Star Dust

National Capital Astronomers, Inc. Washington, DC (301) 320-3621

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June Meeting To Feature Area Science Fair Winners

by Nancy Byrd

At the June meeting of National Capital Astronomers, winners of the Science Fair competitions in the field of astronomy will receive their awards and present their winning projects to NCA members. NCA congratulates the winners on their successes! The 1992 winners are as follows:

Sharon Samuel	Evolution of the Sun	grade 9	Woodrow Wilson High School (DC)
Karla Williams	Analysis of Supernova Remnants Based on Multiple Observations from 1730 MHz to1440 MHz	grade 11	Thomas Jefferson High School for Science and Technology (Fairfax County)
Huy Xuan Vu	Derivation of Equation to find the Sun at the Equator	grade 12	W.T. Woodson High School (Fairfax County)
Joseph Bobbitt	A Vertical Declining Sundial	grade 8	Ellen Glasgow Middle School (Alexandria)
Hsien YeanWong	Monte Carlo Simulation of Planetesimal Collisions	grade 12	Montgomery Blair High School (Montgomery County)

In addition to the above presentations, Harold Williams will be showing the videotape, *On Robot Wings - a flight through the solar system,* a composite of several NASA films about the planetary missions. NOTE: the meeting will be held in the 14th floor auditorium of Building 9, at NIH, instead of in the Bunim Room.

Pizza Party to Precede the Meeting

1992 Science Fair winners will be feted with pizza at Shakey's before the June meeting. Come join the celebration. Directions to Shakey's are on page 12 of this issue.

Summer Calendar

The Public is Welcome!

Saturday, June 6, 5:30 PM - Dinner with the Science Fair winners at Shakey's restaurant, located at East-West Highway and Wisconsin Avenue in Bethesda.

Saturday, June 6, 7:30 PM - NCA monthly colloquium featuring presentations by the Science Fair Winners. Meeting will be held in the 14th floor auditorium of Building 9 at the National Institutes of Health. For directions, refer to map and description on last page.

Tuesdays, 7:30 PM - Telescope making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 202/362-8872.

Fridays 7:30 PM - Telescope making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 202/362-8872.

Friday, June 5, 12, 19, July 10, 17, 24, August 7 and 21, 9:30 PM- NCA 14-inch telescope open nights with Bob Bolster, 6007 Ridgeview Drive, south of Alexandria off Franconia Road between Telegraph Road and Rose Hill Drive. Call Bob to confirm at (703) 960-9126.

Summer schedule for Montgomery College Planetarium: at 7600 Takoma Avenue (Takoma and Fenton Street). Information: Dr. Harold Williams, 301/650-1463 (office), 301/942-1014 (home).

Saturday, 20 June, 7:00 PM - "Father Sun, The Summer Solstice"
Saturday, 27 June, 8:00 PM - Music/Laser/Light Show, Jack Hurwitz performing his own music.
Saturday, 11 July, 7:00 PM - "Montgomery College's Eclipse Expeditions Revisited"
Saturday, 25 July, 8:00 PM - Music/Laser/Light Show.
Saturday, 8 August, 7:00 PM - "Light Pollution: How Seeing the Stars Will Save You Money"

1992 Schedule for "Exploring the Sky"
Held at the open field on Glover Road, NW, in Rock Creek Park near the Nature Center. This program needs telescopes and volunteers for each of these events. For further information, call John Lohman, 703/820-4194.

Saturday, June 20, 9:00 PM
Saturday, July 18, 9:00 PM
Saturday, August 15, 9:00 PM
Saturday, September 19, 8:30 PM
Saturday, October 17, 8:00 PM
Saturday, November 14, 7:30 PM

Astronomy and Personal Computers

by Joan Bixby Dunham

We recently received *The Zodiacal Sky Atlas 2000.o* (with catalog) prepared by Blazej Feret of Lodz, Poland using an IBM AT clone. The sky atlas consists of 27 maps (plots of the stars) brighter than magnitude 8.5 in the zodiacal zone and the catalog, a listing of position and magnitude of each of the stars on each map. The stars are plotted as black dots on a white background, with the sizes of the dots indicating the magnitude. Identifications are given for the brighter stars, and the constellation boundaries are given. This is a very nicely done atlas. Mr. Feret says that the software to select the stars and do the plotting was done with programs he wrote in Pascal and FORTRAN, and the maps were printed using Ventura Publisher and a Hewlett-Packard Laser Jet III printer.

Mr. Feret included a region almost twice the area of the region that the Moon traverses. This is particularly nice for asteroidal observations, since some

See Atlas, Page 7

OCCULTATION EXPEDITIONS PLANNED

Dr. David Dunham is organizing observers for the following occultations. For further information call the IOTA information line (301) 474-4945 (Greenbelt, MD).

