Star Dust

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November Speaker: Linhui Sui, "Solar Flares and RHESSI"

Submitted by Jeff Guerber

Linhui Sui (Catholic University/Goddard Space Flight Center, Ph. D. Candidate) will present the featured talk "Solar Flares and RHESSI" at the November 1 meeting of the National Capital Astronomers.

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.

Abstract

Solar flares are among the largest explosions in the solar system, releasing as much energy as a billion one-megaton nuclear bombs. They are often closely associated with fast coronal mass ejections (CMEs), which propel energetic particles into space that impinge on the Earth's magnetic field, igniting the auroras and generating magnetic storms that can interfere with radio communications and satellites. The Ramaty High Energy Solar Spectroscopic Imager (RHESSI) is designed to investigate particle acceleration and energy release in solar flares, through imaging and spectroscopy of hard X-ray/ gamma-ray continua emitted by energetic electrons, and of gamma-ray lines produced by energetic ions. It provides the first high-resolution hard X-ray imaging spectroscopy, the first high-resolution gamma-ray line spectroscopy, and the first imaging above 100 keV including the first imaging of gamma-ray lines. RHESSI was launched on February 5, 2002. I will present an overview of the mission, and then introduce the recent results from RHESSI.

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"Exploration of Mars: Update on Mars Research" A Talk by Dr. David E. Smith

Reviewed by Dr. Andrew W. Seacord, II

At the September 7 meeting of National Capital Astronomers, Dr. David E. Smith presented a talk about some of the things we are learning from the Mars Global Surveyor (MGS) and Mars Odyssey missions. Dr. Smith said, "We are beginning to understand how Mars actually works." Dr. Smith was the Principal Investigator of the MGS Mars Orbiter Laser Altimeter (MOLA). The MGS arrived at Mars in 1997.

Global Surface Features

To begin his presentation, Dr. Smith showed us an altimeter drawing of the Martian surface in the form of a topographic map. It illustrated the contrast between the smooth, almost featureless, northern hemisphere and the heavily cratered southern hemisphere. Parts of the northern hemisphere are the smoothest surfaces known in the solar system, having a height variance of two meters over an area of 100 square kilometers. We now know the radius of Mars to within one meter.

The Hellas basin, a prominent feature of the southern hemisphere is a large impact crater surrounded by heavily cratered highlands. The ejecta from the impact form a significant part of these surrounding highlands. The Hellas basin is so large that most of the highland material in the southern hemisphere could be scraped off and placed within it.

Altimeter data show that there is a significant pole-to-pole slope of the surface. The average slope from the higher south to the lower north is 0.036 degrees. The crust near the south pole is thicker than that near the northern pole. This disparity in crustal thickness is an important feature of Mars.

Another major feature is the Tharsis rise. This 3.5 to 4.0 billion-year-old feature occupies 20 to 25 percent of the Martian surface and rises 10 to 12 km above its surroundings. It is the origin of four volcanoes, one of which is Olympus Mons, the largest volcano in the solar system. It rises 25 km above the height that would be mean sea level on Earth. The Tharsis region creates a substantial load on the crust underneath it. This load requires that there be a significant load 180 degrees around the surface from it. An image of that region shows a feature that appears to be a rise with a network of channels, or valleys, radiating from it. The valley network appears to be drainage channels running from the top of the rise to the lower surface below.

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NCA Events This Month

The Public is Welcome!

NCA Home Page: http://capitalastronomers.org

Fridays, November 7, 14, 21, at 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. Also, see article at right.

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

Saturday, November 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.

Linhui Sui will present the featured talk: "Solar Flares and RHESSI"

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

The Athenian Plaka Restaurant
7833 Woodmont Ave.
Bethesda, MD
301/986-1337

Saturday, November 15 7:00 P.M. Exploring the Sky at Rock Creek Park. See the article below.

Observing with the NCA C-14

Bob Bolster

All at 8:30 p.m.	**Prime Objects**
Saturday, November 1	Mars, Gibbous Moon, Uranus
Fridays, November 14, 21, 28	Mars, Double Cluster, M31

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.

