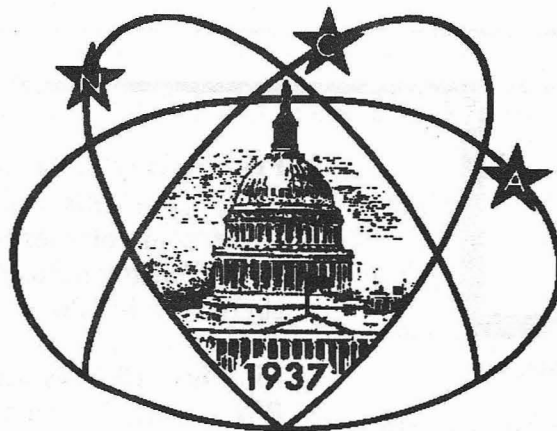


Star



Dust

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David Williams To Speak On The Tectonics of Venus

by John Graham

The next meeting of National Capital Astronomers will be on May 2, 1992 at 7:30 PM at the National Institutes of Health (the Bunim Room at the Clinical Center on Floor 9, Building 10). On this occasion we shall be addressed by Dr. David Williams from the Department of Terrestrial Magnetism of the Carnegie Institution of Washington on the subject "The Tectonics of Venus".

The outer shell of the Earth is divided into about ten large rigid plates which are in slow but distinct motion relative to one another, with deformation of these plates largely confined to the vicinity of the boundaries between them. Their movement represents the mechanism by which the Earth transmits stress and loses internal heat. The recent results from the radar images of the surface of Venus from the Magellan spacecraft show conclusively that this concept of plate tectonics does not apply to Venus. In fact, Venus shows a sweeping distribution of surface deformation at all scales. This naturally brings to mind two basic questions: why doesn't Venus, a planet similar in size to the Earth, have plate tectonics and how

does Venus transmit stress and expel heat from its interior? The ability to answer these questions will depend to a large part on understanding how the surface of the Earth interacts with its interior and what differences between Venus and Earth could be causing differences in this interaction.

Dr. Williams was born and grew up in Commack, New York. He obtained his first degree at the State University of New York at Binghamton. Following this, he went to the University of California at Los Angeles for graduate studies where he wrote a dissertation dealing with tectonics and gravity in Venus. After a stay at Arizona State University, he came to Washington in July 1991 where he continues his interest in Venus tectonics and also collaborates with Dr. George Wetherill on models of early planet formation. He is married to Dr. Elizabeth Myhill who is also at DTM working on problems of star formation with Dr. Alan Boss, one of our speakers last year. We look forward to an interesting talk from Dr. Williams about our neighbor planet, which still presents us with many puzzles.

May Calendar

The Public is Welcome!

Saturday, May 2, 5:30 PM - Dinner with the speaker at Frascati's Restaurant in Bethesda before the monthly meeting. Reservations are for 5:30 Sharp!

Saturday, May 2, 7:30 PM - NCA monthly colloquium featuring David Williams (Carnegie Institution of Washington) on "The Tectonics of Venus." 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, May 5, 12, 19, 26, 7:30 PM - Telescope making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 202/362-8872.

Friday, May 1, 8, 15, 29, 7:30 PM - Telescope making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 202/362-8872.

Friday, May 8, 22, 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 at (703) 960-9126.

Monday, 18 May and Saturday, 23 May, 7:00 PM - "The Search for Extra-Terrestrial Intelligence" - 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).

Saturday, May 23, 9:00 PM - "Exploring the Sky" at Rock Creek Park on Glover Road, NW, near the Nature Center. Information: John Lohman, 703/820-4194.

Saturday, May 30 5:30 PM to ?? - Open House and Star Party, Hopewell Observatory. See article on page 5 for details. Directions are on page 6.