Date	Time (EST)	Place	Vis. Mag.	Pcnt. Sunlit	Cusp Angle	Min. Aper.
Grazing Lunar:						
June 2	21:12	north DC suburbs*	7.2	5	9N	6 cm
June 5	21:00	Petersburg, VA	8.3	29	10N	15 cm
June 5	23:04	Henderson, NC	5.3	30	6N	6 cm
June 7	21:27	Arlington, VA*	6.8	52	10N	6 cm
June 9	21:04	Manassas, VA*	6.5	74	12N	6 cm
July 9	0:37	Hancock, MD	6.5	71	6S	8 cm
July 12	1:57	Ashbox, MD	3.2	94	11S	6 cm
Aug. 24	3:24	Bowie, MD	6.3	20	1N	6 cm

*See map on page 9 for detailed path and meeting places

Date	Time (EST)	Place	Star Mag.	Delta Mag.	Name	Min. Aper.
Planetary:						
June 20	21:55	Appalachians	8.5	-	Mercury	20 cm

A Tectonic View of Venus

by Nancy Byrd

At the May 2, 1992, meeting of National Capital Astronomers, Dr. David Williams presented a lecture on "The Tectonics of Venus". Dr. Williams, who is currently at the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, began his talk with a geophysical survey of the inner solar system. He pointed out that from a tectonic perspective, the moon, our nearest neighbor, is essentially dead. Many of the visible impact craters bear ages of almost 4 billion years, and the maria(large areas of basaltic lava flows) are between 3 1/2 to 4 billion years in age. At present, there is not much happening on the moon. Mercury, shows very similar features to the moon's. Like the moon, Mercury shows evidence of some tectonic activity very early in its history, around 3 1/2 to 4 billion years ago, but very little since then. Mars, a bit more interesting, shows a huge rift valley with many extensional features (Valles Marineris) and very large shield volcanoes which dwarf those on Earth. The largest of these is Olympus Mons, a volcano the size of Arizona and possibly the largest volcano in the Solar System. These features attest to an active period on Mars, but we do not see evidence that such activity continues today. Earth, on the other hand, shows much evidence of continuing tectonic activity. We see evidence of sea floor spreading, earthquakes, and abundant volcanism. We also see some evidence of cratering on Earth, but with erosion and subduction of material at the margins of plates, there is continuous resurfacing of Earth's surface, making craters hard to find.

Dr. Williams observed that the tectonic activity of bodies in the inner solar system seems to correlate with the size of the bodies. Mercury and the Moon each have less than 10% of the volume of the Earth and appear to be have been tectonically inactive for over 3 billion years. Mars, with less than 20% of the

See Venus, Page 4

VENUS From Page 3

Earth's volume shows evidence of having been active, but not today.

There is good reason for a correlation such as this. The main source of heat in a planet today is the decay of radioactive elements in its interior. We believe that the abundance of radioactive material is similar for all the planets in the solar system, and is proportional to the volume of the planet. The implication of this is that the amount of heat produced by radioactive decay is proportional the volume of the planet, which is proportional the radius of the planet cubed. On the other hand, the ability of a planet to release heat is proportional to the surface area of the planet, which is proportional to the radius squared. The result is that a small planet mainly loses heat by simple conduction to the surface. Volcanism is a more efficient way to remove heat from the interior. The most efficient way to lose heat that we know about is plate tectonics - a system of moving plates, with material coming out at the mid ocean ridges, spreading out, cooling as it moves and then getting subducted back into the interior at the margins of the plates (in subduction zones). This is the major mechanism of heat loss from the Earth, almost like a boiling pot of water. However, Venus is about the size of the Earth, yet does not show evidence of continuing, Earth-style tectonics.

Only recently have we been able to penetrate the thick sulfuric acid and sulfur dioxide cloud layer that surrounds Venus, by using radar images from Soviet and United States spacecraft. If we use an image of the Earth, degraded to the resolution of images we have for Venus, to look at the Earth, we can see a clear demarcation between continents and ocean basins. On the Earth, we see that in the middle of ocean basins there are ridges. This is where crust is being created, and is pushing the continents apart in the Atlantic. In the Pacific, material is being subducted at the edges of the plates, forming the obvious trenches. These features are among the most striking features of our planet. We must have these features present to have Earth style plate tectonics. The ridges represent hot material which tends to be lighter and less dense, and hence forms long systems of ocean ridges. We do not see such features on Venus.

What is surprising about this difference, is that the Earth and Venus are the closest planets to each other in the solar system, and their mean solar distance is similar. The mean radius, density of Venus and hence volume and mass are basically the same as Earth's. But the rotation period is different: a retrograde 243 days. We have the moon, but Venus has no satellites. Other major differences from Earth are a mean surface temperature of 743°K (about 450°C), a surface pressure 90 times that of the Earth and no measurable magnetic field on Venus.

The potassium-uranium ratio, spectral data and planetary models indicate that the radiogenic heat sources are indeed similar in abundance to those on Earth. However, Argon 40 is produced by the breakdown of potassium 40 in the interior of a planet. The abundance of Argon 40 in the atmosphere of Venus is only about 30% that of the atmosphere of Earth which indicates that the interior of Venus is not releasing the material from the interior as efficiently as Earth does.