Come See the Stars!

by Joe Morris

Exploring the Sky 2002-2003 Schedule

Date	Time	Notes
11/15	7:00 P.M.	Leonid meteor shower 11/14-11/21

Exploring the Sky is an informal program that for nearly fifty years has offered monthly opportunities for anyone in the Washington area to see the stars and planets through telescopes from a location within the District of Columbia.

Sessions are held in Rock Creek Park once each month on a Saturday night from April through November, starting shortly after sunset. We meet in the field just south of the intersection of Military and Glover Roads NW, near the Nature Center. A parking lot is located immediately next to the field.

Beginners (including children) and experienced stargazers are all welcome — and it's free!

Questions? Call the Nature Center at (202) 895-6070 or check the Internet sites:
http://www.nps.gov/rocr/planetarium
or http://www.capitalastronomers.org

Report From the Mirror-Making Workshop

Guy Brandenburg

The NCA telescope- and mirror-making workshop continues as usual in the basement of the Chevy Chase Community Center at the intersection of McKinley Street and Connecticut Avenue, N.W., in Washington, D.C. We meet every Friday evening from 6:30 to 9:30 P.M., so that means November 7, 14, and 21. However, we will not meet on Friday, November 28, which is the day after Thanksgiving - still digesting the turkey!

We were recently given a very nice equatorial plumbing-pipe mount, made by Mark Uretsky and Jerry Schnall. It has a very stable tripod base, and Mark has used it for quite some time with his own telescope (which he made some years ago in the same workshop, under Jerry's able instruction). Mark has upgraded to a different commercial mount, and has offered to let us either use the mount for demonstration purposes or sell it and use the proceeds for the benefit of the class. Mark thinks that some lapping compound could be used to smooth out the gears (which are pipe threads) to make tracking a little smoother. Otherwise, it works very well - and it is VERY sturdy! So, if anybody is interested in purchasing a very well-made equatorial mount, please contact me (Guy Brandenburg) either at gfbrandenburg@yahoo.com or else at 202-262-4274.

Linhui Sui

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Curriculum Vitae

Education:

Ph. D. Candidate at Catholic University in connection with work at the Solar Physics Branch, Laboratory for Astronomy and Solar Physics, NASA Goddard Space Flight Center. Dissertation Title: "Electron Acceleration and Transportation in Solar Flares."

Master of Science (01/2002), Department of Physics, Catholic University of America, Washington, D.C.

Master of Science (06/1995), High Energy Physics Branch, Department of Physics,

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Talk by Dr. David E. Smith

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The valley network is younger than the south-north slope and the Tharsis rise.

The Martian surface has six or seven prominent features which appear to be drainage basins or watersheds. They suggest that a significant amount of water flowed sometime during the Martian past. However, the existence of a warm and wet period with heavy rains is controversial. The drainage basins all flow toward the north because of the downward south-to-north slope mentioned earlier. The northern plains constitute the largest area on the planet.

Because water must have been present in large quantities in the past, a major research effort has been the search for the remains of it. The Mars Odyssey spacecraft carries a gamma-ray spectrometer and the High Energy Neutron Detector (HEND). Cosmic rays impact the planet and react with hydrogen, if present, to produce neutrons. Hydrogen detected from a neutron flux is assumed to be tied up in water ice, or permafrost, located in the top meter of the Martian soil. This ice makes up 10 to 50% of the mass and up to 60% in volume of the top ten meters of the crust in both northern and southern hemispheres. A color-coded map made from Mars Odyssey HEND data shows large regions of permafrost in the northern plains. Dr. Smith noted that neutron flux measurements of the Moon possibly indicate the presence of hydrogen also in regions other than polar craters.

Researchers at Los Alamos also found patterns of hydrogen concentration during Martian summers in both northern and southern hemispheres. These patterns were similar to those found by the Mars Odyssey spacecraft. Neutrons are detected only during the summer season in each hemisphere. During winter seasons, the surface is covered by carbon dioxide frost which blocks neutrons, preventing the detection of hydrogen, or water ice, under the dry ice. However, during the winters, researchers try to measure the density of the dry ice frost covering the surface.

Some impact craters, such as Korolev, show evidence of being filled in by a highly-reflective material, perhaps a mixture of dirt and dust mixed with water ice. We do not fully understand how this material was formed there, but we do know that the crater was formed in an ice-rich surface.