Next Month:

Saturday, June 6, 7:30 PM - Science Fair Awards, Pizza Party

Saturday, June 20 - Exploring the Sky

A Geological Tour of Mars from James Zimbelman

(Review of the April Colloquium Lecture)

by Gladys Fuller

Dr. James Zimbelman of the National Air and Space Museum began his talk with a brief pictorial history of Mars, starting with an early map of Mars from the Lowell observatory which showed some of the "canals" and which showed the soft red hues seen also by the Viking landers. After seeing the Mariner images which gave us the view of the planet as a bleak and barren place but with diverse topography, scientists designed the Viking missions to study some of the previously observed landforms in more detail and to look for evidence of life. The Mariner images had 100 m resolution, while the Viking Orbiter pictures had about 40m resolution. With the Viking Landers,

details down to 1mm could be observed. The two landers showed Mars to have a very rocky terrain with a fine dust cover. When properly adjusted, they also showed Mars to have a pink sky, due to the fine dust particles in the atmosphere. At the northern landing site, the rocks appeared to be vesicular basalts and some areas showed a white coating, the seasonal ice cap, which was found to be a clathrate of water and CO₂ ice intermixed.

Dr. Zimbelman then took us on a geologist's tour of various landforms. First we looked at volcanoes.

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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 (EST) EDT	Place	Vis. Mag.	Pcnt. Sunlit	Cusp Angle	Min. Aper.
<i>Grazing Lunar:</i>						
May 5	22:00	DC area	7.0	13	12N	6 cm
June 2	21:12	DC area	7.2	5	9N	6 cm

Date	Time (EST) EDT	Place	Star Mag.	Delta Mag.	Name	Min. Aper.
<i>Asteroidal:</i>						
May 2	0:37	Yucatan*	11.2	1.3	(308) Polyxo	20 cm
May 5	22:33	Peru, Mexico*	4.9	9.2	(429) Lotis	2 cm

Planetary:

May 21	2:17	No. America?	13.5	1.3	Pluto	35 cm
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*Appulse to be observed for possible satellites or path shift. Observers should obtain a finder chart from Dunham or IOTA. A finder chart and further information on the Pluto occultation can be found on p. 545 of the *May Sky & Telescope*.

Astronomy and Personal Computers

by Joan Bixby Dunham

Since we have just started Daylight Savings Time, and are in a leap year, this is a good time to discuss time and calendars. The time systems in use and the relations among them can be fairly complex. Time is measured by changes — the number of oscillations of a cesium atom, or the number of revolutions of the Earth — and what is used as a standard is set by convention. There is nothing sacred about a particular convention for measuring time, although trying to make a change is very difficult since, many people hold passionate attachments to the ones in use. The calendar reform that Pope Gregory designed in the 16th century was not adopted for several centuries. Changing from the Julian to the Gregorian calendar required removing 10 (or 11 or 12, depending on in which century the calendar change was made) days from the year, and there was considerable emotion about losing days out of one's life.

In the calendars devised, days correspond to the Earth's rotation, either relative to the Sun (universal time) or to the stars (sidereal time). Months are related to the orbit of the Moon about the Earth. Weeks, however, are not related to an astronomical cycle, but just developed as a custom. No changes have been made to the cycle of days for the week, nor have there been breaks in the sequence, even when switching from the Julian to the Gregorian calendars. The weeks cycle independently of the cycles of days, months, or year that form the basis of our calendar. That can make for an interesting problem in determining the week day which corresponds to a given calendar day. The easiest way is using the Julian Day Number. Jean Meus notes in *Astronomical Algorithms* that the day of the week can be found by

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Those on Mars are on a very much larger scale than those here on Earth. Olympus Mons and the Tharsis Montes would easily cover a state such as Washington, and the height of Olympus Mons is about 15 miles. It has a very large scarp around its base, forming cliffs 2 to 5 km high. To try to explain its size, we might add up all the magma in the Hawaiian - Emperor chain; we would then have a volcano the size of Olympus Mons. This suggests that Mars has a hot spot pumping away, but with no moving plates, it produces one large mountain, not a chain.

