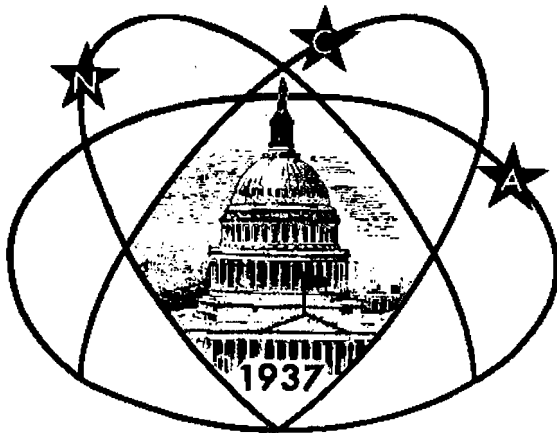


Star



Dust

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Exploring Interstellar Space with Pickup Ions, A Talk by George Gloeckler

submitted by Nancy Byrd

At the Saturday, February, 1999 meeting of National Capital Astronomers (NCA), Dr. George Gloeckler, a physicist at the University of Maryland, will introduce us to a new and fascinating way to study the nearby galactic neighborhood. Dr. Gloeckler has provided the following abstract of his talk, entitled "Exploring Interstellar Space with Pickup Ions"

Abstract: The local interstellar cloud surrounds our solar system. Neu-

tral gas from this cloud penetrates deep into the sphere of influence of the Sun—the heliosphere, where solar radiation ionizes some atoms of this gas to form interstellar "pickup ions" (IPIs). Recent advances in instruments on board deep space missions traveling beyond the orbit of Jupiter finally made it possible to detect and record the characteristics of these elusive IPIs. Thus, we now have a new window to look at the physical and chemical properties of the nearby gal-

axy using IPIs as a direct sample of matter from this distant region. Current and future measurements of interstellar pickup ions address questions on the physical characteristics and nucleosynthetic status of the present-day galaxy. Such studies will help us to understand the origin of our solar system, our galaxy, stars, and the nature and destiny of the Universe.

We look forward to a delightful excursion into nearby interstellar space.

Solar Variation and Climate: A Science in Flux Review of Kenneth H. Schatten's Lecture

by Nancy Byrd

On Saturday, January 9, 1999, Dr. Kenneth Schatten spoke to National Capital Astronomers (NCA) on the subject of solar variation and climate change. He began his talk with an introduction and history of known solar influences (especially on climate), continued with an overview of "the climate change problem", and then discussed his perception of the status of current knowledge of solar variation and its effect on climate. In his talk he drew material primarily from his recent (1997) book, coauthored with Douglas V. Hoyt, *The Role of the Sun in Climate Change*, and from the work of Judith Lean, who has also been an NCA speaker.

The speaker's introduction and brief history of the study of solar variability, included a chart of sunspot data showing the familiar "eleven year" cycles of maxima and minima of sunspot counts over the last several hundred years (since the Maunder minimum). He pointed out that these cycles are only approximately regular in either magnitude or duration. Switching to another view, he showed carbon-14 data plotted with a history of winter severity in Paris and London, as well as sunspot data, the combined data extending over almost a millennium. Carbon-14 is produced by reaction of cosmic rays (mostly from the sun) with atmospheric nitrogen and is a

good surrogate for sunspot data.

Dr. Schatten pointed out the Maunder minimum (later 17th century) and the earlier Spörer minimum. During these periods, solar activity (sunspots, flares, etc.) virtually ceased. These were exceptionally cold periods in the northern hemisphere. He also noted the period of high solar activity during the 11th and 12th centuries, when the earth was particularly warm, sufficiently warm, for the Vikings to occupy parts of Greenland which are now frozen over. The history of the study of solar variability has seen many attempts to correlate solar activity with Earth's weather. So-

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Calendar of Monthly Events

The Public is Welcome!