There are other Martian surface features whose geologic processes are not yet understood. For example, in the Chandor Chasm (a part of the Valles Marinaris system), stratification can be seen in the chasm walls. It is not understood how the stratification was created. Was the stratification caused by different layers of sediment, or was it caused by the process that removed the material from the channel?

Impact craters are surrounded by material ejected during the impact, forming a feature known as an ejecta blanket. For most craters, including those on our Moon, the ejecta blanket is like a rubble pile on a desert surface. The ejecta blankets around some Martian impact craters, however, have the distinct appearance of aprons. The surfaces of these blankets are smooth and the outside edges are somewhat scalloped. These apron-like ejecta blankets are found in soil where there is permafrost underneath the surface. They are not found in Mars' equatorial region.

The Utopia Basin lies in the northern hemisphere. It is about the size of the Hellas basin and is completely filled in by a 5 to 7 km layer of sediment. There are features in the basin which suggest the presence of water or ice activity. Utopia and the northern plains surrounding it are the flattest surfaces in the solar system. These regions appear to have very few craters, suggesting that the surface is very young. This appearance is, however, illusory. In images, the rays of sunlight are nearly perpendicular to the surface. However, since these are digital images, they can be processed to make the sunlight graze the surface. In grazing sunlight, the appearance of the surface changes and many crater rims become visible. The crater counts for the two hemispheres are the same; consequently, the northern hemisphere is as heavily cratered as is the southern hemisphere. The northern hemisphere craters seem to have been filled in by water and sediments.

Originally, it was thought that, since there were so few craters there, the northern hemisphere surface must be very young. And, because the southern hemisphere is heavily cratered, it must be very old. This is now known not to be true. The ages of the northern and southern hemispheres are the same.

Polar Caps

The permanent northern polar cap is made of water ice and rises 3 km above the surrounding area; however, it is 2 km below the "mean sea level." An image of the permanent south pole cap shows a layered terrain whose top is 3 km above "mean sea level," making the difference in height 6 km between the two caps. The permanent south cap is most certainly a mixture of water and dry ices, even during the summer season. An image of the southern cap with a resolution of 150 meters shows fine structure. The cause of this structure is not understood, but may be due to the formation or motion of glaciers.

The ages of the permanent caps are unknown. The volume of the permanent southern cap is larger than that of the northern cap, although it is difficult to discern the boundary of either cap. The volume of the southern seasonal cap is also larger than that of the northern seasonal cap. The load which the caps place on the underlying surface is unknown.

The albedo of the southern polar cap was measured at a wavelength of 1064 nanometers using the MOLA receiver, allowing the brightness at mid-spring to be compared to the brightness at late spring. With a resolution of 400 meters on the surface, we can see the edge where carbon dioxide ice begins to sublimate.

The structure of the polar cap surfaces is different from the rest of the Martian surface. Some researchers think that the cap surfaces are solid, crystal-clear dry ice. This, however, is controversial. Profiles of both polar cap surfaces obtained along several azimuths show that the shape of the southern cap is more complicated than that of the northern cap. The southern cap looks more "eaten away." The cap profiles are used as an argument for claiming that the caps are water ice rather than dry ice, because dry ice cannot produce the observed shapes.

Images obtained by Mike Carr show that cap ice is built up in layers. The layered structure may be caused by the variability of the Martian obliquity (the angle Mars' rotation axis makes with its orbit plane). Currently, the Martian obliquity is 25.19

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Talk by Dr. David E. Smith

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degrees. However, about six million years ago, the obliquity was about 45 degrees. That would have eliminated the present polar caps, and ice would have formed at the equator.

There is evidence of a layer of carbon dioxide snow on the caps built up over time. Since the southern cap is about 6 km higher than the northern cap, it appears that the process by which precipitation occurs may be different on the two poles, possibly because there is less atmosphere at the south pole. The variation in mass of the seasonal poles is close to the mass of the inner satellite, Phobos.

The Martian Atmosphere
Dust is always prevalent in the Martian atmosphere. The size of the dust particles is about one micron (one millionth of a meter), about the same as a smoke particle. Because the dust is so light, it hangs in the atmosphere making the atmosphere always hazy. Since there is no rain on Mars, winds provide the only means of cleaning the air. Dr. Smith described the day-by-day development of a dust storm over a period of 1.5 months. The storm was observed by the Thermal Emission Spectrometer.