While the Tharsis volcanos are smaller than Olympus Mons, they are still about 200 miles in diameter and about 10 miles high. In the wall of the Ascraeus Mons caldera we see a feature which stands out in relief and continues in the floor of the caldera. This feature appears to be a dike, which gives a clue that the internal structure of this mountain on another planet may be similar to our Hawaiian volcanos. One lava flow down its flank is similar in size to the 1984 flow from Mauna Loa, which makes it more credible that these may be basaltic flows. A smaller volcano in the Tharsis region shows some interesting relationships. Using the Principle of Superposition (that in strata laid down over top of one another, the youngest will be on top), we can see the smaller volcano existed before its larger neighbor and also before an impact crater its flank. But a channel running down its flank which deposited a delta inside the impact crater shows that the volcano was still active after the impact.

We then moved on to tectonic features, the largest example of which is Valles Marineris, a canyon larger than the entire U.S. At its deepest, its depth is about 5 miles or about five times the depth of Grand Canyon. The fluted or ribbed appearance at the upper rims and the streaks along the walls look like the bedrock exposures in southwestern U.S. in an arid environment. The weathering and down-falling of material created a talus slope $1\frac{1}{2}$ miles high at the base. Many faults appear to radiate away from a region in the Tharsis mountains. There are also a few concentric features which would also indicate some

sort of a welling up of hot material, bulging the crust to create such fracture patterns.

Many erosional features, visible on the surface of Mars, indicate that liquid water was present on the surface of Mars in the past. These features do not show the dendritic patterns of rain and run-off into mountain streams, but show few tributaries and very linear segments, similar to canyon patterns in the Southwest that result from a sapping process where subsurface flow of water follows joint patterns and erodes the canyon heads. There are also many features which suggest sudden releases of water with flooding of large areas.

Currently, water exists not only as subsurface ice, but is also present in the polar ice caps which are seasonally covered with frozen CO_2 . Pressure measurements on Viking Lander 2 show that the winter air pressure is $\frac{2}{3}$ its summer value, suggesting that $\frac{1}{3}$ of the Martian atmosphere is frozen out of the atmosphere and into the seasonal ice caps. The layering of the ice caps might yield a climatic record of Mars over hundreds or thousands of years.

The thin atmosphere of Mars can move fine particles; in fact, we have observed very large dust storms on Mars. The resulting sediment is a homogeneous coating of red dust everywhere on the planet. This dust will create a major engineering problem for machinery that we take to Mars. The talcum-sized dust is fine enough to get into everything. The wind also does some substantial erosion. There is enough sand to do that, as evidenced by pictures of large dune fields in the Southern hemisphere and a Saharan amount of sand in the fields near the North polar cap.

Information about the particle size in an area can also be obtained by measurements of thermal inertia, the measure of how slowly or rapidly the particles retain or give up heat, which is related to particle size. What we would really like to get is Martian rock samples. We think we have 8 such samples from the thousands of meteorites obtained from Antarctica. The particular samples date to about 1.3 Gy, much younger than

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Hopewell to Host Spring Open House

by Dick Byrd

The Hopewell Corporation, formed by a group of NCA members, has invited National Capital Astronomers members, their families and guests to the spring open house and star party at Hopewell Observatory on Saturday May 30. Sunset will be at 8:30 and twilight will end about 2 hours later.

Come any time after 5:30 PM. Leave daylight time to tour the Hopewell facilities, set up your telescope, if you have one, and see a beautiful sunset. Bring a picnic but please, no charcoal grills or the like, as they can be hazardous at night and the heat disturbs the air. Coffee, tea, cocoa, and soft drinks will be provided by the Hopewell Corporation. Dress warmly, as temperatures will drop in the night.