Hypsommetric peaks (graphs of percent of area compared to the elevation) are a measure of topography. On Earth we see 2 peaks, one for the granitic (less dense) continents - between 2 and 4 km above sea level, and one for the more dense (basaltic) ocean floor - between 0 and 2 km below sea level. The reason for this is the difference between continental crust and ocean crust. On Venus we see one smooth peak. Most of the surface of Venus is concentrated between a very narrow range of elevation. There are a few very high mountains on Venus, and some low lands, but these are exceptions.

Dr. Williams then continued by describing theVenusian gravitational field. On Earth, the high, less dense (granitic) areas have crustal roots and float like icebergs. The low lying, denser, oceanic crust, is thinner than the continental crust. These differences cancel out the gravity effect of changes in mass due to elevation differences and so tend to produce no net gravity anomaly. On Venus, however, one

See VENUS, Next Page

VENUS From Previous Page

sees a positive gravity anomaly from the highlands and a negative gravity anomaly from the low lying areas. One way to support a high gravity anomaly from the mountain areas would be for the lithosphere to be thick and rigid enough to support it. Another would be material flowing fast enough to hold a high standing area up, but the gravity anomaly associated with it is quite deep; so we cannot see it as clearly. We see that the topography on Venus is uncompensated, that there is not compensation right below it, and we find a high gravity signature. On the Earth the topography is, for the most part, compensated.

The lack of a magnetic field on Venus is a major difference between Earth and Venus. Earthquake seismic data and the density of the Earth have led scientists to believe that the core consists mostly of iron and nickel. This core is solid at the center, and has a liquid outer layer. Although the phenomenon is not well understood on Earth, models of the Earth's magnetic field that we have now indicate that convection of the liquid outer core around the solid inner core is producing a magnetic field, and that this movement is being driven by the freezing out of the solid inner core. So that with time, the inner core is getting larger; the Earth is cooling down. The freezing of the inner core is providing the energy to drive the convection, which is providing a dynamo, which generates the Earth's magnetic field.

On Venus, continued Dr. Williams, we do not know anything about the temperatures of the interior of Venus. But if we imagine that there is not any inner core on Venus, there may not be enough energy to drive a dynamo and generate a magnetic field. Thus Venus may be hot enough in the interior, and at slightly lower pressure because Venus is slightly smaller than Earth, so that a solid core cannot form. In fact, the pressure at the center of Venus is less than the pressure at the inner core - outer core boundary on Earth.

But why doesn't Venus have plate tectonics, as does Earth? The main material on the surface of the Earth, and that which forms the ocean floors of Earth is basalt. With depth, and increased pressure, this material will undergo a phase change into a new material called eclogite which is much denser than basalt, and somewhat denser than the surrounding mantle (the layer underlying the crust). When this process occurs in a subducting plate, the increased density will contribute to pulling the slab down. If you start out at a much higher temperature, say at 450°C as on Venus, this transition may not occur soon enough, and this force for driving subduction may be lost. Another possibility is that the lithosphere of the Earth has a very efficient way of cooling as it moves along the bottom of the ocean. The ocean water is close to 0°C and sucks the heat out of the ocean floor. When the slab reaches a low enough temperature, it will be dense enough to begin sinking down into the mantle. On Venus, perhaps the lithosphere is just not cooling fast enough to begin subducting. Another possibility derives from the fact that unlike Earth, Venus has no water. Water makes the rocks weaker, softer and lowers their melting point. Thus the lack of water may be preventing the plates from bending at the plate boundaries, and so preventing subduction. Also on the Earth, we have a layer beneath the lithosphere called the aesthenosphere. This is where the material is hot enough that it is softer than the lithosphere above it. A less popular explanation is that the aesthenosphere may provide a lubricating zone on which the overlying plates may slide across the mantle until they are cool enough to subduct, and that water may be required for the aesthenosphere to exist. The plates on Venus could be stuck.

So how is Venus losing heat? And how do you explain the topography that we see on Venus? One idea is localized heating at the core mantle boundary, with melting which forces its way to the surface, Hawaii style, but without overlying plate motion. Another possibility is that there may be convection below the surface, even though the lithosphere is not moving. There may be a downwelling, dragging lighter materials down, which could be causing the gravity anomaly. (Closer to the surface, it would cancel out the gravity anomaly.) Finally, maybe just the bottom parts of the plates cool sufficiently to break off and fall into the mantle, so that there may

See VENUS, Next Page

be vertical plate motion on Venus, rather than the horizontal motion seen on Earth.

Dr. Williams showed Venera lander photos taken in the Beta Reggio area, and pointed out the broken up pieces of the surface, showing that we do see some sort of weathering on the surface, even without water. Flat, plate-like features which look like basaltic lava flows suggest that there may be active vulcanism at the lander site. The Venera lander site appears to be most like a terrestrial shield volcano.

By combining Venera images and Pioneer altimetry data and using the newer Magellan images Dr. Williams then gave us a geological tour of the surface of Venus. Of special note were the largest highland area, Aphrodite Terra and the highland area, Ishtar Terra showing compression, steep scarps, the very high Maxwell Montes and calderas with huge lava flows.