Martian Gravity Field
Dr. Smith showed us a color-coded map of the Martian gravity field. The field strength was plotted in units of milligals. Several anomalies, regions where the field strength is different than the mean field, were evident. Most of these anomalies contain volcanoes, mountains, or impact basins. There were several anomalies which cannot be identified with a surface feature. One of these has a field strength of 3,000 milligals and is unlike anything found on Earth. The gravity field map also indicates that there is no trend in the field strength between the north and south poles.

Another major anomaly is associated with the Hellas basin, an 8-km depression formed by a large impact 4 billion years ago. Following the impact, material flowed underneath the basin, compensating for the material ejected by the impact, and balancing the mass in the region. As the crust cooled, it became capable of supporting a substantial load without deforming. This compensated feature would not, itself, be a gravitational anomaly. However, after the crust cooled, the Hellas basin was filled in with a 2-km layer of sediment from the plains, creating a gravitational anomaly.

The Tharsis rise extends 10 to 12 km above the surrounding surface. The gravity map suggests that, during its formation, enough material flowed out from underneath the Tharsis region to make it 90% compensated. Because the Tharsis region is so large, the 10% uncompensated mass creates a significant gravitational anomaly.

Comparing the Martian topography with the gravity field, we can see that the topography shows a trend south to north, but the gravity field shows no pole-to-pole variation. The goal is to create a model from the topography and gravity field that can compute what the crust thickness must be. This model is constrained by the condition that the crust thickness not be zero anywhere. This model will have something to say about the formation of Mars. Sean Solomon has argued that if the northern hemisphere is not younger than the southern hemisphere, it must have been hotter. Therefore, it must have been thinner. The thinnest crust probably will be found under the Isidis basin, probably one of the youngest features we have encountered. The model will also show how the mantle material has flowed under the Hellas basin to compensate for the ejected crust material. So, in summary, we see a surface which is sloping down from south to north because the crust is thicker in the south than it is in the north. And 4 billion years ago, the northern crust was hotter than the southern crust.

Martian Magnetic Field
Mars does not have a global dipole field like that of Earth. However, in the southern hemisphere, there are several regions, or magnetic anomalies, where there is a strong local field. None of these anomalies can be found in the northern hemisphere. At this time there is no explanation for them. However, there was a global dipole field at one time and the magnetic anomalies may be remnants of that field. Remnants of a magnetic field can be erased by the effects of an impact or washed away by water flow, leaving nonmagnetic sediments.

We do not know when or how the dipole field went away. However, its disappearance must have predated the formation of the Hellas basin which does not have a magnetic anomaly. The field should have been established as soon as the planet had become differentiated and formed a core.

If Mars did have a global dipole field at one time, why did it disappear? Perhaps Mars originally had an electrically conductive (metallic) liquid core that cooled and became solid. Once the core solidified, electric currents that generate the field (the dynamo) stopped, shutting down the field. Recently a gravity Love number for Mars was estimated to be about 0.17. If the Love number is greater than 0.10, there must be a solid and liquid core. This suggests that Mars now has a solid core surrounded by a fluid shell. However, we still have no explanation for the origin and decay of the dynamo and magnetic field.

Most planetary scientists believe that there is some connection between the atmosphere and the magnetic field. Four billion years ago, the atmospheric pressure on Mars was a few bars. Currently it is about 6 millibars. We are not sure where it all went. Some of it blew off into space and some of it was dissolved into the ocean. However, the magnetic field influences the retention of an atmosphere by constraining the motion of charged particles in the atmosphere. For example, if Earth's magnetic strength were to become zero, our atmosphere would be diminished.

There is also a relationship between the crustal thickness and the location of magnetic anomalies. Comparing the location of these anomalies with the thickness of the crust, we find that the source of the anomaly lies about 60 km below the surface. There is no explanation for this. The anomalies are very large. The farther below the surface they lie, the larger they must be.

