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S T A R



D U S T

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Kerr and Henning Seek Galaxies Hidden Behind Milky Way



DR. KERR

Dr. Frank J. Kerr, Astronomy Program, University of Maryland, and graduate student Patricia A. Henning, will present the current status of their search for galaxies behind the Milky Way,

at the May 6 NCA colloquium in the National Air and Space Museum.

The obscuration in the Milky Way makes it very difficult to see galaxies in that part of the sky. From their 21-cm survey using the late, lamented 300-foot NRAO telescope, they have already discovered about 50 galaxies. They have found characteristic differences between these galaxies and those in the clear regions. They plan to continue, using the Very Large Array and infrared.

Professor Frank J. Kerr recently retired from the Astronomy Program at the University of Maryland, College Park, where he has been since 1966. Before then, he was a researcher at CSIRO in Australia. Much of this work was 21-cm study of the Magellanic Clouds and of the spiral structure and kinematics of the Milky Way Galaxy. He is now concerned with external galaxies. He has always been especially concerned with working with graduate students.

At the University of Maryland, he was Director of the Astronomy Program from 1973 to 1978, and was Provost of the Division of Mathematical and Physical Sciences and Engineering from 1973 to 1975. He has also been working with several national and international astronomical bodies.

MAY CALENDAR — *The public is welcome.*

- Tuesday, May 2, 9, 16, 23, 30, 7:30 pm — Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.
- Friday, May 5, 12, 19, 26, 7:30 pm — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.
- Saturday, May 6, 5:45 pm — Dinner with the speakers at the Smithsonian Restaurant, 6th and C Streets, SW., inside the Holiday Inn. Reservations unnecessary. Use the 7th Street and Maryland Avenue exit of the L'Enfant Plaza Metrorail station.
- Saturday, May 6, 7:30 pm — NCA election of fiscal 1990 officers, followed by the NCA monthly colloquium in the Einstein Planetarium of the National Air and Space Museum, Seventh Street and Independence Avenue, SW. Enter Independence Avenue side. Dr. Kerr and Ms. Henning will speak.
- Friday, May 12, 19, 26, 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 960-9126.
- Saturday, May 13, 10:00 am to 4:00 pm — Astronomy Day Open House at Naval Observatory with NCA. Volunteers needed. See page 57.
- Saturday, May 27, 8:30 pm — *Exploring the Sky*, presented jointly for the public by NCA and the National Park Service, on Glover Road south of Military Road, NW, near Rock Creek Nature Center. Planetarium if cloudy. Information: John Lohman, 820,4194, or NCA, 320-3621.

For other organizations' events of interest see elsewhere in this issue.

APRIL COLLOQUIUM

Mr. David H. Sloney, ophthalmic physicist at Aberdeen Proving Ground, described the mechanisms of bright-light eye damage at the April NCA colloquium in the National Air and Space Museum.

He was followed by a discussion on light pollution by Dr. David Crawford, Kitt Peak (Arizona) National Observatory astronomer, Vice President of the International Dark-sky Association, and NCA member.

As the present high level of solar activity continues to increase to the 11-year cyclic peak, it is prudent for solar observers to understand the potential hazards in order to observe safely. Mr. Sloney is widely recognized as a leading expert in protection from various kinds of eye damage caused by light sources such as lasers, searchlights, welding arcs, and the Sun.

Optical hazards depend primarily upon the wavelength of the radiation. Wavelengths far from the visible band, gamma rays and radio frequencies, are mainly transmitted through the eye with very little absorption, insignificant at naturally occurring levels. At high enough intensities, however, they can damage.

