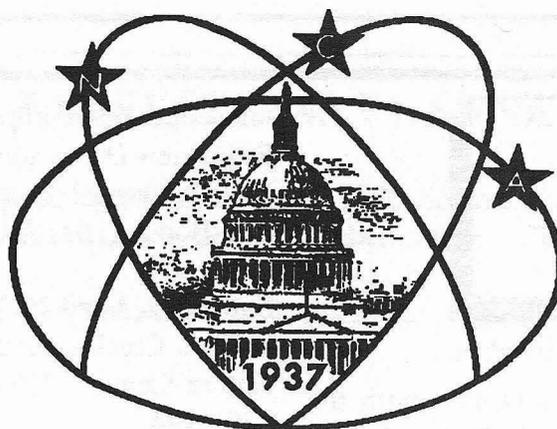


Star



Dust

National Capital Astronomers, Inc.

Washington, DC (301) 320-3621

Volume L, Number 98

April 1992

ISSN 0898-7548

James Zimbelman to Talk On The Geology of Mars

by John Graham

The speaker at the next meeting of National Capital Astronomers on April 4, 1992 will be Dr. James R. Zimbelman of the National Air and Space Museum. The subject of his talk will be "The Geology of Mars". The time and place will again be 7:30 pm at the National Institutes of Health (the Bunim Room at the Clinical Center, Floor 9, Building 10).

Dr. Zimbelman was born in Jamestown, North Dakota and obtained his first degrees at Northwest Nazarene College, Nampa, Idaho and at the University of California at Los Angeles. He obtained his PhD at Arizona State University in 1984 submitting a dissertation which relates directly to the subject of his talk to us. Before coming to Washington, he was a staff scientist at the Lunar and Planetary Institute in Houston, Texas. He is currently a geologist in the Center for Earth and Planetary Sciences at the National Air and Space Museum where his scientific work centers on the geological mapping of Mars. He is also involved in a study of stabilized dunes in the Mojave Desert of California as part of a departmental effort to monitor global change. Dr. Zimbelman serves as the

curator for the "Magellan" display at the museum and lectures for the Resident Associate Program and the National Associate Program of the Smithsonian Institution.

This promises to be a most exciting and informative talk which will remind us of how much we have learned about the red planet over the last 20 years thanks to the planetary space probes and the development of new technology for instrumentation. We shall be hearing it from a speaker who has had a long-term fascination for the subject of planetary geology and for Mars in particular.

IDA Moving Forward

Dr. David Crawford, Executive Director of the International Dark Sky Association (IDA), writes that the association has nearly 900 members from 47 states, the District of Columbia, and from 34 other countries. The organization has been very successful in developing awareness of the harmful effects of light pollution but needs continued growth to pursue its ambitious program. The address is - International Dark Sky Association, 3545 N. Stewart, Tucson AZ 85716.

April Calendar

The Public is Welcome!

Saturday, April 4, 5:30 PM - Dinner with the speaker at Frascati's Restaurant in Bethesda before the monthly meeting. Reservations are for 5:30 Sharp!

Saturday, April 4, 7:30PM - James Zimbleman, (National Air and Space Museum) "Geology of Mars." Meeting will be held in the Bunim Room at the National Institutes of Health. For directions refer to map and description on inside back page.

Tuesday, April 7, 14, 21, 28, 7:30 PM - Telescope making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 202/362-8872.

Friday, April 3, 10, 17, 24, 7:30 PM - Telescope making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 202/362-8872.

Friday, April 10, 17, 24, 9:00 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 at (703) 960-9126.

Saturday, April 25, 7:30 PM - "Exploring the Sky" at Rock Creek Park on Glover Road, NW, near the Nature Center. Information: John Lohman, 703/820-4194.

Monday, 13 April and Saturday, 18 April, 7:00 PM - "Astronomy in the Summer Time: The Origins of Astronomy, the Religion that Became a Science"- public planetarium program at Montgomery College Planetarium at 7600 Takoma Avenue (Takoma and Fenton Street). Information: Dr. Harold Williams, 301/650-1463 (office), 301/942-1014 (home).

Next Month:

Saturday, May 2, 7:30 PM - David Williams (Carnegie Institution of Washington) "The Lithosphere of Venus."

