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National Capital Astronomers, Inc.

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Sliney: Bright-Light Eye Damage by UV, IR, and Blue



MR. SLANEY

Mr. David H. Slaney, Medical Physicist, Aberdeen Proving Ground, Maryland, will address the April NCA colloquium everyone will find useful, at the National Air and Space Museum.

It is always important for everyone, and particularly for solar observers during this time of unusually high solar activity, to understand the several kinds of potential eye damage, some of which may be surprising, resulting from exposure to bright light. Appropriate precautions

depend upon knowledge of the hazards.

Mr. Slaney will describe the present understanding of the mechanisms of eye damage caused by bright light of ultraviolet, blue, and infrared wavelengths.

It has long been recognized that optical radiation can be harmful to the eye; however, the precise exposure conditions, wavelengths, and irradiation levels required to injure the cornea, lens, and retina have not always been well understood. Only recently has it been appreciated that the geometry and direction of the source are important. The damaging photochemical effects are dramatically dependent upon specific wavelength ranges. Thus, it is important that protective filters (including sunglasses) have proper spectral and attenuation characteristics, and that they be properly used.

David H. Slaney, has been Chief, Laser Branch, U.S. Army Environmental Hygiene Agency, at Aberdeen Proving Ground, Maryland since 1965. He is a subcommittee chairman in the ANSI Committees Z-136, Safe Use of Lasers, and Z-311, Safety with Lamps and Lighting Systems, and IEC Committee TC76, on Lasers. He received a Fulbright Fellowship in 1976, and has been an advisor to WHO and UBESCO. He is an editor of "Lasers in the Life Sciences," and serves on the editorial boards of three other journals, including "Lasers in Surgery and Medicine." He coauthored a 1,000-page book: Slaney and Wolbarsht, "Safety with Lasers and Other Optical Sources," Plenum, 1960. Mr. Slaney is a member of many scientific societies and twice was co-chair of the Gordon Conference on Lasers in Medicine and Biology.

APRIL CALENDAR — *The public is welcome.*

Saturday, April 1, 5:45 pm — Dinner with the speaker 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, April 1, 7:30 pm — NCA monthly colloquium in the Einstein Planetarium of the National Air and Space Museum, Seventh Street and Independence Avenue, SW. Enter Independence Avenue side. Mr. Slaney will speak.

Tuesday, April 4, 11, 18, 25, 7:30 pm — Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

Friday, April 7, 14, 21, 28, 7:30 pm — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.

Friday, April 14, 28, 8:30 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.

April 15, 10:00 am to 4:00 pm — Astronomy Day Open House at Naval Observatory with NCA. Volunteers needed. See page 48.

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

MARCH COLLOQUIUM

Mr. Timothy E. Eastman of the Institute for Physical Science and Technology, University of Maryland, addressed the March 1989 colloquium of National Capital Astronomers at the National Air and Space Museum. He spoke on boundary layers in astrophysical plasmas.

A plasma is a quasineutral gas of charged and neutral particles which, through electromagnetic interaction, exhibit collective behavior. Although some particles are charged, the plasma as a whole is approximately neutral. Over 99 percent of the universe by volume, and perhaps 50 percent by mass, is in the plasma state. The air in places such as the room we are in are exceptions. Familiar examples of plasma regions include filaments of gaseous nebulae, solar flares, and the ion tails of comets. Most plasma regions are invisible in photographs; some are mapped by instruments carried in spacecraft.

Plasma behavior differs from that of a fluid (gas, liquid). A plasma region can exhibit large abrupt changes in density and composition. Velocity shears can occur both in fluids and in plasmas. Plasma temperatures can be difficult or impossible to define. Collective behavior is clearly evident in the examples above; no fluid would behave in such a fashion.

The solar wind is a plasma. It originates mainly in invisible holes in the Sun's corona, and some from solar flares. It interacts with planets; large plasma structures envelope them. (See review of February 1989 NCA Colloquium in March issue — ed.). The solar wind extends unexpectedly far; Pioneer 10 is now mapping it beyond the orbit of Neptune.