Tracking the MGS Spacecraft
In order to conduct any geophysical research, the orbit of the MGS spacecraft around Mars must be determined with high precision. The orbit is computed from tracking data which determines the distance to Mars and the velocity of the spacecraft with respect to Earth measured over a long period of time. The NASA Deep Space Network (DSN) is used in the X-band to determine the distance (range) to a precision of a few meters and the range rate to about 50 microns/sec on a basis of 10 to 30 seconds. Three and a half years of MGS range data originally showed a curious pattern: a 50 to 100 meter range bias and su-

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David Dunham Wins Brouwer Award!

By Wayne H. Warren Jr.

NCA member David W. Dunham has been selected by the American Astronautical Society to receive its prestigious Dirk Brouwer award for the year 2004. The award will be presented to David at the American Astronautical Society's Spaceflight Mechanics meeting to be held February 8-12, 2004 on the island of Maui, Hawaiian Islands. We should all sympathize with poor David at having to attend that meeting.

The Dirk Brouwer award honors significant technical contributions to space flight mechanics and astrodynamics and recognizes Dirk Brouwer's outstanding role in celestial mechanics and his widespread influence on workers in space flight and astrodynamics. David is no doubt extremely pleased to receive this award, not only for its recognition of his outstanding spacecraft dynamics work, but also because several significant people in David's career are past recipients. The award was won in 1980 by Professor Paul Herget of the University of Cincinnati Observatory, where David worked for a couple of years, in 1984 by Dr. Robert W. Farquhar, with whom David presently works, and in 1981 by Professor Victor Szebehely, who was Joan's thesis advisor at the University of Texas. It is also significant that Professor Brouwer spent a good part of his career as the Chair of the astronomy department at Yale University, where David earned his Ph.D. degree.

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).

Meteor Showers

November Radiants

Full Moon: November 9

Important Note: The Leonids were in a cycle of strong activity up to 2002. Although no "storm" level activity is predicted during the next few years, above-normal displays may be present through 2006.

Major Activity

Radiant	Duration	Maximum
Leonids (LEO)	November 14-20	Nov. 18 @ 01:50 UT

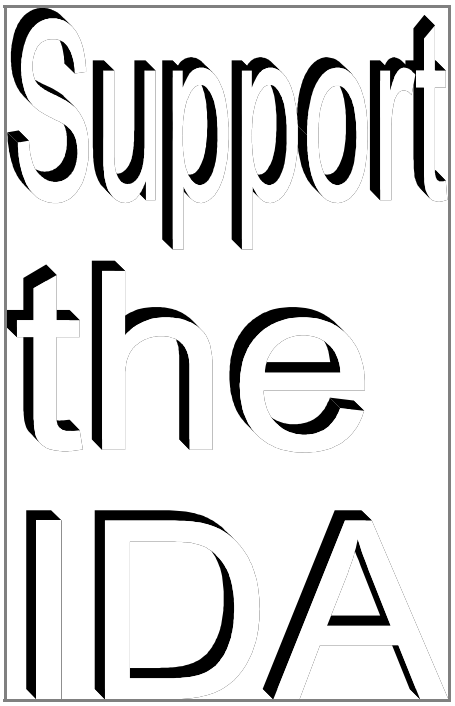
Moderate Activity

Radiant	Duration	Maximum
Northern Taurids	October 12-December 2	Nov. 4-7
Southern Taurids	September 17-November 27	Oct. 30-Nov. 7

Minor Activity

Radiant	Duration	Maximum
Andromedids	September 25-December 6	November 14/15
Alpha Monocerotids	November 13-December 2	November 21
Alpha Pegasids	October 29?-November 17?	November 1-12

Source:http://comets.amsmeteors.org/meteors



Join the International Dark-Sky Association

3225 N. First Avenue Tucson, AZ 85719-2103

www.darksky.org

The deadline for the December Star Dust is November15. 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.