NCA Home Page: <http://myhouse.com/NCA/home.htm>

Mondays, February 1, 8, 15, and 22, 7:30 PM - Public nights at U.S. Naval Observatory (USNO), in Northwest Washington, D.C. (off Massachusetts Avenue). Includes orientation on USNO's mission, viewing of operating atomic clocks, and glimpses through the finest optical telescopes in the Washington-Baltimore region. Held regardless of cloud cover. Information: USNO Public Affairs Office, 202/762-1438. Home page: <http://www.usno.navy.mil>.

Fridays, February 5, 12, and 19, 8:30 PM - Open nights with NCA's Celestron C-14 telescope at Ridgeview Observatory; near Alexandria, Virginia; 6007 Ridgeview Drive (off Franconia Road between Telegraph Road and Rose Hill Drive). Information: Bob Bolster, 703/960-9126. Call before 6:00 PM.

Fridays, February 5, 12, 19, and 26, 7:30 PM - Telescope making classes at American University, McKinley Hall Basement. Information: Jerry Schnall, 202/362-8872.

Saturday, February 6, 5:30 PM - Dinner with the speaker, and NCA members at Faryab, 4917 Cordell

Ave., Bethesda, MD. See map and directions on back page.

Saturday, February 6, 7:30 PM - NCA meeting, at Lipsett Auditorium in Building 10 at NIH, will feature George Gloeckler, speaking on "Exploring Interstellar Space with Pickup Ions" See map and directions on back page.

Tuesdays, Closed - Telescope making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Classes from November 10th through April will be cancelled due to construction and will resume in May. Information: Jerry Schnall, 202/362-8872.

See page 4 for more Washington area astronomical events. Other events too numerous to list in *Star Dust* are listed in the publications, *Sky & Telescope*, the *Astronomical Calendar 1998*, the *Observer's Handbook 1998*. NCA members can purchase all these (and much more) at a discount. Information can also be found in numerous software packages, and links available on the NCA Home Page (see above for address). To join NCA, use the membership application on page 5.

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lar variation correlations with various phenomena have been inferred, including for example, the rise and fall of Lake Victoria, a correlation which did not hold up over time.

Dr. Schatten followed with a "2 minute course" in solar activity. He showed a diagram with concentric circles, where the innermost circle represented the fusion zone. This was ringed by a circle for the radiative zone, where the energy from fusion is transported by radiation. This circle was in turn ringed by another circle, representing an outer layer, the convective zone. This layer, cooler and less dense than the inner zones, is highly turbulent. Here you get the buildup of immense magnetic fields which actually inhibit convective transport to the surface, and are responsible for the sunspots, flares, and

other features which we see. Our speaker emphasized that we really do not fully understand how the solar dynamo works; nor do we understand the behavior of its manifestations. Said Dr. Schatten, "It's not a simple eleven year cycle, like everyone would like to believe."

There are two basic types of solar influences affecting the earth: radiation at different wavelengths, delivering about 1400 watts to each square meter of the Earth's surface; and particles (solar wind, flares, etc.), delivering less than .01 watts per square meter of the Earth's surface. This is a puzzle to the climate modelers, because there does not seem to be enough energy in the solar variations to cause the observed climate changes. We have now observed that the Sun radiates more during periods of high solar activity even though the sunspots appear darker at visible wave-

lengths, because the total energy is greater when the energy from other wavelengths are included.

After showing several other correlations between solar variability and other phenomena, the speaker introduced the climate problem: We know that, in the long run, the amount of radiation falling on the Earth will equal the radiation leaving it. But what does this tell us about what the average temperature of the Earth will be at any particular time? This, Dr. Schatten submits, is an example of an inverse problem. An inverse problem, a multivariate problem, may not have a unique solution, and at best will be very difficult to solve. He points out that many climate modelers still believe that their models have solved the problem. However, often their solutions are indeterminate. (Reviewer's note - a quick search on the

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internet will illustrate Dr. Schatten's contention.)