Wavelengths longer than about 1400 nm and shorter than 200 nm are absorbed superficially on the skin and cornea, thus mainly damaging only the outermost surface of the cornea. At wavelengths longer than about 305 nm the cornea is more transparent, and allows about two percent to penetrate to the lens, so lens damage can be expected. At 360 nm, more than half of the energy is absorbed in the lens. Thus, it would seem that lens damage would be much greater at 360 nm than at 300. Not so! Partly because of the higher quantum energy of the 300 nm wavelength, but mostly because of the selective absorption spectrum of the lens, the 300-nm damage is approximately a million times greater than that at 360 nm. This highly damaging wavelength range is quite narrow, and is the range responsible for skin cancer, aging effects of the skin, sunburn, etc. In the visible and near infrared, energy from a point source or parallel light can be focussed to a tiny spot on the retina. The intercepted energy is concentrated into a spot about 10 microns in diameter on the retina, which amounts to an optical gain of about 100,000 times; hence the danger in the parallel beams of lasers. One watt per square cm intercepted on the cornea thus yields 100 kilowatts per square cm in the retina.

The damage mechanism in the short wavelengths is largely photochemical; in the longer wavelengths, thermal. (Ed.

electron volts. The shorter wavelengths, if absorbed, thus deliver more energy in photochemical reactions.) The longer visible and infrared wavelengths raise the temperature and cook the tissue. Photokeratitis, inflammation of the cornea by light, is caused by photochemical damage to the cornea by ultraviolet. Erythema, sunburn, is the corresponding effect on the skin. Cataracts and skin cancer are caused by ultraviolet in the region of 300 nm.

Because thermal damage (red and infrared) depends upon raising the temperature of the tissue, a very short, bright exposure may do less damage than a long, less bright exposure, which allows more time for the temperature to rise. The effect corresponds to reciprocity failure in photographic film.

Photochemical damage, however, from ultraviolet (coronal and lens damage), or visible blue light (short wavelength retinitis), called blue hazard, depends only upon the number of delivered quanta, and is cumulative with time. Equal photochemical damage can result from a short exposure to a very strong source, or from long exposure to a weaker source.

Elaborating on the visible blue-light hazard, short-wavelength retinitis, Sloney emphasized the cumulative effect of photochemical damage. The danger is not only of looking at a very bright blue source for a short time, but also of staring at even a much less bright blue source for a longer time. These dangerous visible blue wavelengths, the shortest that penetrate to the retina, lie in the 400- to 500-nm range.

He recommends sunglasses that block wavelengths shorter than 500 nm. With the rather recent general recognition of blue hazard, such glasses have become popularly known as "blue-blockers." Blue or green sunglasses should never be worn. They cause the pupils to open, thus to gather more of the very damaging shortwave light the glasses are designed to admit. Use either neutral or, better, "blue blockers" that block the wavelengths shorter than 500 nm. They will look amber or red.

Night vision, dark adaptation, is affected by exposure to bright light for the previous few days. For complete dark adaptation at night, it is necessary to wear very dark sunglasses during the previous days. Although it is almost never experienced, the completely adapted human eye can detect about 10 photons.

The cornea is the only living tissue of the eye that is exposed to the Sun, wind, dust, ultraviolet, etc. The outer layer of corneal cells is replaced about every 48

other hand, has a very slow metabolic rate; damage to the lens may result in a cataract years later.

The retina, the layer of photosensitive receptor cells (rods and cones), deteriorates with age; the cells are progressively lost. It now seems that the aging process is hastened by exposure to bright light throughout life. Protection from bright light, especially blue, is always prudent.

Retinal damage from staring at the Sun is primarily photochemical. Lens damage, also photochemical, is cumulative over a lifetime. Hence Sloney's remark that everyone who lives long enough will eventually have cataracts. Tropical populations experience a higher incidence of cataracts because of the more intense solution. Sloney points out, however, that temperature also is a function of latitude; the effects of heat therefore cannot be ruled out.

Sloney showed and discussed photographic examples of retinal lesions caused by staring at the Sun.

