



STAR FIELDS

NEWSLETTER OF THE AMATEUR TELESCOPE MAKERS OF BOSTON, INC.

Vol. 2, No. 10

December 1991

OUR DECEMBER MEETING...

Thursday, December 12, 1991, 8 p.m.
Phillips Auditorium, Harvard-Smithsonian
Center for Astrophysics

INTERFEROMETRY WITH THE INFRA-RED OPTICAL TELESCOPE ARRAY is the subject of this month's lecture by Dr. Nathaniel P. Carleton, a physicist at the Center for Astrophysics. Dr. Carleton received his PhD from Harvard in 1955. After a few years in industry and a stint at the National Bureau of Standards, he returned to Harvard in 1962 as a lecturer and researcher at the CfA. His research over the years has been in the fields of atomic physics, the physics of planetary atmospheres, and the interstellar medium.

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Join us for a 5:45 p.m. pre-meeting dinner with our speaker at the Marino Ristorante & Market, 2465 Mass. Ave., Cambridge, MA., 617-868-5454.

NOVEMBER MEETING HIGHLIGHTS...

Our November meeting was attended by some 65 members and guests. The usual executive reports were given except for that of the Observing Committee Chairman who was absent. Our Membership Secretary, Ed Los, announced his intentions of resigning his post this Spring. Ted Poulos suggested that the ATMoB become an organizational member of the International Dark-Sky Association. After a brief discussion, a motion was made to this effect and then passed by a show of hands vote. The president, Marion Hochuli, read a letter from Erwin Shapiro, Director of the CfA, thanking the ATMoB members who participated in Science Day for Kids. Mario Motta announced that he has decided to begin the grinding of the 32-inch mirror blank that he owns.

Ed Wallner announced that Feb. 7 will be the date for the Reading Middle School star party. Some neat gadgets were displayed at the meeting: the Project Star spectroscopy kit was shown by Ted Poulos, Joseph Rothchild showed off a compact, but bright LED flashlight he purchased, and our master gadgeteer, Vladimir Vudler, passed around a multicolored LED that added blue to the red, orange, yellow, and green colors available until now. Finally, our speaker, Dr. Gordon Pettengill of MIT described and showed us incredible surface features of Venus as obtained by the Magellan spacecraft and its radar imager.

MAPPING OUR GALAXY FROM CAMBRIDGE...

On the roof of the CfA building housing Phillips Auditorium is one of the smallest radio telescopes, but one that is doing enormously important work in mapping our galaxy. Sam Palmer, Project Engineer, described this facility and its research at last month's CfA's Monthly Observatory Nights. Always a colorful lecturer and educator, Sam Palmer introduced his talk with the question what is a radio telescope. Placing a C8 on the podium he described how an optical telescope worked. He then produced a "boom-box" radio, removed the C8's eyepiece and diagonal and placed the tip of the radio's telescoping antenna at the C8's prime focus. "Now I have a radio telescope. It consists of a telescope I can't look through and a radio I can't listen to", said Palmer.

The 1.2 meter radio dish, now housed in a new 16-foot, began its original work from the roof of Columbia University in the heart of Manhattan. It was moved to Cambridge in 1986 because, as Palmer quipped, "everyone knows that it is best to make observations from the center of the universe, Harvard." Actually, since radio telescopes are not bothered by light pollution only atmospheric water vapor, its current location is fine because the air is quite dry in New England during a good part of the year.

This scope was designed to map the giant gas clouds in our galaxy. These clouds consist mostly of hydrogen molecules, but these do not radiate at radio wavelengths. Luckily, the clouds also contain carbon monoxide molecules that are excited by collisions with the hydrogen molecules and then radiate at a wavelength of 2.6 mm (or 150 GHz). The CfA's radio telescope is tuned to this wavelength and thus uses CO as a tracer for measuring H₂. The dish is equipped with a new detector, cooled by liquid helium to 4° K, that has a sensitivity of 10⁻²⁶ watts--25 times the sensitivity it had in its earlier work. Furthermore, it is equipped with a 150 channel tuner centered on the 150 GHz so that the doppler shifts caused by movements within the clouds can also be measured. The small size of this dish gives it low resolution, but this is okay, says Palmer, because of the enormous size of the objects being mapped. The CfA's radio telescope and its twin in Chile has thus far succeeded in beautifully defining one spiral arm of our galaxy, and the work goes on.

