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</tr>
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<tbody>
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<td>Standard Individual or Family Membership</td>
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If you wish to receive an annual subscription to *Sky and Telescope Magazine* at a $10 discount from the standard S&T annual subscription rate, please add $33 to the membership rates above.

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Please mail this form with your check payable to National Capital Astronomers, to:  
Mr. Jeffrey Norman, NCA Treasurer; 5410 Connecticut Avenue, NW #717; Washington, D.C. 20015
Inside this issue:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review of December Talk</td>
<td>1</td>
</tr>
<tr>
<td>NCA Events This Month</td>
<td>2</td>
</tr>
<tr>
<td>Astronomical Tidbits</td>
<td>3</td>
</tr>
<tr>
<td>Mid-Atlantic Occultations</td>
<td>4</td>
</tr>
<tr>
<td>Survey</td>
<td>5</td>
</tr>
<tr>
<td>Directions to Meeting</td>
<td>8</td>
</tr>
<tr>
<td>Map to Meeting Place</td>
<td>8</td>
</tr>
<tr>
<td>Dinner Reservations</td>
<td>8</td>
</tr>
<tr>
<td>Ride Reservations</td>
<td>8</td>
</tr>
<tr>
<td>Observing after the Meeting</td>
<td>8</td>
</tr>
<tr>
<td>About NCA</td>
<td>9</td>
</tr>
<tr>
<td>Membership Application</td>
<td>9</td>
</tr>
</tbody>
</table>