Photochemical effects are not all bad; there are also good photochemical effects: vision. It is the photochemical response of the rods and cones that we sense as vision. The three types of cones are sensitive to different parts of the visible spectrum, and are the color sensors. They are insensitive to very dim light. Much more sensitive than the cones, but yielding only black-and-white response, the rods function only in dim light; their activation is a major part of the dark-adaptation process.

Examining environmental conditions, Sloney lists the outdoor conditions encountered in order of UV hazard. Most of the outdoor hazard to the fovea, the tiny point of sharpest vision, is from reflected energy from the ground or other surfaces. Although the solar radiation intensity is greater at high altitudes, grass-covered mountains reflect only about one percent or less at the short wavelengths. Fresh snow, as expected, is almost totally reflective, surf, about 20 percent, and most artificial surfaces, concrete, etc., about 10 percent reflective.

Fortunately for us, the atmosphere attenuates ultraviolet severely. In the summer, the most dangerous (cancer, cataracts, sunburn) UV dose rate at 9:00 am and 3:00 pm local solar time, is only about 10 percent of that at noon. Only a 20- or 30-percent variation might be measured in the visual wavelengths over this time period. At lower elevations of the Sun the attenuation is, of course, much

greater.

Reflections from most surfaces are greatest at grazing incidence, when the Sun is low, and most of the UV is absorbed in the atmosphere. At noon, when the UV is strongest, the reflection is weakest; the reflection coefficient varies with the angle in a fortunately compensatory way.

While it is best to keep the Sun out of the field of view (even peripherally), the strong UV arriving from the Sun at a high angle strikes the cornea at a more-or-less grazing incidence (when looking horizontally), and is mostly reflected, not absorbed by the corneal tissue. When the Sun is low, more of the incident radiation is absorbed, but it is already much reduced by the atmosphere. For the foregoing reasons, UV radiation entering the direct line of vision, such as welding arcs or reflection from snow, is more dangerous than radiation from sources nearly overhead but still in peripheral view. In the case of compact sources, such as welding arcs or laser beams, however, there is the additional hazard of thermal burn in the small, focused image on the retina.

Eye protection for viewing the Sun must block not only the visible rays but, at least equally, all others. If such a filter actually does this, and is comfortable, it is safe, provided further that it is not in or near the focal plane or exit pupil of the telescope, the extremely hot regions of the system. It is far preferable to use metal-coated glass (or plasti) attenuators in front of the telescope before the light enters the instrument. Dyed-glass filters are not safe, even if comfortable. Fully-exposed and developed black and white film, not color film, if dense enough to be comfortable, is safe for direct viewing, if used carefully. The dyes in color film, even if it is comfortably dark, will pass dangerous radiation, and should not be used.

Following Sloney's presentation, Dr. David Crawford discussed the progress and status of the International Dark-sky Association (IDA) and the effort to raise public awareness, develop data bases, lectures, etc. He described IDA as a catalyst to help members who are working in their localities to raise public awareness of the light-pollution problem, offer solutions whereby everyone benefits, alter lighting practices for higher quality and less pollution, etc.

Crawford pointed out that every county and about thirty cities in Arizona now have ordinances to protect the night sky from light pollution. Some day (night) maybe here. Robert H. McCracken

COMING NEXT MONTH

At the June 1 NCA meeting, the annual high school science fair awards will be presented. The colloquium will feature

Dr. Martin Harwit, eminent astronomer, author, and Director of the National Air and Space Museum.

OCCULTATION EXPEDITIONS PLANNED

Dr. David Dunham is organizing observers for the following occultations. For further information

call the NCA-IOTA Information Line: (301) 474-4945 (Greenbelt, MD).