The age of features on a planet is estimated by counting impact craters. This is problematic on Venus, because only the larger bodies can penetrate the thick atmosphere of Venus. Thus statistics based on crater counts are of lesser quality than for other planets with a less dense atmosphere. However, craters do occur, and are generally in a pristine condition. This situation differs from that on Earth where even recent craters are eroded to the point where they are extremely difficult to recognize. However, best estimates suggest that the oldest observed features are no more than 500 million years old, so that some sort of resurfacing is occurring on Venus.

Drawing our attention to evidence of more viscous flows than basalt, Dr. Williams noted that these features indicate that there is some reworking of material producing more viscous magmas, similar to those that are produced in subduction zones. Dr. Williams also showed tensional features and presented the model that plumes cause upwelling to form highlands and downwelling to form the low lying areas. While there is not evidence of Earth style plate tectonics, there is significant distributed deformation of the surface. It appears that , unlike on Earth, somehow the mantle flow is directly connected to what is happening on the surface of Venus. The high surface temperatures may be responsible for a very thin lithosphere; certainly, he said, they are responsible for the fact that there is no water on Venus.

Dr. Williams ended his talk by listing some of the major still unanswered about Venus. These include the following: How active is Venus today? We don't have proof of active volcanism, but we see what looks like active volcanism, and we see much stretching and compression; so something is going on. Other questions are what supports the high areas of Venus, what is the temperature distribution inside the planet and how is internal convection related to the surface features. A most interesting question with possible environmental implications for the Earth, is when and under what circumstances, did Earth and Venus diverge.

Star Dust To Have New Editor

by Nancy Byrd

As of the September issue, *Star Dust* will have a new editor. She is Nicoletta Stephanz, and she comes to this post with considerable desk top publishing experience. Submissions should be made to her on floppy disks, preferably 3 1/2 inch disks, as the target computer will be a Macintosh. Microsoft Word, WordPerfect and other word processing documents can be accomodated without loss of formatting information. Tabular data is best submitted in a tab or comma delimited format. Using spaces to separate tabular data is problematic, as the spaces must changed to tabs for publication, and lining up the columns can be difficult. She does not have access to a modem. Disks that are submitted will be returned, within a month or two. As before, material is due by the 15th of the month. Contact information for the new editor is

Nicoletta Stephanz
1737B Q Street NW #B2
Washington, DC 20009
Phone: 202/332-7756

NASM Thanks NCA for support on Astronomy Day '92

Cheryl Bauer of the National Air and Space Museum has written NCA thanking us for participation Jay Miller, Jim Roy and Dan Costanzo in Astronomy Day on May 9th. She writes,

"I would like to take this time to thank NCA for their support for the National Air and Space Museum's Astronomy Day "92 events on May 9th. Jay Miller, Jim Roy and Dan Constanzo have always been here whenever we need them. Both Jim and Jay have been volunteers for the Albert Einstein Planetarium for several years, and are a necessary part of our very small staff. May 9th proved yet again that NCA can be depended on to share astronomy with the general public. We hope that we can continue to count on NCA in the future for public events, as well as additional joint projects dreamed up." - Congratulations for the good work, guys!

Classified:

Novelist Norman Maynard is looking for a professional astronomer who would be willing to share his expertise to provide information to be used in his upcoming novel. He can be reached at 410/956-2314.

NCA needs people with some scientific knowledge to review the lectures at the monthly meetings. If we could get 10 volunteers, no one would need to perform the task more than once per year. Please contact Nancy Byrd, phone: 703/978-3440 if you would be willing to do even one review.

STAR ATLAS From Page 3

asteroids have orbits that are more inclined to the ecliptic than the Moon. Atlases such as these are used for preparing finder charts for locating and observing specific objects.

The data he started with were magnetic tapes of the SAO and AGK3 star catalogs, provided to him by the Stellar Data Center at Strasbourg, France. He converted the catalog data to epoch 2000 by applying the precession to the 1950.0 positions from the source catalogs. Then all the stars brighter than magnitude 8.5 and within his zodiacal zone (within 25 degrees of the zodiac) selected for a given map. He cannot guarantee that all stars brighter than magnitude 8.5 are actually on the map, only that all stars in the SAO and the AGK3 are included. He did notice a bright star in the AGK3 (magnitude 5.2) which he could not find in the SAO or any other catalog, possibly an erroneous entry in the AGK3.

The maps are 24 plots of the regions along the ecliptic and 3 maps of clusters, the Pleiades, the Hyades, and the Praesepe. The sizes of the dots represent the magnitudes in a continuous way, so that dots for stars of magnitude 3.3 have a slightly smaller diameter than those of stars magnitude 3.4. Constellation boundaries and individual star descriptions have been done in accordance with the Yale Bright Star catalog and A. Becvar's Atlas Coeli, Skalnate Pleso.