A problem that Dr. Schatten showcased is the "faint young Sun problem." This is an inverse correlation between two plots: the low luminosity of the infant Sun increasing steadily to a much higher luminosity and a temperature plot of the initially quite warm Earth cooling to temperatures similar to those of today. One would expect these plots to be positively correlated. Dr. Schatten made no attempt to address this problem. Instead, he raised the question as to why the Earth had not frozen over long ago, and then answered the question by

suggesting that greenhouse effect accounts for the difference between its albedo temperature (-5°C) and its actual temperature. He described the Earth's greenhouse effect as being "just right" when comparing it to that of Venus or Mars. (In fact, during the late Precambrian, the Earth did suffer its severest ice age, one affecting every continent. We may not have been far removed from that natural frozen state of which he spoke. As to the "faint young Sun problem," many possible explanations for it come to mind, like increased greenhouse effect, or increased radioactivity of the early Earth, leftover heat of gravitational contraction, etc. Some of these

were mentioned during the question and answer period following Dr. Schatten's talk.)

Finally, he reviewed those factors that we know affect climate, and observed that solar variability may not account for all the climate change that we have observed in this century. He asked, "What is the relative importance of the factors with respect to one another?" "The answer," he said, "is important, because it will tell us whether or how much we need to worry about anthropogenic causes, such as the sudden release of carbon into the atmosphere, from the lithosphere, where it had resided for a billion years." ○

Occultations in the Mid-Atlantic States Region, 1999 February

by David Dunham

Total Lunar Occultations

DATE	Day	EST	Star	Mag	%	alt	CA	Notes
						o		
Feb 1	Mon	19:04	R Regulus	1.3	98-	3	62N	Azimuth 77 deg. (E-N-W)
Feb 6	Sat	3:59	R 80 Vir	5.7	69-	45	57N	
Feb 7	Sun	0:47	R ZC 2043	6.5	61-	12	57S	
Feb 21	Sun	20:11	D ZC 0462	6.0	37+	42	73S	
Feb 22	Mon	19:03	D ZC 0608	6.0	49+	55	57S	mag.2 8.8, sep.3.8", PA 221deg
Feb 23	Tue	0:10	D ZC 0626	6.3	50+	10	39S	Azimuth 282 deg. (west)
Feb 25	Thu	1:14	D 71 Orionis	5.2	73+	21	33N	Graze in New Jersey; exped.
Feb 27	Sat	1:38	D zeta Cnc	5.0	90+	37	57N	Triple, mags. 5.6, 6.0, & 6.2
Feb 28	Sun	18:46	D 23 Leonis	6.5	98+	24	70N	Sun alt. -10 deg., o.k.
Feb 28	Sun	23:21	D nu Leonis	5.3	99+	63	90N	Possible close double

Planned Grazing Occultation Expeditions

DATE	Day	EST	Star	Mag	%	alt	CA	Notes
						o		
Feb 7	Sun	0:44	ZC 2047	6.6	62-	11	5S	Richmond & Williamsburg, VA
Feb 25	Thu	1:26	71 Orionis	5.2	73+	18	5N	New Brunswick, NJ

Notes: Feb. 7: NCA's meeting night; need to leave by 9:30 pm for this graze.

Asteroidal Appulses, 1999 February

DATE	Day	EST	Star	Mag	Asteroid	dmag	dur. s	ap in.	Occultation Location
Feb 14	Sun	20:22	GSC02160539	10.3	Alauda	2.0	14	6	Que., w. Ont.
Feb 18	Thu	1:20	ACT13910781	9.8	Frigga	2.5	9	6	n.w.PA,n.NJ, NYC
Feb 20	Sat	2:04	TAC+19d2841	10.1	Harmonia	0.7	10	8	OH,WV, cen.&se VA

Phone the IOTA occultation line, 301-474-4945, for updates and details, or check IOTA's Web site at <http://www.sky.net/~robinson/iotandx.htm>. For asteroidal occultations, finder charts can be found at <http://members.home.net/dega/astchart.htm>.