Date	Time	Place	Vis Mag	Pent Sunlit	Cusp Angle	Min Aper
Grazing Lunar:						
05-03-89	09:33	Clarksburg, MD	4.6	06	11S	5 cm
05-07-89	01:26	Strinestown, PA	8.0	3	20N	13 cm
05-11-89	03:02	Mexico, MD,	9.0	35	14N	20 cm
05-29-89	07:45	Urbana, MD	6.0	37	8N	5 cm
05-31-89	08:25	Norfolk, VA	8.1	16	11N	10 cm
Asteroidal Appulses*:						
05-09-89	03:58	s. Mexico (Country)	8.8	3.0	(39) Latitia	10 cm
05-26-89	05:29	s. Ontario, Canada	9.5	4.0	(481) Emita	13 cm

*Appulses to be observed for possible satellites or path shifts.

USNO/NCA CLARK TELESCOPE SIGN-IN REMINDER

We announced last month that in coordination with the Naval Observatory and Naval Security, we are revising the approval and sign-in procedures for NCA. The present approved key-pass list is being accordingly revised; to remain on the list, you must provide your social security number and date of birth, as soon as convenient (a cut-off date will be set soon), to R.H. McCracken, 5120 Newport Avenue, Bethesda, MD 20816, or call NCA:

(301) 320-3621. Naval Security will require this information and photographic identification, both for future approvals and for those presently listed.

Pending finalization of the new procedures, to be announced, for those presently on the list: When signing in at the main gate of the Observatory, be prepared with your current NCA membership card, your key pass, and some form of photoidentification.

NCA TO ELECT FISCAL 1990 OFFICERS

The annual National Capital Astronomers election will be held at the May 6 meeting. The election will be the only business preceding the colloquium. The nominating committee offers the following candidates:

President, Kenneth R. Short; Vice President, Scott A. Thurlow; Secretary,

Patricia B. Trueblood; Treasurer, Ruth S. Freitag; Trustee, Walter I. Nissen; Sergeant at Arms, Eric O. Nystrom.

Additional nominations may be made by petition of 10 regular members in good standing, presented to the secretary prior to the election.

NCA WELCOMES NEW MEMBERS

Eugene S. Casey
6300 Huntover Lane
Rockville, MD 20852

Charlie E. Cutchin
3006 Jamestown Court
Woodbridge, VA 22192

S. Reddix
146 Bryant Street, NW
Washington, DC 20001

Mark L. Poppe
6100 Leewood Drive
Alexandria, VA 22310

AIR AND SPACE MUSEUM OFFERS VARIETY OF PROGRAMS

The following free, public programs will be held during May in the Einstein Planetarium, National Air and Space Museum:

Saturday, May 6, 9:30 am -- Monthly Sky Lecture: "Solar Eclipse!" Fred Espenak, NASA Goddard Space Flight Center. The longest total eclipse of the Sun (almost 7 minutes) for the next 140 years will occur on July 11, 1991. Dr. Espenak will preview the eclipse and offer suggestions for observing it. Safe telescopic viewing of the Sun will follow, weather permitting.

Suggestion: Attend the Sky Lecture, tour

the Museum during the day, then return to the planetarium at 7:30 pm for the NCA science fair awards and monthly NCA Colloquium. (See front page.)

Wednesday, May 10, 7:30 pm -- Exploring Space Lecture Series: "Planetary Nebulae," Sally Heap, NASA Goddard Space Flight Center. These central stars of planetary nebulae are in a spectacular phase of their evolution. Dr. Heap will describe the results of her NASA group's studies of these interesting stars. Telescopic sky viewing will follow, weather permitting.

EXCERPTS FROM THE IAU CIRCULARS Robert N. Bolster

1. March - At the suggestion of J. Westfall of ALPO, L. Wasserman of Lowell Observatory examined the possibility that an occultation of SAO 187255 by Titan would occur in association with the occultation by Saturn on July 3. It was found that an occultation might be observed from Europe, Africa, and part of South America, with the closest approach at 22h 42m UT.

2. March 31 - H. Holt and N. Thomas discovered a fast-moving asteroidal object

(1089FC) at 16th magnitude with the 46-cm Palomar Schmidt telescope. The orbital elements indicate that the object passed 0.005 AU from the Earth on March 23, a near-record close approach.