THINGS YOU MAY WANT TO KNOW...

NEW ATM_oB MEMBERSHIP SECRETARY NEEDED. Ed Los has announced his intention to resign as the club's membership secretary. Therefore, we need dedicated club members to come forth and indicate their interest in this position. The job involves the following tasks:

- Collecting membership dues.
- Maintaining the membership mailing list.
- Being our ALCOR representative.
- Maintaining S&T and Kalmbach subscriptions.

Other than an enthusiastic urge to serve, the only other qualification needed is access to a computer. If you're interested contact our president, Marlon Hochuli (603-888-0141).

SOME 35 MEMBERS who renewed their memberships from late September to October 20 may have an interruption in their S&T delivery because of a lost order to S&T. A new order has been issued to correct the situation. —Ed Los

WRISTWATCH FOUND at the clubhouse on Saturday, Oct. 26. Contact Michael Harrison: Daytime 617-338-0050, Evening 508-369-5029.

A NEW RESTAURANT for the pre-meeting dinner with our speaker has been selected starting this month. It is Marino Ristorante & Market, 2465 Mass. Ave., and it has parking in the rear of the building.

SPECTROSCOPE KITS that some of you ordered have been received and can be pick up at our December meeting. A few tips for improvements when building the kit: (1) you may want to spray the interior sections with flat black paint before assembly, (2) after aligning the grating, secure it in place with a couple of drops of glue, and (3) seal any light leaks. — Ted Poulos

MIRROR ALUMINIZING. A local source that has been aluminizing and overcoating mirrors for some 30 years is Research Service Co. It has just recently moved to a new location at 890 Lafayette Rd (Rt. 1), Seabrook, NH 03874. The price for aluminizing is \$3.00 per inch of diameter plus shipping charges. Contact Don Jaynes at 603-474-9332.

OBSERVE JUPITER THIS WINTER through the 'world class' 18-inch, f/16 Clark refractor at the Wilder Observatory, Amherst, MA. Tom Whitney of the Amherst Area Amateur Astronomers Assoc. extends this invitation to all ATM'ers. The most convenient dates in January are the 4, 10, 11, 18, 24 and 25. An over-night stay can be arranged. The AAAAA also has access to Arunah Hill, Cummington, a dark sky site with excellent horizons about 1/2 hr. from Amherst. Omega Centauri has been observed from atop this hill! Anyone want to organize a car-pooling trip? Tom has supplied me with additional info on dates, times, etc. and when he can best be reached by phone. I will be happy to provide this info to those interested (617-566-5127).

— Ted Poulos

A NEW DISCOUNT PRICE LIST FOR BOOKS from Sky Publishing Corporation is in the club's Reference Book that is always available on the rear table at our meetings. To qualify for the discount, you must be a paid up member, and you must order the book(s) by using a special order form obtained from the Secretary or Membership Secretary.

WCVB TV's CHRONICLE on Nov. 20 featured Baxter State Park and the climbing Mt. Katahdin, Maine's tallest peak. Since this has been the sight of an annual ATM_oB late summer dark skies trip, we'll make a video tape of the show available for viewing at some future meeting.

NEVER TO SEE STAR FIELDS AGAIN. Yep, that's your future starting next month if you haven't renewed your ATM_oB membership. So rush your check for \$35 (\$20 for students under 21) to our Membership Secretary, Ed Los, 7 Cheyenne Dr., Nashua, NH 03083.

NEW ATM_oB MEMBERS...

We extend a hearty welcome to the following new members and we hope your ATM_oB membership will be active and prove rewarding.

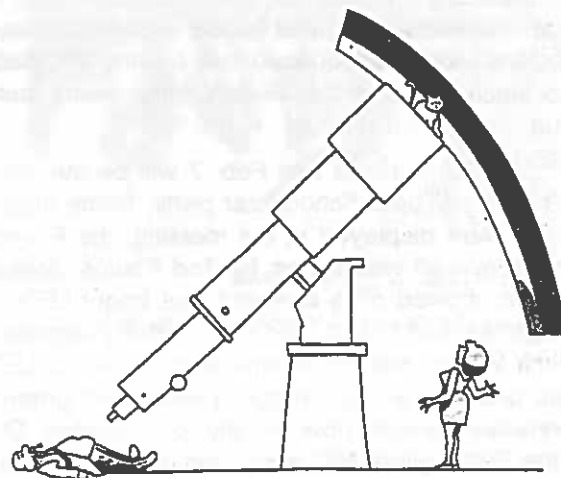
Robert Kroin Brookline, MA
Gerald I. Lipsky Brookline, MA

LET'S COMMUNICATE...