Saturday, May 23 - Exploring the Sky

Saturday, May 30 - Open House and Star Party, Hopewell Observatory.

Angular Momentum Transfer Necessary for Stars to Form

(Review of the March Colloquium Lecture)

by the speaker, Harold Williams

Cold molecular clouds must first form out of the hot interstellar matter for material to collapse under the force of gravity to form stars; this process gives rise to the seeming paradox of cold clouds forming hot stars. These large cold clouds have a net rotation. Just the angular momentum caused by differential galactic rotation would be enough to make the collapsing clouds spin faster than the speed of light if the entire cloud collapsed to form a star. This means that most of the angular momentum of the protostellar cloud must be transferred outward as some of the

mass falls in to form the star. Some matter must flow out so that other matter can fall in. In our own solar system most of the angular momentum is in the planets, but most of the mass is in the sun. The fact that the ecliptic and the galactic planes are not even closely aligned, of course, means that there are sources of initial rotation in collapsing cold dark clouds besides differential galactic rotation. At the March 7 meeting of the National Capital Astronomers, Harold Williams described one of the ways that angular

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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 (EDT)	Place	Star Mag.	Delta Mag.	Name Aper.	Min.
<i>Asteroidal:</i>						
Apr. 9	6:19	Ohio*	11.4	1.1	(230) Athamantis	15 cm
Apr. 13	4:57	Mexico*	7.0	5.6	(184) Dejepeje	3 cm
Apr. 17	23:53	Texas*	9.0	1.9	(44) Nysa	5 cm

*Appulse to be observed for possible satellites or path shift. Observers should obtain a finder chart from Dunham or IOTA. Finder charts for Athamantis and Nysa can be found on p. 430 of the April Sky & Telescope.

Astronomy and Personal Computers

by Joan Bixby Dunham

Interpolation and Extrapolation

Interpolation and extrapolation are techniques of obtaining from a table of values of a function for one set of times, the values at other times. When interpolating, the tabulated values are given at times both larger and smaller than the desired time. Extrapolating is going beyond the tabulated values, so all of their times are either larger or smaller than the time of interest. Extrapolation can be risky, but if the time of interest is not far from the tabulated values, it can be useful.

Examples of when interpolation is used in astronomy would include interpolating positions of solar system objects at specific times from the tables in the *Astronomical Almanac*, or interpolating an asteroid position from an IAU card with a table of predicted positions. Examples of interpolation for different techniques are given in Appendix K of the *Astronomical Almanac*, and in Jean Meeus' book, *Astronomical Algorithms*. There are examples of interpolation and discussions of various methods in

many numerical methods textbooks, such as *Numerical Recipes*, by Press, et. al. and (my favorite book title) *Numerical Methods that Work*, by Acton. The numerical methods texts, however, usually do not have examples specific to astronomy. Also, the Royal Greenwich Observatory published a pamphlet on *Interpolation and Allied Tables*, which discusses extrapolation as well, and a second on *Subtabulation*.

Interpolation and extrapolation methods are relatively easy to program, even on a programmable calculator. The main difficulty is in understanding the notation. Most techniques are based on differences, so there needs to be a way to indicate the values of the function at different times (and those times), the first differences (differences between adjacent functions in the table), the second differences (differences between adjacent first differences), and so on. This can quickly lead to an intimidating set of negative and positive subscripts, subscripts in

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momentum can be transferred outward while most of the mass moves inward, avoiding the angular momentum problem.

Harold Williams, NCA member, Planetarium Director at Montgomery College of Takoma Park, and astronomy, mathematics and sometimes physics teacher, began the talk by showing some beautiful color-correct pictures of star-forming regions taken by David Malin. The most beautiful pictures ever taken of objects within our Galaxy are of star-forming regions. In these pictures the red nebula are generally caused by hydrogen and helium gas fluorescing red after absorbing ultraviolet light from hot, newly formed O and B stars. The dark regions within the red are often dense, cold, dusty, high-density clouds. The blue clouds are dust, which reflects foreground blue starlight better than red starlight, because dust scatters blue better than red light. (This is why cigarette smoke and oily car exhaust smoke is blue gray and why the sky itself is blue.) On the scales revealed in these pictures, with many long filaments, magnetic fields are evidently responsible for much of the support of these clouds against gravity's inward pull. In the dark, cold, high-density regions the fractional ionization is very low, since