Preparing this atlas took considerable time and effort. Now that he has finished, however, Mr. Feret has had difficulty finding a print shop capable of reproducing the atlas without introducing "copier stars", the specks and flecks we are accustomed to find in our copied documents. For most of us, this is no more than a nuisance, but this is a disaster for a stellar atlas. He has made a few copies by printing them separately. If you are interested in this catalog, you may contact:

Mr. Blazej Feret
PO Box 203
90-980 7
Poland

A sample, undoubtedly with "copier stars", is reproduced on page 10.

Excerpts from The IAU Circulars

by R.N. Bolster

1. May 1 - D. Rabinowitz, University of Arizona, reported the discovery of a comet (1992h) of 19th magnitude near the ecliptic in Virgo by the moving-object detection software on the Spacewatch telescope at Kitt Peak. The object has been named Comet Spacewatch.

2. May 3 - W.A. Bradfield, Dernancourt, Australia, discovered a comet (1992i) of 10th magnitude in Cetus..

Comet Comments: Discovered on October 6, Comet Shoemaker-Levy (1991a1) is finally approaching perihelion. It is not expected to be bright, perhaps mag. 6 to 7 at best. It will be circumpolar from the end of May until mid-July, passing under the pole at the end of June, and during that period can be observed all night. The following ephemeris covers the best periods for morning and evening observation when the Moon does not interfere. These positions are for the time at the beginning or end of astronomical twilight. First well above the horizon in the northeast, the comet moves to the north, then northwest, and finally toward the horizon in the west. After crossing the bowl of the big dipper (July 11 to 13) it will be closest to the Earth about the 14th. As it recedes it will pass west of Coma and east of Denebola. See also p. 706 of the June Sky and Telescope.

Comet Shoemaker-Levy (1991a1)

Epoch of Perihelion:	1992	7	24.508	Lat. 38.787226
Arg. of Perihelion:	145.2242			Long. -77.10587
Long. of Asc. Node:	49.0506			
Inclination:	113.5019			Elements from IAU Circ. 5414.
Perihelion Dist.	.836525	A.U.		Positions for Equinox J2000.0.
Eccentricity:	1			

Morning, Sun at -18 degrees.

1992	UNIV.					SUN		COMET		MOON	
DATE	TIME	R.A.	Dec.	DELTA	r	ELONG	h	Az	m1	h	Az
6/2	7 50	1 33.2	+54 42	1.690	1.258	48	30	42	9.6		
6/4	7 49	1 37.2	+56 5	1.639	1.233	49	31	40	9.5		
6/6	7 48	1 41.7	+57 33	1.587	1.209	50	32	39	9.3		
6/8	7 47	1 46.9	+59 7	1.536	1.184	50	32	37	9.2		
6/10	7 46	1 52.8	+60 46	1.484	1.160	51	33	36	9.0		
6/12	7 45	1 59.9	+62 32	1.433	1.137	52	34	34	8.8	-2	245
6/28	7 48	5 28.9	+78 16	1.061	0.967	55	31	11	7.5	1	60
6/30	7 49	6 45.3	+78 37	1.024	0.950	55	29	8	7.3		
7/2	7 51	8 3.1	+77 38	0.990	0.933	55	27	5	7.2		
7/4	7 52	9 7.2	+75 20	0.961	0.917	55	24	2	7.0		
7/6	7 54	9 53.8	+72 4	0.937	0.903	55	21	359	6.9		
7/8	7 56	10 26.7	+68 6	0.918	0.890	54	17	357	6.8		
7/10	7 58	10 50.1	+63 41	0.904	0.878	54	13	355	6.7		
7/12	8 0	11 7.2	+58 58	0.896	0.867	53	8	353	6.7	-2	240