Mid-Atlantic Occultations and Expeditions

by David Dunham

Asteroidal and Saturnian Occultations

Date	Day	EST	Star	Mag	Asteroid	dmag	dur. s	Ap. in.	Location
Nov 4	Tue	2:33	TYC01141937	9.8	Alfaterna	5.7	6	5	e. NC, s.e. VA
Nov 5	Wed	2:02	SAO 117986	8.4	Feronia	5.7	4	2	nWV,nMD,sPA,NJ
Nov 5	Wed	3:20	TYC18020036	11.3	Gehrels	3.7	2	7	s. VA, n.e. NC
Nov 13	Thu	5:07	SAO 118753	8.3	Beagle	7.2	2	2	n. SC, s.e. NC
Nov 14	Fri	2:03	TYC13431865	10.6	Titan	0.1	472	10	N. America
Nov 15	Sat	3:48	SAO 78867	8.6	Saturn	0.0	107m	8	N. America
Nov 15	Sat	4:13	TYC08131835	10.4	Carmen	3.5	6	6	n. SC, s.e. NC
Nov 16	Sun	5:01	TYC02680843	10.9	Dynamene	2.9	5	7	Georgia
Nov 25	Tue	5:43	SAO 78832	8.5	Saturn	0.0	--	8	N.America
Nov 26	Wed	3:55	TYC18720207	11.2	Metcalfia	2.6	9	7	s.Ont.,n.NY
Dec 1	Mon	21:55	TYC13031486	11.4	Miriam	1.5	8	8	s.Que.,s.Ont.

Lunar Grazing Occultations

DATE	Day	EST	Star	Mag	%	alt	CA	Location
Oct 30	Thu	17:51	SAO 188311	9.2	36+	23	5S	Sun-9; Clinton&n.Annapolis,MD
Nov 8	Sat	21:40	SAO 093219	9.3	72E	53	89U	Laytonsv.&Gaithrsbg,MD eclipse
Nov 12	Wed	5:01	125 Tauri	5.2	91-	52	6S	Garrisonville, NY; Sun -18
Nov 15	Sat	1:44	SAO 80070	7.5	69-	48	4N	Harrisburg, PA
Nov 17	Mon	5:10	eta Leonis	3.5	48-	65	10N	Charleston, SC
Nov 19	Wed	8:02	nu Vir	4.0	27-	15	-1N	Charleston, SC
Nov 20	Thu	7:00	gamma Vir	2.8	17-	42	S	Staunton, VA? Sun -0.5

Total Lunar Occultations

DATE	Day	EST	Ph	Star	Mag	%	alt	CA	Sp.	Notes
Nov 3	Mon	19:53	D	ZC 3413	6.1	78+	40	62N	K5	2nd * mag.11 3.5", PA256
Nov 5	Wed	20:17	D	ZC 0095	7.0	92+	46	36S	F8	Maybe close double
Nov 6	Thu	21:17	D	mu Piscium	4.8	97+	53	66S	K4	ZC 0219
Nov 8	Sat	20:06	D	SAO 093210	8.5	0E	35	54U	K2	during total lunar ecl.
Nov 8	Sat	21:18	R	SAO 093210	8.5	40E	49	72U	K2	during partial lunar ecl.
Nov 9	Sun	19:19	R	13 Tauri	5.7	99-	21	87S	B9	double? Term. 17" ZC 531
Nov 9	Sun	19:51	R	14 Tauri	6.1	99-	27	41S	G8	double? Term. 8" ZC 533
Nov 12	Wed	3:11	R	ZC 0842	6.5	91-	73	37S	F5	2nd * mg.8.3,sep.15",275d
Nov 13	Thu	2:30	R	ZC 0994	6.6	85-	75	76N	F5	Maybe close double
Nov 14	Fri	0:52	R	SAO 079316	7.5	77-	49	17S	G2	
Nov 14	Fri	5:39	R	ZC 1131	7.3	76-	66	84S	A2	
Nov 14	Fri	22:08	R	SAO 079980	7.3	69-	9	69N	G8	Azimuth 65 deg.
Nov 15	Sat	1:59	R	SAO 080070	7.5	68-	52	27N	K0	
Nov 16	Sun	4:27	R	ZC 1373	6.5	58-	66	75S	A2	
Nov 17	Mon	4:37	D	eta Leonis	3.5	47-	55	-51S	A0	ZC 1484; close double
Nov 17	Mon	5:49	R	eta Leonis	3.5	47-	66	67S	A0	ZC 1484; close double
Nov 18	Tue	2:53	R	ZC 1586	7.5	37-	27	46N	K0	
Nov 18	Tue	6:11	R	ZC 1598	6.5	36-	59	24N	F5	Sun -8; maybe close dbl.
Nov 20	Thu	5:33	R	SAO 138889	7.2	17-	30	64S	A0	
Nov 20	Thu	6:44	D	gamma Vir	2.7	16-	40	-17S	F0	Sun -3; graze Staunton,VA
Nov 20	Thu	7:19	R	Porrima	2.7	16-	44	41S	F0	Sun +3; =dbl.,1.2",PA247d
Nov 25	Tue	17:14	D	ZC 2601	6.7	6+	8	65S	K4	Sun -6; Az 224; double?
Nov 28	Fri	17:33	D	ZC 3102	7.0	31+	28	63N	A0	Sun -9; close double?
Dec 1	Mon	20:32	D	ZC 3506	6.1	63+	41	62N	K4	maybe close double
Dec 2	Tue	22:22	D	14 Ceti	5.9	73+	38	67S	F5	ZC 0076
Dec 5	Fri	22:46	D	ZC 0413	6.7	94+	64	31N	K0	