3. April 10 - K. Meech, University of Hawaii, and M. Belton, Kitt Peak National Observatory, observed a coma extending 5 arcseconds from Chiron. They used a CCD detector at the prime focus of the Kitt Peak 4-m telescope.

ASTRONOMY DAY OPEN HOUSE AT NAVAL OBSERVATORY WITH NCA

The U.S. Naval Observatory open house will mark Astronomy Day on May 13 with National Capital Astronomers participation.

The Observatory staff has planned an unusual opportunity for an entertaining and educational family day. Have lunch with Galileo, Aristotle, Copernicus, Einstein, Halley, and Newton, and other famous characters of the past, have them answer your questions, watch their demonstrations, and learn while being entertained. At 1:00 pm the U.S. Navy Band Sea Chanters (the real ones!) will present a concert on the Observatory grounds.

National Capital Astronomers will

U.S. NAVAL OBSERVATORY TOURS IN MAY

The Monday night public tours of the Naval Observatory begin at 9:30 pm (EDT). The next tours are scheduled for May 1, 8, 15, and 22. Passes will be issued to the first 100 persons in line at the gate across from the British Embassy, at Massachusetts Avenue and the southeast side of Observatory Circle. Some form of photoidentification will be required.

Parking is not allowed on the grounds

demonstrate the fascinating craft of telescope making, show videotaped observations from their actual worldwide expeditions, computer simulations of the sky for any time of your choice, and offer safe telescopic viewing of the Sun with the NCA telescopes.

The event also offers the public an opportunity to visit the major facilities at the Observatory, see special exhibits, displays, and demonstrations, and, weather permitting, safe telescopic viewing of the Sun in both white light and hydrogen alpha.

Volunteers are needed. Call NCA: (301) 320-3621.

For the tours except for the handicapped; ample parking is available near the gate.

Visitors will see various observatory facilities and, weather permitting, appropriately selected celestial objects, with the historic 26-inch Clark refractor with which the satellites of Mars were discovered more than a century ago.

For details, call the taped Observatory message: (202) 653-1543.

UNIVERSITY OF MARYLAND OPEN HOUSE SCHEDULED

The Astronomy Program, University of Maryland, holds open house on the 5th and 20th of each month at the University's observatory on Metzert Road in College Park. Talks and slide shows are presented at 9:00 pm, followed by telescopic sky viewing, weather permitting.

Friday, May 5, - "On the Early Universe," Dr. D. Papadopoulos

Saturday, May 20, - "Are We Alone?" Dr. G.L. Verschuur

The public is invited; there is no charge, and no reservations are necessary for individuals. Groups larger than ten should call (301) 454-3001 at least 5 days prior to the program.

MARYLAND UNIVERSITY SPACE SCIENCE SEMINARS SCHEDULED

The University of Maryland holds a Space Science Seminar series each Monday at 4:30 pm at the U. MD. Space Sciences Building, Room 1113.

For more information, contact Tim Eastman, (301) 454-0339/3136.

May 15 - "The Erosion of Saturn's Rings," Dr. John E. Conerney, NASA GSFC. H10

AAS SOLAR PHYSICS MEETING IN JUNE

The Solar Physics Division of the American Astronomical Society will meet June 5-8 at the Applied Physics Laboratory

of Johns Hopkins University, Laurel, Maryland. For further information contact David Rust, 953-5000.

Sorting is a function with almost universal application for all users of computers. In astronomy, an obvious sorting is that of organizing data about stars into catalogs. But that is only one of many ways in which we sort. We may need a list of time-ordered observations, or an alphabetical list of character data. For example, we may wish to sort star data into the constellations in which the stars are seen. Or we may want an alphabetical listing of observers for specific events.

Providing users with orderly lists or tables of data is a function computers do very well. A number of different algorithms are available to ease the computational burden of providing sorts. Some of these are better when the set of data to be sorted is very large, others work better when the data set is somewhat smaller, but still larger than we would want to do by hand.