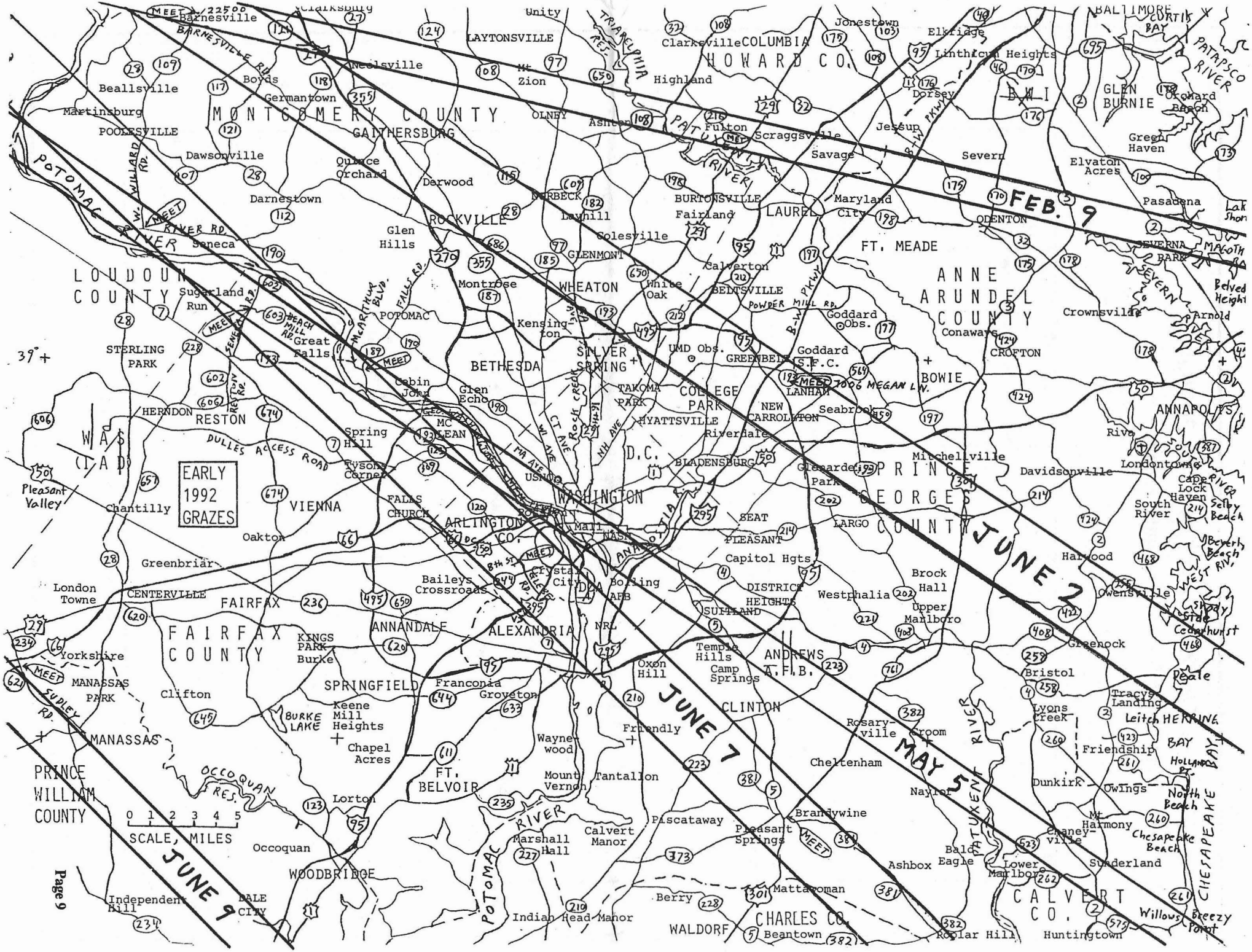
Evening, Sun at -18 degrees.

1992	UNIV.					SUN		COMET		MOON	
DATE	TIME	R.A.	Dec.	DELTA	r	ELONG	h	Az	m1	h	Az
6/18	2 35	2 30.2	+68 15	1.288	1.071	54	17	4	8.4	1	114
6/20	2 36	2 46.7	+70 24	1.240	1.049	54	19	3	8.2	-9	95
6/22	2 36	3 8.7	+72 36	1.193	1.028	55	21	2	8.0		
6/24	2 36	3 39.1	+74 45	1.148	1.008	55	24	360	7.8		
6/26	2 36	4 21.9	+76 43	1.105	0.988	55	26	358	7.7		
6/28	2 36	5 21.4	+78 9	1.065	0.969	55	28	355	7.5		
6/30	2 36	6 36.6	+78 38	1.028	0.952	55	30	352	7.4		
7/2	2 35	7 55.0	+77 48	0.994	0.935	55	31	348	7.2	-9	301
7/4	2 34	9 1.0	+75 39	0.964	0.919	55	33	344	7.1	3	275
7/18	2 24	11 36.7	+44 49	0.908	0.845	52	32	304	6.6	6	103
7/20	2 21	11 43.0	+40	0	0.923	0.841	51	30	299	6.6	-4 83
7/22	2 19	11 48.0	+35 22	0.944	0.838	50	28	295	6.6		
7/24	2 17	11 52.1	+30 56	0.970	0.837	50	25	291	6.7		
7/26	2 14	11 55.5	+26 44	1.000	0.837	49	23	287	6.7		
7/28	2 11	11 58.3	+22 48	1.033	0.839	48	20	284	6.8		
7/30	2 9	12 0.6	+19 7	1.070	0.843	48	17	281	6.9		
8/1	2 6	12 2.5	+15 42	1.110	0.849	47	15	279	7.0	-8	281
8/3	2 3	12 4.1	+12 32	1.151	0.856	46	12	276	7.1	4	255

Terms:
R.A., Dec.: Right ascension and declination.
Delta, r: Distance of comet from Earth and Sun, in A.U.
SUN ELONG: Angular distance from the Sun.
h, Az: Altitude above the horizon, azimuth from north toward east.
m1: Predicted brightness - can be considerably in error.