Notes about the Titan and Saturn occultations:continued on next page

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Titan and Saturn Occultation Notes

(Continued from page 6)

Nov. 14: Observations of this occultation by Saturn's large Moon would be valuable to learn about Titan's atmosphere, but the small magnitude drop will make it difficult to obtain useful information except with large telescopes. A better occultation of an 8th-mag. star the same night will occur in southern Africa, to which European astronomers are traveling to obtain observations of that event. Both occultations are mentioned in my article on p. 106 of the March issue of *Sky and Telescope*.

Nov. 15, Saturn: The brightness of the rings and of Saturn will make observation of this event (monitoring changes in the star's brightness as it passes behind the rings) quite difficult, but the star should be visible in Cassini's gap, and possibly though the thin inner C ring, with medium-sized telescopes. For the Washington area, the star will disappear at the edge of the A ring at 0:27 a.m. EST (it may flicker as the thin F-ring briefly covers it a minute or so before), then will appear in Cassini's gap at 0:53, and will traverse the C-ring from 1:38 to 2:02 (when it will disappear into the atmosphere of Saturn). It will reappear from behind the edge of Saturn at 5:31, traverse the C-ring from 5:45 to 6:09, appear in Cassini's gap at 6:51, and reappear at the edge of the A- ring at 7:21 (when twilight will be too bright to see it). Diagrams and more information about this occultation are in Alister Ling's article on pages 76 and 77 of the November issue of *Astronomy*.

Nov. 25: The time is for the disappearance at the edge of the A-ring; again an F-ring brief event is possible a couple of minutes before. The star will be in Cassini's gap at 6:20, when twilight will already start to interfere; this occultation will be better seen farther west.

Explanation of codes:
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. On Nov. 8, there will be some occultations during a lunar eclipse, where the "sign" following the % sunlit is "E", indicating that the percent is the percent of the Moon's disk that is NOT covered by the umbra. Cusp Angle is described more fully at the main IOTA Web site - see above. Sp. is the star's spectral type (color), O,B, blue; A,F,white; G,yellow; K,orange; M,N, S,C red

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Dr. David E. Smith

(Continued from page 4)

perimposed over that, a 245-day oscillation with a magnitude of 27 meters. This tracking history was based on the JPL Developmental Ephemeris (DE) 403 Martian ephemeris. The pattern was larger and different when the DE 405 ephemeris was used. There was quite a bit of concern about the range oscillation which could not be explained. Later, however, JPL produced another ephemeris, the Dynamical Ephemeris 410. When the tracking data were reduced with it, the oscillation disappeared. It is not known why the patterns appeared with the 403 and 405 ephemerides and not with the 410.

Dr. Smith concluded with a brief discussion of outflow channels and the nature of the surface of the northern plains. Northern plain craters are hidden by ejecta, but they can be seen with sunlight grazing the surface. The general nature of the surface is rather rough, being covered with "nobbly stuff."

We thank Dr. Smith for his very interesting presentation.

Linhui Sui

(Continued from page 2)

Nanjing Normal University, Nanjing, China, Thesis Title: "Distribution of Transverse Momentum and EMC Effect."

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Professional Experience:
Research Assistant (05/2001 to present), Solar Physics Branch (Code 682), Laboratory for Astronomy and Solar Physics, NASA Goddard Space Flight Center, Greenbelt, MD 20771, Analyzing flare data from spacecraft Ramaty High Energy Solar Spectroscopic Imager (RHESSI).