light cannot penetrate these opaque clouds, so magnetic fields lose their grip. It is in such a regime that gravitational torques redistribute angular momentum when rotation reaches a point of non axisymmetric instability. Some of the latest theoretical hydrodynamic calculations of star formation, in which only gravity, gas pressure, and mass motion are important, were shown. The hydrodynamic calculations shown were done by Joel Tohline, Richard Durisen, Sheldon Yang, Alan Boss, and the speaker. Two videos, one made by Tohline and Williams and another by Durisen and Yang, demonstrated star formation in computer simulated animations.

Stephanie Williams, NCA junior member and Harold Williams' daughter, sang "The Elemental Composition of the Universe" (lyrics by Harold and Barbara Williams):

"Twinkle, Twinkle, little star.
Yes I know just what you are.
You're three-quarters hydrogen,
And one-quarter helium
With trace amounts of other things
From pink sea shells, to diamond rings."

to the delight of all, especially her mother and me.

Letters to the Editor

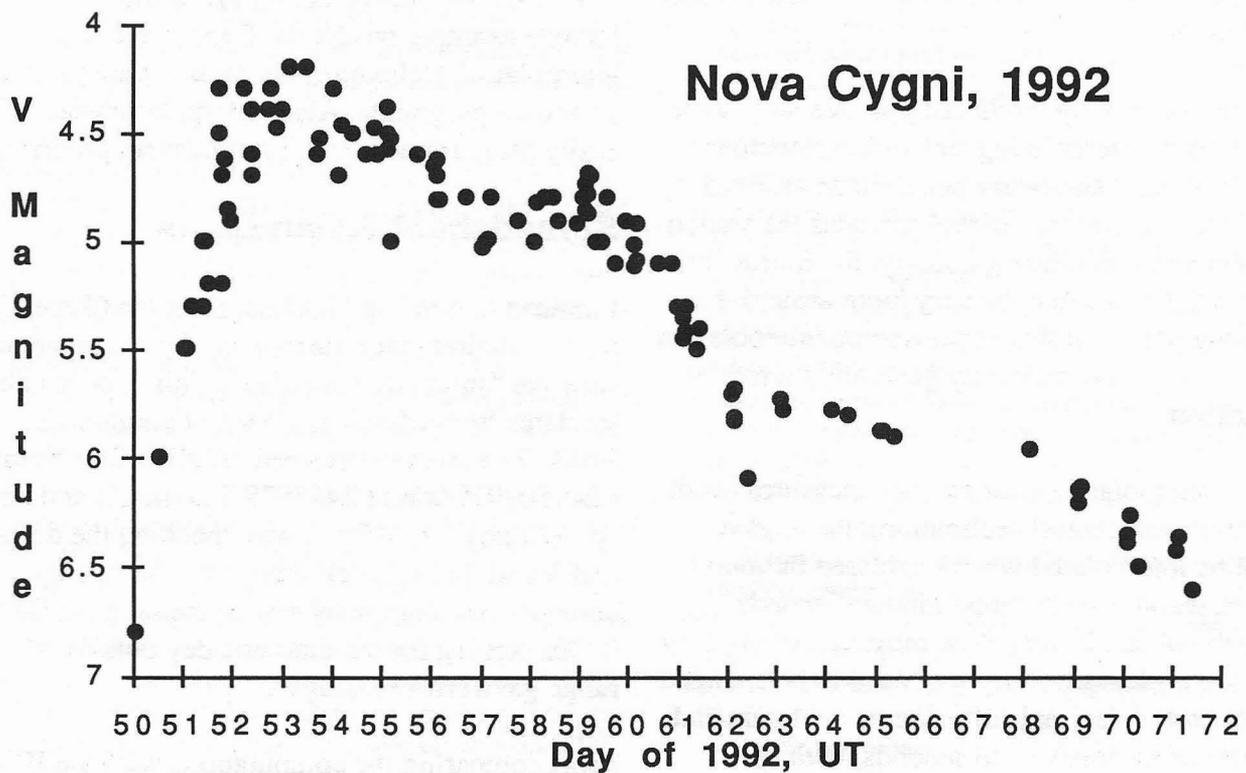
"Dark matter" and "matter that is dark"

...After reading the review, I began to wonder if some members might have a misconception about the "dark matter" in galaxies that I discussed in my talk. This dark matter is a form of mass whose presence we can deduce only through its gravitational effect on matter that we can see; it has not been detected directly. Dark matter has come to be a technical term referring to the unseen matter that we believe is present in galaxies (and clusters of galaxies) because of our observations of the motions of stars and gas; dark matter does not refer to ordinary matter that happens to be dark at visible wavelengths.