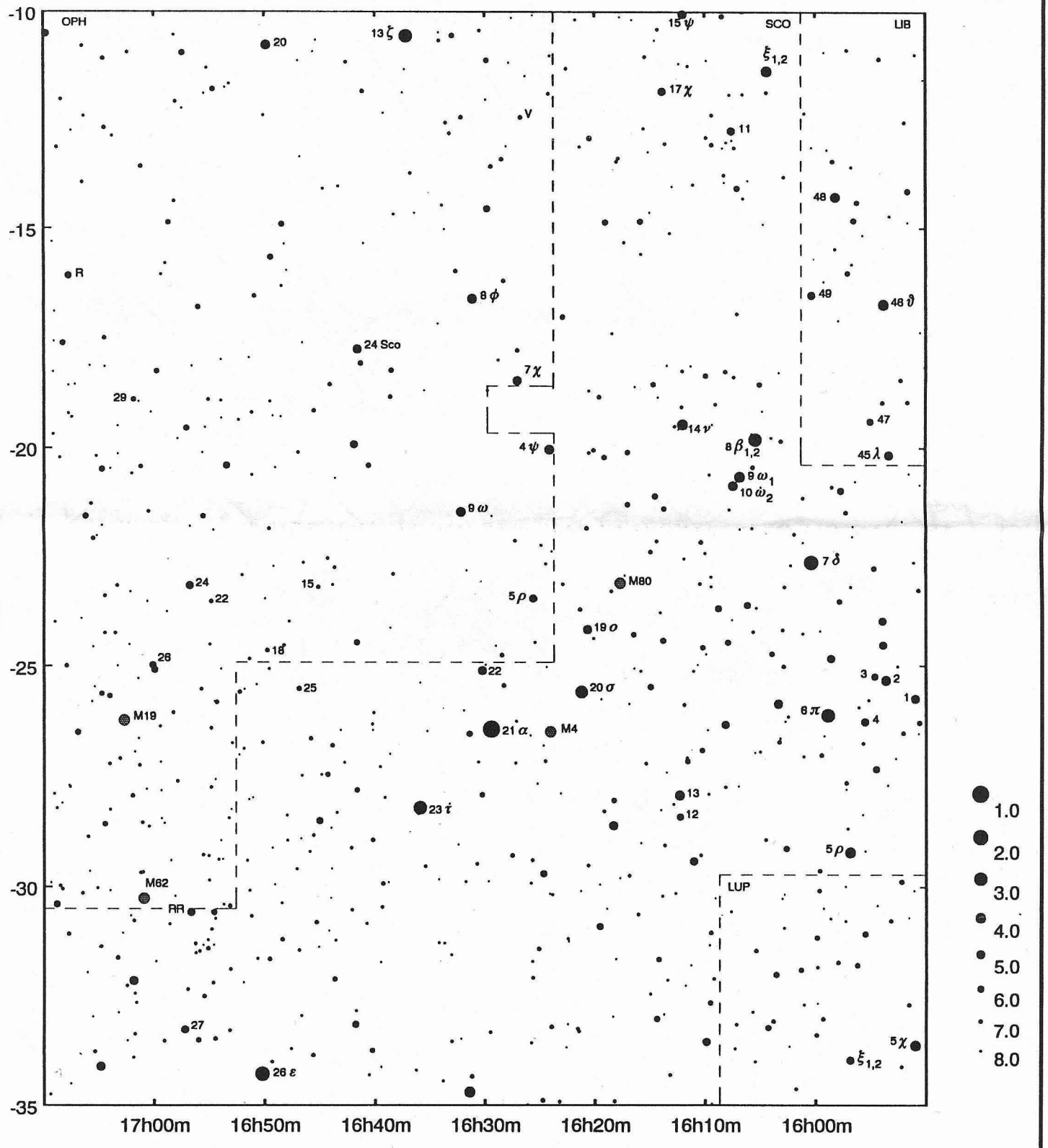
On Opposite Page:

Map of Grazing Occultations in the Washington Area, Summer 1992


EARLY
1992
GRAZES
FEB. 9
JUNE 2
JUNE 7
MAY 5
JUNE 9
MONTGOMERY COUNTY
PRINCE GEORGES COUNTY
ANNE ARUNDEL COUNTY
HOWARD CO.
LOUDOUN COUNTY
FAIRFAX COUNTY
PRINCE WILLIAM COUNTY
CALVERT CO.
CHARLES CO.
WASHINGTON D.C.
ARLINGTON CO.
ALEXANDRIA
ROCKVILLE
GAITHERSBURG
BETHESDA
SILVER SPRING
WHEATON
COLLEGE PARK
LAUREL
BOWIE
ANNAPOLIS
FT. MEADE
ANDREWS A.F.B.
FT. BELVOIR
DULLES ACCESS ROAD
POTOMAC RIVER
PATUXENT RIVER
CHESAPEAKE BAY
SCALE, MILES
0 1 2 3 4 5
Page 9

Map 17 from *The Zodiacal Sky Atlas 2000.o*

(See Astronomy and Personal Computers, page 2.)



National Capital Astronomers, Inc.

is a non-profit, public-service corporation for advancement of the astronomical sciences and is the astronomy affiliate of the Washington Academy of Sciences. For information, call NCA: (301) 320-3621.

SERVICES AND ACTIVITIES:

A Forum for dissemination of the status and results of current work by scientists at the horizons of their fields is provided through the monthly NCA Meeting. (See monthly *Stardust* for time and location.) All interested persons are welcome; there is no charge.