National Capital Area Astronomical Events

Free Lectures at the Einstein Planetarium and Other Daily Events
National Air & Space Museum

202/357-1550, 202/357-1686, or 202/357-1505 (TTY)

Home page: <http://www.nasm.edu>

Other Area Astronomical Events

Department of Terrestrial Magnetism, Carnegie Institute of Washington —

Seminars are all at 11:00 am and are generally held on Wednesdays (unless otherwise noted by **) in the Seminar Room of the Main Building

“Brown Dwarfs: From Mythical to Ubiquitous”, Speaker, James Liebert, Feb. 3.

“The BIMA Survey of Molecular Gas in Nearby Spiral Galaxies”, Speaker, Michael Regan, Feb. 10.

“Seismic Imaging of Magmatism: Evidence for Lithosphere Control”, Speaker, Feb. 17.

Maryland Space Grant Observatory
— Open House every Friday evening (weather permitting), Bloomberg Center of Physics and Astronomy, Johns Hopkins University, Baltimore, MD. Information: 401/516-6525 or check their web site at www.pha.jhu.edu/facilities/observatory/telescope.html.

Montgomery College's Planetarium, Takoma Park — “African Skies”, Feb. 20, 7:00 PM.

NASA Goddard Scientific Colloquia
— All colloquia will be held in the Building 3 Auditorium at 3:30 pm.

“The Kuiper Belt”, Speaker, David Jewitt, Feb. 5.

“The ‘Old Faithful’ Black Hole and Other Discoveries of the Rossi X-Ray

Timing Explorer”, Speaker, Jean Swank, Feb. 12.

“Water Ice on the Moon and Other Discoveries from Lunar Prospector”, Speaker, William Feldman, Feb. 19.

“The Power of Nothing: Zeroing on the Casimir Effect”, Speaker, Steve Lamoreaux, Feb. 26.

US Naval Observatory Colloquia — All Colloquia will take place in Bldg. 52, Room 300, with coffee and cookies at 10:00, talk at 10:30, and lunch at 12:00

“Future of Origins Program”, Speaker Dr. Harley Thronson, Feb. 5.

Astronomical Calendars

The 1999 Astronomical Calendars are available. You can pick them up at the February meeting. If you are unable to attend the meeting, contact Wayne Warren at 301/474-0814.

Newsletter Deadline for March *Star Dust*, February 15, 1999

Send Submissions to Alisa & Gary Joaquin, at ajglj@erols.com or fax submissions to 703/658-2233. Text must be in ASCII and graphics submitted must be in TIFF, GIF, or JPEG. Thank you.

Meteor Showers

Major Activity		
Radiant	Duration	Maximum
None		

Minor Activity		
Radiant	Duration	Maximum
Aurigids	Jan. 31-Feb. 23	Feb. 5-10
Alpha Centaurids	Feb. 2-25	Feb. 8/9
Beta Centaurids	Feb. 2-25	Feb. 8/9
Delta Leonids	Feb. 5-Mar. 19	Feb. 22/23
Sigma Leonids	Feb. 9-Mar. 13	Feb. 25/26

Daylight Activity		
Radiant	Duration	Maximum
Capricornids-Sagittarids	Jan. 13-Feb. 28	Jan. 30-Feb. 3
Chi Capricornids	Jan. 29-Feb. 28	Feb. 13/14