The existence of astronomical plasma was recognized only recently. The tentative identification of comet ion-tail structure is an exception. High-energy particles were detected in 1958. Alfvén deduced the presence of cellular structure in 1963. Theory has been developed only in the past very few years. (A vacuum is not "nothing," [proper English!] but is filled with virtual particles. The space medium can support electrical fields.)

The physical theory of fluids is complicated, but they were studied experimentally nearly back to Newton's time. Theories were constructed to explain those data. Plasma theory is even more complicated; there are fifteen independent variables. "Cold" plasmas are produced in the laboratory, and there are theories that partially explain them. Astronomical plasmas have very different properties, and have been observed for only a few decades. Theory has been developed for a

few years and is primitive. As a start, an approximation can be used with some qualifications, but a full-fledged plasma theory is needed very soon. A plasma has to be viewed as a whole, a system; there are strong interactions among its regions.

Almost all observational information is of nearby regions, i.e., in the solar system. To understand faraway regions we must extrapolate. It is difficult and uncertain. Thus, there is no present hope of sending spacecraft to interstellar regions or even farther away.

A major tool for the study of plasmas is the instrumented spacecraft which operates near the planets, including Earth. Each planet so far studied interferes with the solar wind. The Earth's magnetic field blocks the solar wind at the magnetopause; Mars, Jupiter, Saturn, and Uranus behave very similarly, but on different scales. Jupiter's magnetopause extends more than a hundred times as far as the Earth's. Venus has no significant intrinsic magnetic field; its ionosphere stops the solar wind. The solar wind reaches the Moon's surface, as the moon has neither a magnetic field nor an atmosphere. Data coming from Neptune in August is awaited eagerly, and a study of Mercury would be interesting.

The ICE Spacecraft, which NASA sent to monitor the solar wind ahead of Comet Halley, was sent through the tail of Comet Giacobini-Zinner, where it made many measurements of plasmas and related phenomena.

Unfortunately, all of the other Halley probes passed the comet ahead of its bowshock; ICE alone has penetrated the tail of a comet. (Probably more comet physics was learned from this fine NASA mission than from all of the other Halley probes combined; and NCA's own Dr. David Dunham designed the intricate orientation maneuver that sent the craft precisely to its target! — ed.)

The region around each planet where the solar wind is modified roughly resembles a comet. It begins with a collisionless shock ahead, and then extends around the planet into a magnetotail for more than 10 planet diameters. A shock occurs when fluids or plasmas meet at supersonic speeds. In a collisionless shock the density is so low that individual particles do not collide, but interact electro-magnetically, and thus modify the structure. Dr. Eastman described these phenomena in fine detail.

The aurora is a visible manifestation of the solar wind's reaching the magnetopause. In the aurora we see structures of the region and of the solar wind, and also of the chemical composition. Data are acquired from both

OCCULTATION EXPEDITIONS PLANNED

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

Date	Time	Place	Vis Mag	Pcnt Sunlit	Cusp Angle	Min Aper
04-11-89	03:19	Newton, MD	5.6	30	14N	5 cm
04-12-89	01:09	Pole Tavern, NJ	8.2	40	13N	10 cm
04-15-89	22:25	Lewistown, VA	1.3	78	5N	5 cm
05-03-89	10:33	Clarksburg, MD	4.6	06	11S	5 cm

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

USNO/NCA CLARK TELESCOPE SIGN-IN PROCEDURE BEING REVISED

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, as a first step, 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, 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.

NOMINATING COMMITTEE OFFERS OFFICER SLATE

The nominating committee presents the following slate for the May 6 election of fiscal 1990 NCA officers: 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.

surface (local) and spacecraft (global) observations.