For those unfamiliar with the Hopewell facilities, they occupy the top of a mountain outside Haymarket, Virginia, a few miles off Interstate 66. On the mountain top, is a two bay observatory building with a rather unique roll-off roof. Nearby is a lodge house with sitting, eating and restroom facilities. The observatory presently houses Bob McCracken's Celestron C-14 in one bay, and in the other, is Bob Bolster's cluster of hand built reflectors and refractors on his own beautifully crafted mounting system. Surrounding the observatory is a large grass-covered clearing which gives plenty of space for star party guests to bring their own instruments for observing. Power is available on the outside of the observatory building for those who need it for their drive systems. Although there is some glow from Manassas to the East of the site, overall, the viewing is far above that usually seen in the Washington area. The band of the Milky Way overhead is usually spectacular.

Directions:

(1) From the Beltway, go West on I-66 for 25 miles to Exit 9 at Haymarket. (2) Left onto U.S. 15 at top of exit ramp. (3) Go 0.3 mile to traffic light and turn right onto Rt. 55. (4) Go 0.8 miles and turn right onto Antioch Rd. (Rt. 681). (5) Go 3.2 miles to the end of Antioch Rd. and turn left onto Waterfall Rd. (Rt. 601). (6) Go one mile and bear right onto Rt. 629. (7) Go 0.9 miles on Rt. 629 to private, narrow, blacktop paved road on

right with orange pipe gate directly across from stone-wall entrance and gate. (8) Turn right onto narrow blacktop road; go 0.3 miles to top of ridge at microwave station. (9) Go around microwave station onto grass/dirt path through the woods for a few hundred feet to the observatory. Park along the road short of the buildings. For further information call (703) 960-9126 or (301) 320-3621.

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almost all the other meteorites from that area. The isotopic analysis of the gas trapped inside bubbles in the meteorite is identical to that determined by the Viking Landers for five noble gases in the Martian atmosphere. The specimen pictured was a weathered igneous rock with a fusion crust due to its trip through our atmosphere.

Dr. Zimmelman also showed pictures of the moons of Mars. Phobos, the larger moon, about 27 km long, is slowly spiralling into Mars and will impact the surface with a substantial crater. Deimos, the smaller, about 15 km long, appears very smooth and covered by dust. This raises the questions of: how did the dust get there? and how does it stay there on such a small body with low gravity?

Future missions include the Mars Observer which is scheduled for Martian orbit in 1993. With its 1 mile per pixel images, it will probably alter many of the geological interpretations of Mars. Its primary mission will be climatology studies of the atmosphere and will be in orbit for at least one Martian year. The next mission would be a sample return mission with plans to collect small samples from over the planet, totalling 5 kilograms. Finally there would be a mission to send humans to Mars.

Notice to the Membership

At the time of publication of *Star Dust*, the slate of potential officers for the 1992-1993 was incomplete. We hope to have this problem solved by the time of the May meeting; if not, the elections will have to be delayed until we find a suitable candidate.

From the Secretary:

If your membership expires in August, please save your *Sky and Telescope* renewal reminder and bring it to the May NCA meeting, if you are planning to attend. I will have your renewal bill there. Doing so will save NCA postage. If you renew at that time, you can save yourself postage.

- Leith Holloway

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adding 1.5 to the Julian Day Number and dividing by 7. The remainder gives the day of the week: 0 for Sunday, 1 for Monday, ..., and 6 for Saturday.

There are other techniques for determining the day of the week. The *Explanatory Supplement* (see April *Star Dust*, "Astronomy and Personal Computers" for description of these publications) describes a method that depends on knowing the day of the week of the first Sunday in the year. Each year is assigned a letter based on the dates of the first Sunday in that year. The *Explanatory Supplement* has a series of tables to use. First, the Dominical letter for the year is found, then another table is consulted with the month and year to find an entry for use in the final table which gives the day of week for a given date in the month. It sounds more complicated than it is, but this can be easily programmed to generate a perpetual calendar. (The system was developed to set the dates for holidays in the Christian religions, such as Easter, which must occur on certain days of the week.