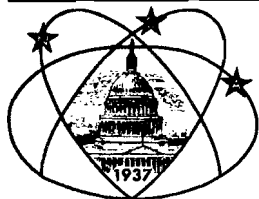
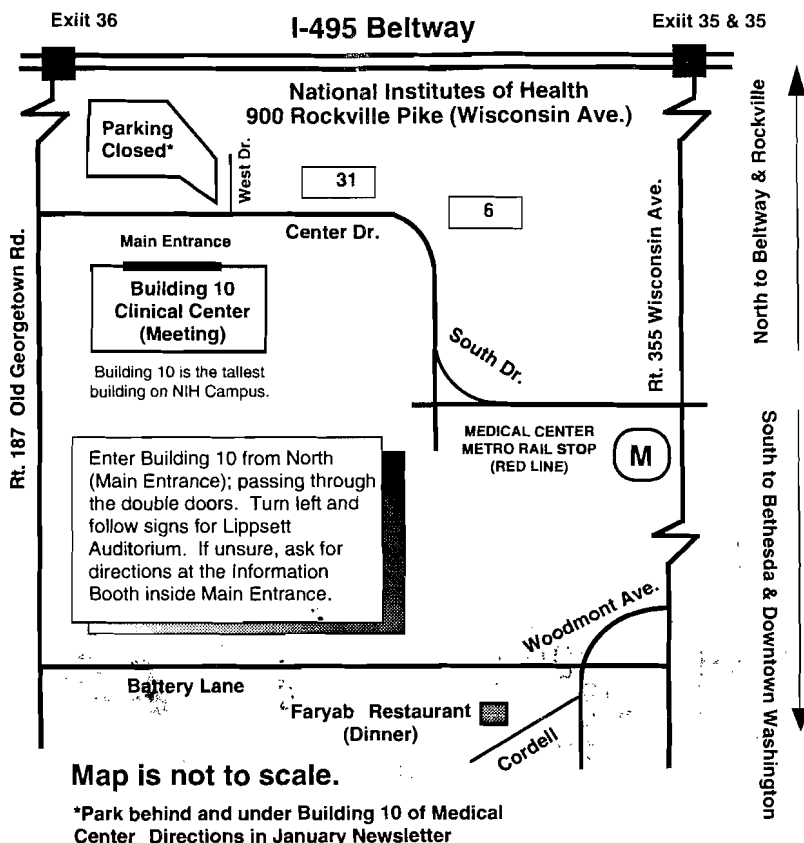
Don't throw this newsletter away. If you're finished with it, pass it on to someone else to read or recycle it. It's right for astronomy and the environment.

Getting to the NCA Monthly Meeting

Metrorail Riders - From Medical Center Metro Station: Walk down the hill, pass the bus stops and turn right at the anchor onto Center Drive. Continue uphill to Building 10, the tallest building on campus (walking time about 10 minutes). Also, the J2 bus line connects the Bethesda (7:16 PM) and NIH (7:23 PM) Metro stops with Building 10 (7:25 PM).

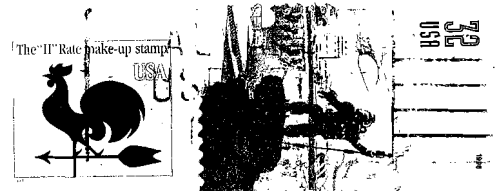
To Faryab Restaurant - Take Wisconsin Avenue toward Bethesda and head right onto Woodmont. Follow Woodmont to Cordell Avenue (2 blocks south of Battery). The restaurant is at 4917 Cordell Avenue (301/951-3484) near Woodmont. There are parking garages nearby. Seats are not guaranteed after 5:30 PM.

Star Dust is published ten times yearly (September through June) by the National Capital Astronomers, Inc. (NCA), a nonprofit, astronomical organization serving the entire National Capital region, and beyond. NCA is the astronomy affiliate of the Washington Academy of Sciences and the National Capital region's representative of the International Dark-Sky Association. President: Andrew Seacord, 301/805-9741. Deadline for *Star Dust* is the 15th of the preceding month. Editors: Alisa & Gary Joaquin, 4910 Schuyler Dr., Annandale, VA 22003, 703/750-1636, E-mail: ajglj@erols.com. Editorial Advisor: Nancy Byrd *Star Dust* © 1999, *Star Dust* may be reproduced with credit to National Capital Astronomers, Inc.



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