Scales of known plasma regions range from 10^{-6} to 10^{26} meters. Micrometer to meter scale lengths are studied in the laboratory. Near the Earth we find scales up to thousands of kilometers; near Jupiter, hundreds of thousands of kilometers. Hundred-parsec structure is observed near the center of the galaxy, and there are uniform magnetic fields over a kiloparsec in spiral galaxies. Microgauss fields exist over megaparsecs in clusters of galaxies, so we infer electric currents of 10^{-19} amperes. Galaxies themselves tend to lie within networks of filaments with scale lengths of 10 kiloparsecs to 500 megaparsecs. Eastman pointed out that plasma stream's velocities are no more than 1200 kilometers per second; they would take about 200 billion years to travel 500 megaparsecs. This could have

implications about a universe supposed to be about 20 billion years old!

Dr. Eastman emphasised two points especially strongly: Good theory must be based closely on observational data. The data base for plasma theory is thin, and is likely to remain so. One reason is that NASA is not planning enough spacecraft and flights, he said.

The plasma state so pervades the universe that when it is understood astrophysical theory will be substantially changed. He suggested that this forecast could also apply to cosmology; but here the data base is likely to remain inadequate.

He stated that a shortage of qualified scientists is developing in these areas. We will be at least 50 percent short by the late 1990's. He encouraged young people to enter these areas. John B. Lohman

COMING NEXT MONTH

The May 6 NCA colloquium will feature radioastronomers Dr. Frank J. Kerr and Patricia A. Henning, University of Maryland. They will present their progress in their search for galaxies hidden on the

other side of the milky way. Fortunately, their radio survey using the 300-foot radiotelescope at Green Bank was completed before the giant dish collapsed.

EXCERPTS FROM THE IAU CIRCULARS Robert N. Bolster

1. January 23 - C.S. Shoemaker discovered a comet (1989e) of 13th magnitude in Leo on exposures made with the 46-cm Palomar Schmidt.

2. January 23 - Nagoya and Tokyo University astronomers used the GINGA to detect an X-ray pulsar in the direction of the molecular cloud Lynds 1457. Pulsation period was 206.3 second.

February-16 - Observers using the 3.6-m telescope of the European Southern Observatory failed to detect the submillisecond pulsar seen in January at

the location of SN1987A.

3. March 2 - O.A. Parker and M. Hartley discovered a comet (1987i) of 16th magnitude in Sextans with the 1.2-m U.K. Schmidt telescope at Siding Spring. S. Makano noted that the object had previously been identified as minor planet 1986TF.

4 March 9 - C.S. and E.M. Shoemaker and H.E. Holt discovered a comet (1989j) of 13th magnitude in Leo Minor with the Palomar Schmidt telescope.

ASTRONOMY DAY OPEN HOUSE AT NAVAL OBSERVATORY WITH NCA

The U.S. Naval Observatory open house will mark Astronomy Day on April 15 with National Capital Astronomers participation. The event 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.

A FEW OBSERVERS HANDBOOKS STILL AVAILABLE

One of the best bargains in astronomy, the *Observer's Handbook*, published annually by the Royal Astronomical Society of Canada, is so valuable and economical that no one interested in any aspect of astronomy at any level should be without it. Our Treasurer, Ruth Freitag, has a few copies of the 1989 edition left at a price reduced even below the original bargain.

In addition to a comprehensive index

to the many lists, tables, explanations, references, sky charts, data, etc., there is a handy, quick margin reference to sections on Basic Data; Time; The Sky Month by Month; Sun; Moon; Planets, Satellites and Asteroids; Meteors, Comets and Dust; Stars; and Nebulae.

Don't miss this opportunity, no matter what your interest in astronomy. Call Ruth before they're gone: (703) 621-7831 (Arlington, VA).

NCA WELCOMES NEW MEMBERS

William B. Barrett, 2nd.
PO Box 2541
Duxbury, MA 02331

James G. Kulp
9524 Melrose Square Way
Gaithersburg, MD 20879

Herman Raynes
1015 Smoke Tree Rd
Baltimore, MD 21208

Christopher W. Walker
Lake Road, Box 2087
Middleburg, VA 22117

AIR AND SPACE MUSEUM OFFERS VARIETY OF PROGRAMS

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

Saturday, April 1, 9:30 am -- Monthly Lecture: "The Martian Explorations of Lowell and Campbell," Dr. David DeVorkin, Department of Space History, NASM. View the work of these pioneers in the light of today's science. Einstein Planetarium. Tour the Museum during the day, then return to the planetarium at 7:30 pm for the NCA Colloquium on Bright Light Eye Damage. See front page.