For Sale:

17.5" Coulter Dobsonian with 10X80 finder, 3 eyepieces, 2X Barlow, Lumicon UHC filter, 4 color filters and carrying case for accessories. Price - \$1150 or reasonable offer. Contact David Pessagno, Westminster Astronomical Society, home phone 410/526-5128

Excerpts from The IAU Circulars

by R.N. Bolster

1. March 27, 31 - Zenichi Tanaka, Yodoe, Japan; and Don Machholz, Colfax, California; discovered a comet (1992d) of 10th magnitude in Pegasus. Tanaka photographed the comet on the 27th with a 20-cm reflector, Machholz detected it visually on the 31st with a 12-cm refractor. The orbital elements by Marsden indicate that Comet Tanaka-Machholz reached perihelion on April 22.
2. April 1 - Trafton, University of Texas; Geballe, U.K. Infrared Telescope; and Miller, University College, London; detected H3+ in the atmosphere of Uranus in infrared spectra obtained with the UKIRT. Similar emission from Jupiter had been detected in 1988.
3. April 5 - C.S. and E.M. Shoemaker and D.H. Levy discovered a comet (1992f) of 17th magnitude near the ecliptic in Libra with the 46-cm Palomar Schmidt telescope.

Comet Comments: Comet 1992d is well up in the northeastern sky in the morning, but is not expected to be brighter than magnitude 8.7. Comet 1992f will be in opposition to the Sun in early May, but will remain very faint.

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.

PLEASE ENROLL ME IN NATIONAL CAPITAL ASTRONOMERS MEMBERSHIP

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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

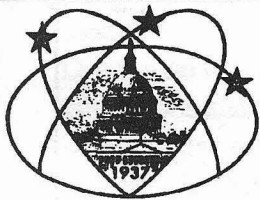
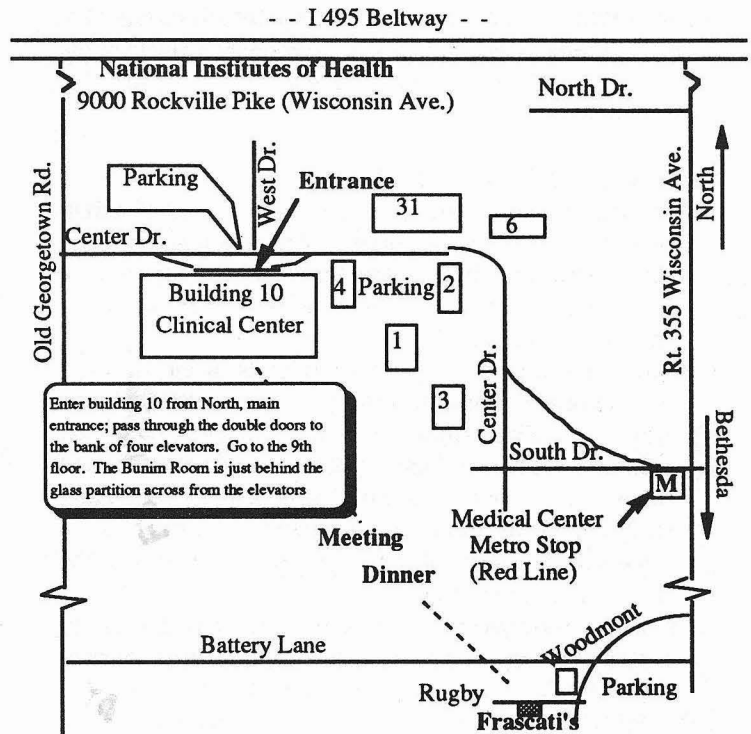
Thank you, and welcome!

Getting to the NCA Monthly Meeting

•Subway Riders - 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 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.

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