Expeditions frequently go to many parts of the world to acquire observational data from occultations and eclipses which contribute significantly to refinement of orbital parameters, the coordinate system, navigation tables and timekeeping. Other results of this work under continuing study include the discovery of apparent satellites of some asteroids, discovery of apparent small variations in the solar radius, and profiles of asteroids.

Discussion Groups provide opportunities for participants to exchange information, ideas, and questions on preselected topics, moderated by a member or guest expert.

Publications received by members include *Sky & Telescope* magazine and the monthly publication of NCA, *Star Dust.*

The NCA Public Information Service answers many astronomy-related questions, provides predictions of the paths and times of eclipses and occultations, schedules of expeditions and resulting data, assistance in developing programs, and locating references.

The Telescope Selection, Use, and Care Seminar, held annually in November, offers the public guidance for those contemplating the acquisition of a first telescope, and dispels the many common misconceptions which often leads to disappointment.

Working Groups support areas such as computer science and software, photographic materials and techniques, instrumentation, and others.

Telescope-Making Classes teach the student to grind and polish, by hand, the precise optical surface that becomes the heart of a fine astronomical telescope.

NCA Travel offers occasional tours, local and world-wide, to observatories, laboratories, and other points of interest. NCA sponsored tours for comet Halley to many parts of the southern hemisphere.

Discounts are available to members on many publications and other astronomical items.

Public Programs are offered jointly with the National Park Service, the Smithsonian Institution, the U.S. Naval Observatory, and others.

PLEASE ENROLL ME IN NATIONAL CAPITAL ASTRONOMERS MEMBERSHIP

[ ] Regular ($38 per year) Each regular membership receives *Sky & Telescope & Star Dust.*

[ ] Junior (Only open to those under age 18) Date of birth: _____

Junior members pay a reduced rate and may elect not to receive *Sky & Telescope.*

[ ] *Sky & Telescope* and *Star Dust.* ($25 per year)

[ ] Star Dust only ($10 per year)

_____ _____ _____ (____) _____

First name Middle Last name Telephone

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Street or Box Apartment City State Zip

If family membership, list names of additional participating immediate family members in same household, with birthdates of all those under 18 years old: _____

Note: If you already subscribe to ***Sky & Telescope***, please attach a recent mail label, or indicate the expiration date: _____. A prorated adjustment will be made. Make check payable to National Capital Astronomers, Inc., and send with this form to:

Leith Holloway 10500 Rockville Pike Apartment. M-10, Rockville, MD 20852.

The following information is optional. Please indicate briefly any special interests, skills, vocation, education, experience, or other qualifications which you might contribute to NCA

Thank you, and welcome!

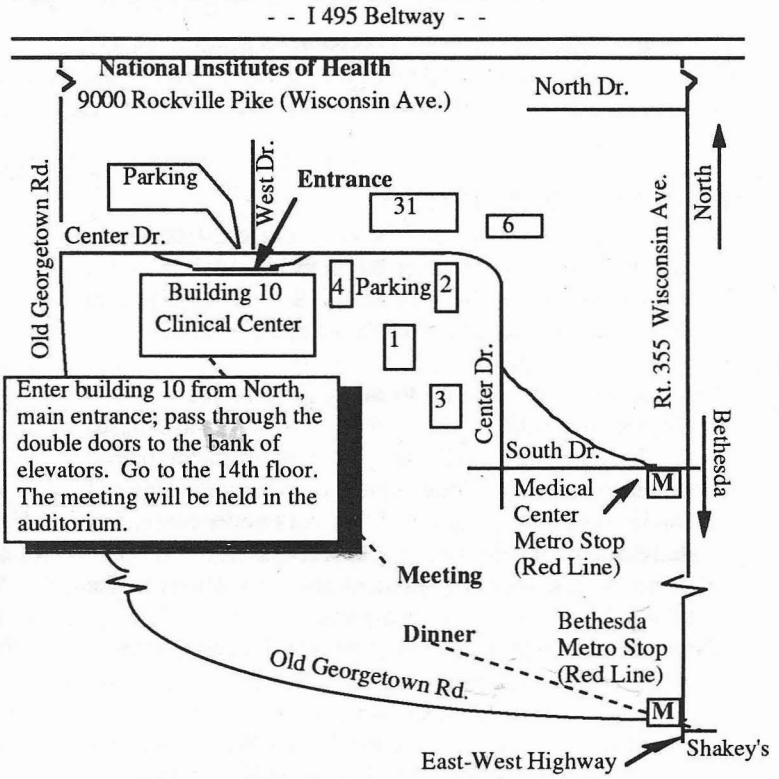
_____

_____

Getting to the NCA Monthly Meeting

•Subway Riders - To get to the meeting from Medical Center Metro Stop: Walk down the hill, pass the bus stops and turn right at the anchor (onto Center Drive). Continue uphill to building 10, the largest building on campus. Also the J2 bus line connects the Bethesda (7:16PM) and NIH (7:23PM) metro stops with building 10 (7:25PM).

•To Shakey's - Shakey's is located at East West Highway and Wisconsin Avenue, one half block South of the Bethesda Metro Stop..



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