Wednesday, April 5, 7:30 pm - The Search for Extraterrestrial Intelligence Lecture Series: "Signs of Intelligence," Dr. Jill Tarter, NASA Ames Research Center. How radiotelescopes scan the cosmos for signs of life. Einstein Planetarium.

Wednesday, April 12, 7:30 pm - Exploring Space Lecture Series "Early Star Evolution and Planet Formation," Dr. Frederick M. Walter, Center for Astrophysics and Space Astronomy, University of Colorado, Boulder, CO. Einstein Planetarium.

NASA GODDARD COLLOQUIA SCHEDULED

The following colloquia will be held at 3:30 pm in Building 3 Auditorium at Goddard Space Flight Center, Greenbelt, Maryland. Coffee and tea will be served from 3:00. Enter the main gate and obtain a visitor's pass from the guard. Call Tracy Parlate, 286-8543, for further information.

Friday, April 7 - "A New View of Vision,"
Barry Richmond, Natl Inst Mental

Health.

Friday, April 14 - "Gravity and Large-scale Structure in the Universe,"
William C. Saslaw, University of Virginia.

Friday, April 28 - "Pulsars Old and New,"
Shrinivas Kulkarni, California Institute of Technology.

U.S. NAVAL OBSERVATORY TOURS IN APRIL

The Monday night public tours of the Naval Observatory begin at 8:30 pm (EDT). The next tours are scheduled for April 3, 10, 17, and 24, and May 1. 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

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 8:00 pm, followed by telescopic sky viewing, weather permitting.

Wednesday, April 5, - "Origin of the Solar System," Dr. Michael F. A'hearn.

Thursday, April 20, - "Solar Oscillations,"
Dr. David M. Zipoy.

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 (Our March NCA speaker) at (301) 454-0339/3136.

April 3 - "Particle Acceleration and Transport, and Gamma-ray Production in Solar Flares," Mr. James Miller, U.Md. and NASA GSFC.

April 10 - "Computer Simulations of the Shape of the Magnetosphere," Dr. Raymond J. Walker, Institute for Geophysics and Planetary Physics,

University of California, Los Angeles.

April 17 - (1) "Plans and Budget Projections for the NSF Magnetophysics Program," and (2) "Nonlinear Processes in Magnetospheric Plasmas,"
Dr. V.L. Patel, Atmospheric Sciences Division, NSF.

April 24 - "Plasma Wave Observations in the Magnetosphere and Geomagnetic Tail from ISEE and AMPTE/IRM,"
Dr. Roger R. Anderson, University of Iowa.

May 1 - Panel Discussion, "Particles and Fields Instrumentation: Present Status and Future Needs," Panelists HI OFF TBD.

A.S.P. CENTENNIAL CELEBRATION IN JUNE; PLAN NOW.

The Astronomical Society of the Pacific will celebrate its 100th anniversary with a gala meeting at the University of California, Berkeley, June 21 - 26, 1989.

Prominent astronomers will present a variety of lectures and seminars, including a day of papers on the history of astronomy during the last century and a series of three technical symposia on the

evolution of the universe. Other features will include tours of Lick and Chabot Observatories, and exhibits of instruments, books, software, and other astronomical aids and resources.

Plan ahead. To get full information and your registration package, write: Berkeley Meeting Information, A.S.P., 390 Ashton Avenue, San Francisco, CA 94112.