Straight insertion: This is the simplest method, and should be familiar to anyone who ever organized a hand for bridge, or placed a month's worth of cancelled checks into time order. The algorithm is to take each item one at a time and move it into the right place with respect to all the others that have been sorted. That is, the second is placed before or after the first, the third where it fits relative to the first and second, and so forth. If there are N objects to sort, this method requires N^2 comparisons. This becomes cumbersome very quickly, and is not recommended for sorts of more than 50 objects.

Shell's method: The Shell sorting technique is to divide the data into smaller groups, sort the smaller sets by insertion, then combine the small groups into larger groups and sort, and continue combining and sorting until the final sort group is the entire data set. For example, if there are N objects, the first step could be to divide the data into $N/2$ groups of 2, order them, divide the data into groups of 4 by combining adjacent pairs, sort them, and so on. These first preliminary sorts allow the final sort to proceed more efficiently, since the subsets of data are all in order, and fewer operations are needed in the final sort. The Shell technique requires fewer comparisons than the straight insertion. In theory, the worst-case Shell sort takes N to the power $2/3$ comparisons.

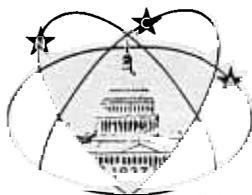
Heapsort: The heapsort is a more complicated method to explain, but is a favorite technique of several texts on numerical analysis. This technique organizes the data into a heap, or a binary tree. This is a hierarchy than can be diagrammed like an organization chart or a pyramid. The highest data point is on top (the company president), with connections to points on the next lower levels (the vice presidents), which are themselves

connected to the next level lower, and so on. A data point (or person) in the middle has an upward path by traveling along those connections. If the top point is removed, the organization is shuffled following strict rules of promotion so that the next highest point is now on top. The sorting is done by first creating the heap and then pulling off the top points one at a time, promoting members of the heap so that the highest is always on top. More bookkeeping is required for the heapsort than for the simpler sorts, but the total number of comparisons required is fewer, of the order of $N \log N$ for the worst-case analysis.

Quicksort: The quicksort algorithm is somewhat like a reversed Shell sort. The data are split into the half above the middle and half below. New middle values are determined for each half, and then each is again split above and below its mid point. This is repeated until the entire set of data is sorted. This technique is also a favorite of many, and is, on average, the fastest of the in-memory sorts. For N data points, the quicksort technique performs $2N \log N$ comparisons on average. However, the number of comparisons in the worst case is N^2 , the same as in the simple straight-insertion method.

Bucket sort: In bucket sorts, the data are first sorted into bins, and then each bin is sorted. One example of bucket-sorted data is a star catalog organized by declination zones. In preparing such a catalog, the star data are first sorted in the buckets representing the declination zones. Then, each zone is sorted by right ascension. The Smithsonian Astrophysical Observatory Catalog, for example, presents the stars in declination zones of 10 degrees. This is a good way to handle voluminous data, particularly when it is not necessary to recombine the buckets into one gigantic data set at the end. Also, before sorting, some idea of the data in the buckets is needed, so that the bucket design distributes the data evenly among the bins. Another example of a bucket sort is the sorting of observations made in a year by time, using the months of the year as buckets. If the observations are evenly spaced, this produces 12 bins, each approximately a twelfth the size of the original data set. If all the data were taken in October, this would produce 11 empty buckets, and one with all the data.

Further information on sorting is available in many numerical analysis textbooks. Two which present computer algorithms are *Numerical Recipes*, William H. Press, et al, Cambridge University Press, 1986 (diskettes of FORTRAN or PASCAL source for the examples are sold separately), and *Computer Algorithms*, Sara Baase, Addison-Wesley, 1978.