Share with all our members, not just those attending our meetings, your announcements, observing or other activities, and/or your interests and thoughts about your hobby. *STAR FIELDS* welcomes your notes or articles on items like the following:

- Comments about some astronomical telescope, accessory, or software you purchased or produced yourself.

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"So there you are, you naughty kitty."

- Astronomical trivia--a piece of interesting or unusual technical or historical information that you came across that others might find intriguing.
- Review comments about an article or book you read and would recommend to others.
- Poems, cartoons, or other philosophical reflections on astronomy.
- Reports on an observatory or other institution you visited or astronomical related event you attended.
- Notes or tips on observing and telescope making and using, or warnings of possible pitfalls.
- Good commercial sources for hard to find parts, materials, and other things needed to make a telescope or construct an observatory.

A DIFFERENT APPROACH TO PLANETARY CCD IMAGING, PART 2 by Ed Dougherty

THE PLANETARY CCD IMAGING SYSTEM. The commonly observed solar system objects, the sun, moon, and five naked eye planets are relatively bright. Therefore, the high charge transfer efficiency, long integrations, wide dynamic range, high sensitivity, and computer control so important to the deep sky CCD system are only of passing interest to the solar system camera. With any system, the energy density per unit area at the image plane increases as the inverse square of the image size. Therefore, in the interest of efficiency and minimum exposure time, we should use the smallest practical detector that can cover the area of interest with sufficient resolution.

With good atmospheric transmission, and a 14-inch scope, the Mars image brightness is about right for a 2 to 2.5 mm CCD when the image fills the detector. Any detector pixels not sensing the image are wasted. Furthermore, they increase the optical magnification requirements, slow the operation, contribute to system noise and increase the cost and complexity.

In planetary imagery, the resolution is limited by atmospheric and optical factors and seldom by the CCD's pixel count. There is an optimum detector size for each object and telescope. Because of atmospheric turbulence and diffraction limitations, using a larger (and more expensive) CCD with more pixels than the optimum will not improve the image, but more likely degrade it. The effect of more pixels beyond this optimum is analogous to the "empty magnification" that occurs when the magnification exceeds the diffraction limit of the optics. It buys nothing, dims the image, and results in a reduced signal-to-noise ratio.

Since it is not practical to have a large number of different detectors, we must choose a compromise size that works with all objects of interest, and then vary the optical magnification to fill the detector. For the planets this turns out to be a 2.5 mm square CCD with about 120 to 180 pixels per line for a scope of 8 to 20

inches. Mars, for example, has an angular size of from 15 to 20 arc seconds. If we optically vary the Mars image size until it just fills a 2.5 mm CCD that has about 180 pixels, then a 15 arc second Mars disc gives a 0.075 (15/180) arc second resolution. This is at least 25 times better than the combined optics and atmosphere will permit under the best conditions. Then why use a CCD with more pixels?

In a planetary imaging system, it is always important to use the lowest optical magnification practical to minimize aberration, and as short an exposure as possible to catch those fleeting moments of "good seeing", and "freeze them." Then repeat the short exposure as rapidly and frequently as possible to give the highest probability of catching a number of frames of good seeing moments. With a good imager like the modified Uniden camera I have been using, I use lower magnifications, and have higher energy densities than by any other technique. This is because the area of the image on the detector is about 50 times smaller than the final image you view, and requires less optical magnification to get a full screen image on the monitor. It would require an impossible 1200 to 2500X magnification with a telescope/ eyepiece to produce the same image of Mars I obtain with only 100 to 200X using my CCD camera and the same telescope.

My system yields a large, bright image on the detector which allows for exposures from 0.01 to 0.03 seconds. This is much shorter than most deep sky imagers permit, and 10 to 50 times shorter than the visual integration of the eye. But when viewing the monitor image, the brightness level is similar to normal day time seeing, and the persistence of the eye is shortened.. Much of the atmospheric blurring is seen as a small image motion that the bright adapted eye can easily follow, and is, therefore, reduced or eliminated. Then if one still frames the video, or photographs the monitor image, the integration period can actually be 0.01 to 0.03 sec., and seeing is essentially frozen. Once the exposures are short enough to take advantage of those moments of good seeing, the next area for improvement is image contrast. -- Continued next month



The 1992 WINTER STAR PARTY.