ASTRONOMY AND PERSONAL COMPUTERS Joan B. Dunham

Buses — A computer bus is the means of communications between the main computer board ("motherboard") and any added boards or peripheral cards. Not all computers have the option to add extra boards. A computer design described as "single board" generally has all the components needed to communicate with peripherals on the board and needs no extra cards. Peripherals by definition are anything that is not directly controlled by the main computer board or is not located on the main board, and can include monitor, keyboard, disk drives, clock, extra memory, modem, printer, plotter, tape drive, and more. Before the IBM PC was introduced, most computer buses were virtually synonymous with the computer make. An Apple II used an Apple bus, an IBM PC its bus, and several different bus designs were used with computers based on the Z-80 chip in the CPM world. One in particular was the S-100 bus, and computers using that bus were called S-100 computers (or boat anchors because of their size and weight).

The bus specification includes both the details of the electrical and the mechanical connections of the card to the main board. The electrical connections are made by inserting the card into a slot in the main board so that copper stripes on the card match with the appropriate stripes in the receptacle. The use for each of the stripes is given in the specifications. Mechanical connections might be attaching the card to the computer frame with screws, and the bus specification details where the attachments are made and the size of the screws. Standards in bus specifications assures that computer owners can purchase add-on cards without fear that they will not fit or will not work.

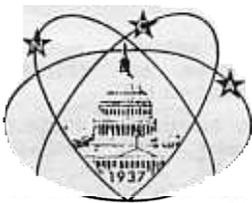
As the power and capability of microcomputers increases, new computer designs with new buses are necessary to allow full use of the newer processors. When IBM designed the PC AT, it added the AT bus, which communicates data between the main board and the card in 16-bit words, instead of the 8-bit words of the PC bus. More recently, IBM has designed another bus, the MicroChannel Architecture (MCA) bus, to accommodate the PS/2's more powerful capabilities. There are reports in the microcomputer press that yet another bus will soon be announced by IBM, and enhanced MCA bus that can operate at higher speeds than the original MCA. A competing bus architecture, the Enhanced Industry

Standard Architecture (EISA) bus, has also been announced by a consortium of computer manufacturers. The MCA bus is only available on the IBM PS/2 Model 70 and 80 computers. The EISA bus will presumably be used in designs of comparable power, if not price, to the 70 and 80.

A proliferation of confusing buses is a problem for manufacturers of computer peripherals, such as printers, modems, monitors, who would like to supply as wide a market as possible to maximize their profits. Having multiple bus architectures is also a problem for businesses, schools, government agencies, or individuals who want to use the more powerful new designs, but already have equipment, and do not want the expense of total replacement or of learning to use new equipment. They worry about the compatibility problems of going from old to new computers. There is also a danger that organizations investing heavily in the older PC AT design may find that old hardware may not be replaceable in the future, or that desirable software products may not run on the older models.

At the moment, most individuals who own a computer or two for personal use need not be concerned about the newer buses. They do not need the higher speeds or the ability to allow multitasking these designs offer. There will come a time, however, when individual computer owners will need some understanding of the different architectures, if only to protect themselves from purchasing the "wrong" model cards. Also, we can expect to find software offered in the future that will not run on the lower end of the PC spectrum. Software developers already have trouble writing programs that work for all combinations of display types, printers, computers, versions of DOS, keyboards, varieties of disk drives, and options. Their difficulties will only be compounded by additional architectures and operating systems.

It will be interesting to look back at this time at some point in the future and see if these multiple bus developments are a sign of strength in the industry, or indications of lack of leadership. Is it better in the long run to have a few standard designs, which may not meet the needs of many users, but which will be well supported by manufacturers and developers, or should we wish for a rich variety of designs, with the risk that we will become increasingly confused and find less support available?



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.

PLEASE ENROLL ME IN NATIONAL CAPITAL ASTRONOMERS MEMBERSHIP

Regular (\$32 per year) Each regular member receives *Sky & Telescope* and *Star Dust*.

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Street or box _____ Apartment _____ City _____ State _____ Zip _____

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!

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.

Telescope: Questar Duplex, 3.5-inch, Cervit mirror, full-aperture solar filter,

\$2350.00. Dan Kaplan, (301) 946-7585 (Wheaton, MD).

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