Therefore, although it is correct to say that we know galaxies contain some types of matter that are dark

in visible light, because we can see the matter silhouetted against luminous regions in galaxies, it is technically incorrect to call this matter (which is ordinary dust): "dark matter" in the sense that I spoke during my talk. Dust in galaxies is present only in relatively small quantities, too small to be causing the fast rotation observed in the outer regions of galaxies. In fact, dust is actually luminous at infrared wavelengths, and thus is not really dark at all. Similarly, the band of dark material surrounding the galaxy Cen A (NGC 5128), is a band of dust, not a band of "dark matter."

CONTINUED, Next Page



Data for Nova Cygni 1992, contributed by Jeff Guerber, were taken from IAU Circulars through 5476 (through March 18), and from observations of George Gliba of the Goddard Astronomy Club. Jeff estimates that the nova is dimming at about 0.122 magnitude per day.

CONTINUED from previous Page

I hope that this explanation clarifies (rather than obscures!) the semantic difference between “matter that is dark” and “dark matter.” Please express my thanks once again to all the members of the National Capital Astronomers for inviting me to their meeting and for the hospitality and interest they exhibited during my visit.

Best wishes,
Penny D. Sackett

Editor's note: Thankyou for pointing out and removing confusion caused by a truly serious error.

Astronomical Abstracts

by John Lohman

Science, v. 255, 28 February 1992, pp. 1067-1068:
"Giving the Galaxies a History"

Observations over the past decade suggest that the population of the universe has changed markedly as recently as the past two billion years. A whole class of faint “blue galaxies” was common then, but has disappeared entirely in today's universe. The earlier universe had from two to thirty times as many galaxies as exist today.

Science, v. 255, 8 February 1992, pp. 1118-1121:
“Rhenium-Osmium Isotope Constraints on the Age of Iron Meteorites”

Data for the IIA iron meteorites indicate that they are 4500 ± 31 Ma in age. Other iron meteorites may have originated from bodies that cooled significantly later than the parent body of the IIA irons.

halves, and superscripts to indicate which difference (1st, 2nd, 3rd).

The interpolation methods can fail. We need to be careful when interpolating right ascension and declination near stationary points in an asteroid orbit. If the tabulation interval includes the stationary point and it is moving quickly, the fourth and higher differences may be very large around the stationary point. In that region, some interpolation schemes may have difficulty generating a reasonable answer.

Also, if interpolating over angular measures (such as right ascension and declination), the angles cannot be interpolated when expressed in hours/minutes/seconds or degrees/minutes/seconds unless the object is very slow moving, so that only the seconds change. They will need to be changed to degrees and decimals of a degree (or hours and decimals of an hour), or to seconds, with care taken to handle cases where the angle rolls over 360 degrees (24 hours). When the angle changes from 360 degrees to 0 (or vice versa), 360 degrees should be added to the small angles or subtracted from the large ones, whichever is most convenient.

The books by Meeus and by Press and co-authors include example programs if you want to try interpolation techniques but do not want to write your own programs. Also, interpolators can be easily programmed with a spreadsheet program.

Spreadsheet Julian Dates

I noticed that my spreadsheet program (SuperCalc) had a function that returns what the documentation calls the "Julian date number". This is only valid for dates from March 1, 1900 to February 28, 2100. The number returned is Julian Day Number - 2415079.5, where 2415079.5 is the JD at 0 hours on February 28, 1900. I was checking the dates and found that it is definitely true that it only computes the date numbers for the range 1900 to 2100. Asking for the date of a day outside of this range gave error messages.

I was comparing the computations with the JD as given in the Astronomical Almanac. I found an error of one day. It was a minute before I realized that my computer clock does not compute the dates correctly for leap years, and was ahead by one day.