National Capital Astronomers, Inc.

is a non-profit, public-service corporation for advancement of the astronomical sciences. NCA 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 colloquia held at the National Air and Space Museum of the Smithsonian Institution. 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 NCA newsletter, *Star Dust*.

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

The Telescope Selection, Use, and Care Seminar, held annually in November, offers the public guidance for those contemplating the acquisition of a first telescope, and dispells the many common misconceptions which often lead 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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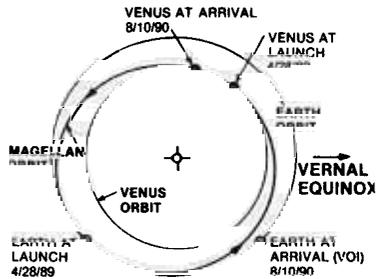
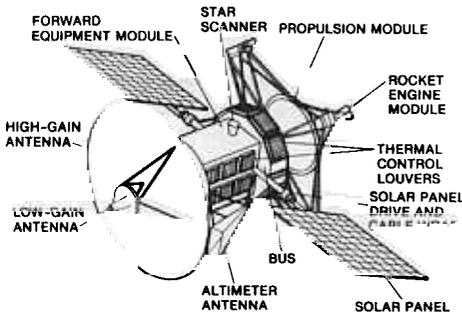
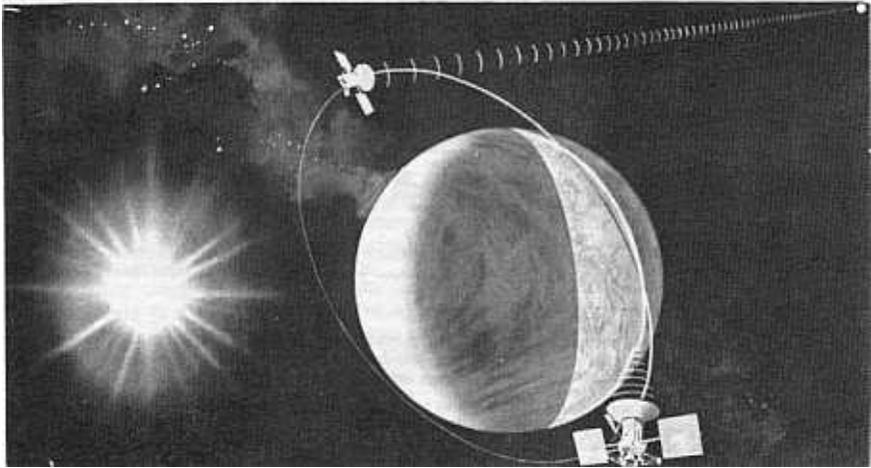
If family membership, list names of additional participating immediate family members in same household, with birthdates of all those under 18 years old:

NOTE: If you already subscribe to *Sky & Telescope*, please attach a recent mail label, or indicate expiration date: _____. A prorata adjustment will be made.

Make check payable to National Capital Astronomers, Inc., and send with this form to: Patricia B. Trueblood, Secretary, 10912 Broad Green Terrace, Potomac, MD 20854.

The following information is optional. If you would like to participate actively in NCA affairs, please indicate briefly any special interest, skills, vocation, education, experience, or other qualifications which you might contribute. Thank you, and welcome!

MAGELLAN LAUNCH DELAYED



This artist's rendition shows the Magellan craft in orbit around Venus. At press time, it is hoped that the delayed launch will be

ready by Friday, May 5. NASA photo and drawing courtesy Jet Propulsion Laboratory, Pasadena, California.

FOR SALE

Serrurier truss and box assembly suitable for 12-inch or smaller telescope. All aluminum construction. \$50 or highest bid received by May 1. Call Mark Trueblood at (301) 903-9442 (Potomac, MD) for details.

WANTED

High-school physics/astronomy teacher for autumn 1989, at Georgetown Day School. Salary negotiable. For more information, call Bruce Ruble at 966-2666 (days).

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