SOUTHERN CROSS ASTRONOMICAL SOCIETY, INC.

Jan. 28 - Feb. 2 at Camp Wesumkee, Florida Keys.
Contact Bob or Sharon Grant, 5401 SW 110th Ave.,
Miami, FL 33165, 305-595-8778.

MARKETPLACE...

WANTED Telescope Making #30 to complete my collection. Call Bob Collara 617-275-9482.

FOR SALE Quantum 4, a 4-inch Maksutov, enhanced silvered mirrors, recently aligned by manufacturer, with mount, drive, camera adapter, 16 mm Clave Plossl, and original wooden case. Price \$1350. Peter Bealo, 603-382-7039.

FOR SALE 20 mm University Optics widescan eyepiece. Needs more "in travel" than my focuser can give. \$95 or best offer. John Samolyk, 617-391-9290.

COMING EVENTS...

Dec. 19 CfA MONTHLY OBSERVATORY NIGHTS, "Cosmic Raisins: Galaxies and the Age of

EXECUTIVE BOARD 1991-92...

PRESIDENT: Marion Hochuli, 603-888-0141
VICE PRESIDENT: Bernard Volz, 508-881-3614
SECRETARY: Ted J. Poulos, 617-566-5127
MEMBERSHIP SEC: Edward J. Los, 603-880-6219
TREASURER: Anthony Costanzo, 508-521-4209
MEMBERS AT LARGE: Mario Motta, 617-334-3648
John Reed, 617-861-8031
PAST PRESIDENTS: 1989-90 David Aucoin
1987-89 Gary Walker
1985-87 E. Talmadge Mentall

COMMITTEES...

OBSERVING: Ed Dougherty, 508-458-8857
WORKSHOP: Greg Chase, 617-272-9394

the Universe" by John Huchra, CfA, 8 P.M., Phillips Auditorium, CfA, Cambridge, MA. For more info call 617-495-7461.

Dec.3-Jan 1 THE CHRISTMAS STAR, Hayden Planetarium, Admission \$6, call 617-723-2500 for times.

Dec. 21 ATMoB MONTHLY OBSERVING NIGHT at our clubhouse in Westford. MA.

JANUARY STAR FIELDS DEADLINE...

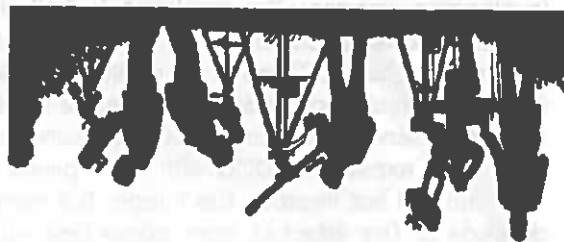
December 27th is the deadline for items to be included in the January issue of STAR FIELDS. Mail or phone your contribution to Ted Poulos, 18 Cushing Rd., Brookline, MA 02146 (617-566-5127).

HOW TO FIND US...

MEETINGS: Held the second Thursday of each month (September to July) at 8 p.m. in Phillips Auditorium, Harvard-Smithsonian Center for Astrophysics, 60 Garden St., Cambridge, MA. Parking available on the grounds.

CLUBHOUSE: Open every Saturday from mid-afternoon to late evening. It is the white farmhouse on the grounds of MIT's Haystack Observatory in Westford, MA. Take Rt. 3 north from Rt. 128 or 495 to exit 33 and proceed west on Rt. 40 for 5 miles. Turn right at the MIT Lincoln Lab, Haystack Observatory sign at the Groton town line. Proceed to the farmhouse on the left side of the road. Since clubhouse attendance varies with the weather and other activities, it is wise to call ahead: 508-692-8708.

FIRST CLASS



3rd Saturday of Every Month

ATMoB MONTHLY OBSERVING NIGHT

AMATEUR TELESCOPE MAKERS OF BOSTON, INC.
c/o Edward J. Los
7 Cheyenne Drive
Nashua, NH 03063