EXCERPTS FROM THE IAU CIRCULARS

by R.N. Bolster

1. February 7 - W. Liller, Vina del Mar, Chile and P. Camilleri, Cobram, Australia, independently discovered photographically a nova of 7th magnitude in Sagittarius.
2. February 19 - Peter Collins, Boulder, Colorado, discovered a nova of 6th magnitude in Cygnus. Located at R.A.= 20h 30m.5 Dec.= +52d 38', the nova brightened to magnitude 4.2 on the 22nd. IUE spectra on the 21st showed Mg II and Al III emission lines with absorption troughs indicating expansion velocities of 2800 km/s. The flux shortward of 200 nm had dimmed by a magnitude since the previous day, then regained its brightness over the next week. A diameter of 0".0036 was measured with the 20-m NRL interferometer at Mount Wilson on the 28th.
3. March 7 - Gilmore and Kilmartin, Mount John University, found that comet Bradfield (1992b) had faded to a faint patch 3' across visible only on long exposures with the 60-cm reflector.

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 as-

tronomy-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.

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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

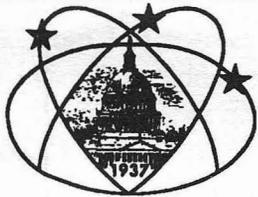
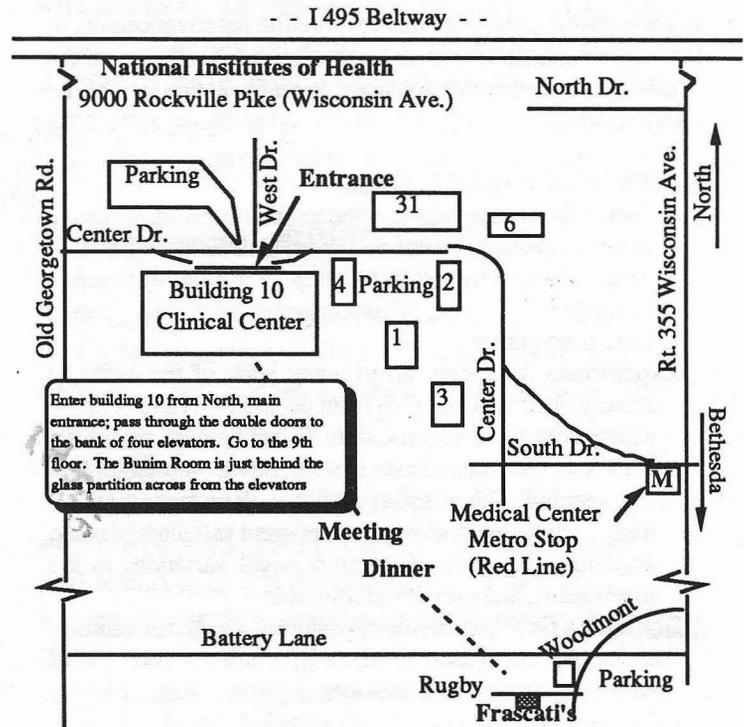
Thank you, and welcome!

Getting to the NCA Monthly Meeting

•Subway Riders - 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.

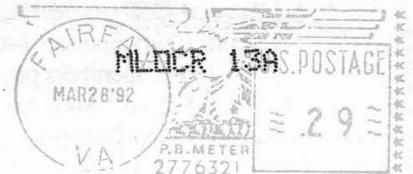
•To Frascati's: Proceed down Wisconsin Avenue toward Bethesda. Bear right onto Woodmont (or the next right onto Battery Lane), follow Woodmont across Battery, take a right onto Rugby and park. The restaurant will not guarantee seats after 5:30.

Stardust is published eleven times yearly by National Capital Astronomers, Inc. (NCA), a non-profit, public-service corporation for advancement of astronomy and related sciences through lectures, expeditions, discussion groups, conferences, tours, classes, public programs, and publications. NCA is an affiliate of the Washington Academy of Sciences. President Daniel Costanzo. Deadline for *Stardust* is the 15th of the preceding month. Editor, Nancy Byrd (703)978-3440 NCA Phone No. 301-320-3621



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