Research Assistant and Teaching Assistant (09/1999-05/2001), Department of Physics, Catholic University of America, Washington, D.C. Taught University Physics problem sessions and labs on electromagnetism for undergraduate students.

Assistant Professor (07/1995-07/1999), Department of Math and Physics, Nanjing University of Posts and Telecommunications, Nanjing, China. Studied nuclear models to explain nuclear EMC effect. Taught university physics course and labs.

Recent Publications
Sui, L., Holman, G.D., "Evidence for the Formation of a Large-scale Current Sheet in a Solar Flare," ApJ, 2003, 596, 251

Holman, G. D., Sui, L., Schwartz, R. A., Emslie, A. G., "Electron Bremsstrahlung - Hard X-Ray Spectra, Electron Distributions and Energetics in the 2002 July 23 Solar Flare," ApJ, 2003, 595, 97.

Dennis, B. R., Veronig, A, Schwartz, R. A., Sui, L., Tolbert, A. K., and the RHESSI Team, "The Neupert Effect and New RHESSI Measures of the Total Energy in Electrons Accelerated in Solar Flares," Cospar, 2002 (in press)

Sui, L., Holman, G. D., Dennis, B. R., Sam K., Schwartz, R. A., Tolbert K, "Modeling Images and Spectra of a Solar Flares Observed by RHESSI on Feb 20, 2002," Solar Physics, 2002, 210, 245

Getting to the NCA Monthly Meeting

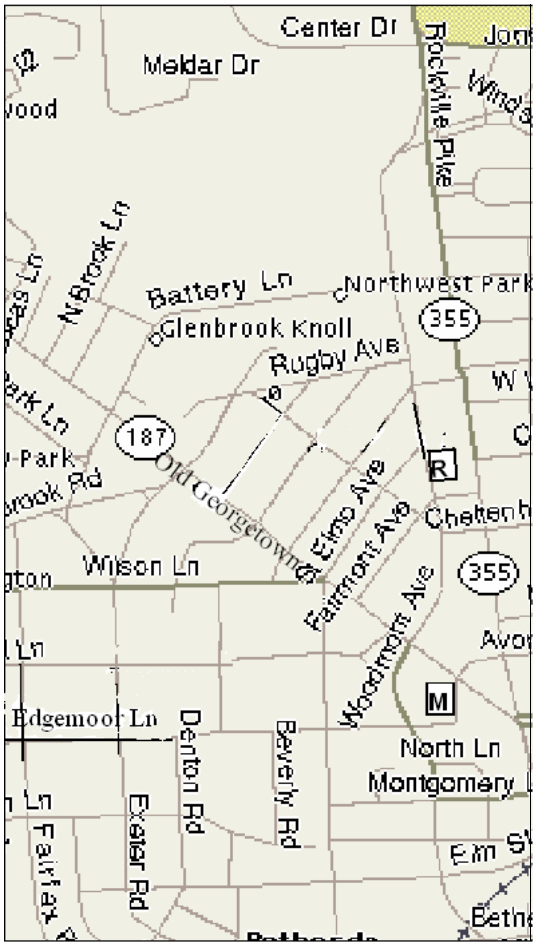
Saturday, November 1

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

Linhui Sui will present the featured talk for the November 1 meeting of National Capital Astronomers, "Solar Flares and RHESSI."

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

The Athenian Plaka Restaurant
7833 Woodmont Ave.
Bethesda, MD
301/986-1337



Directions to the Meeting

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

Because Woodmont Ave. is one-way Southbound coming out of the parking garage, we are offering you what may appear to be circuitous, but is actually a fairly efficient way of getting to the restaurant after the NCA meeting

1. Following the meeting, turn left out of the parking garage. If you are on Woodmont Ave., turn left at the next intersection, which is Edgemoor Lane.
2. Continue on Edgemoor Lane to Old Georgetown Road.
3. Turn left on Old Georgetown Rd. and then turn right on Woodmont Ave.
4. Continue North on Woodmont Ave, passing Cheltenham Ave.
5. Continue North on Woodmont Ave. for another 1.5 blocks to the restaurant, which is on the right side of Woodmont Ave.

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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".

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