

FOCUS



DELAWARE ASTRONOMICAL SOCIETY



Next Meeting – October 21, 2008 at 8:00 PM
--The *Pluto Express* Mission--
Speaker: Greg Lee
Mt. Cuba Astronomical Observatory

Vol. 53, No. 8, October, 2008

FROM THE PRESIDENT ■ *Hank Bouchelle*

Greetings! I hope that everyone has been enjoying this gorgeous autumn weather. And it has not been bad for observing, either!

I hope, too, that folks will take a minute to check out our finalized program schedule for the coming season, listed on the DAS website at http://www.cis.udel.edu/~chester/das/das_meetings.html and in this issue of *Focus*.

This month's program features Greg Lee's long awaited (and much anticipated!) talk on the *Pluto Express* mission. Come join us for what promises to be an informative and interesting evening.

Speaking of our meetings, there are a few items of which I would like to make the general membership aware...

A pleasant way to end the evening, and to provide an opportunity for fellowship and good conversation, is to have refreshments available. I am hoping that one or more individuals will take over this task. The DAS has funds to reimburse expenditures. We only need individuals or an individual who can purchase a selection of goodies and help set up.

One issue that few of us consider is the matter of closing and locking up the facility after our meetings. In the past this task has fallen to one or two members. If you hold a key to the Observatory, and might be willing to be on a rotating list of individuals willing to close up the facility, please let me know.

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DAS BOARD MEETING
7:00 p.m., October 21, 2008
at the Mt. Cuba Astronomical Observatory

Agenda:

Review of September's minutes
Treasurer's Report – Bob Mentzer
Standing committee reports/requests/notes
Focus/Publications – Joe Neuberger
Library- Glenn Bentley
Education Programs- Bob Karcha
Sawin Observatory Tom Sidowski
Observing – Greg Lee
Disposition of 50th Anniversary booklets
Astronomy Course Update?
Dates
Curriculum revision
Speaker topic determination
Nicastro
Summerfield
Expanding use of e-mail list
Forward Planning
Anniversary of the telescope and Galileo's observations
Others?
Refreshment Chair
Facility lock-up
Awards Committee
LJPE Award
Astronomer of the Year Award
Chartered Awards Committee
Other?

FROM THE PRESIDENT ■ *(continued from page 1)*

It is not too early to begin thinking about the spring, and the Luther J. Porter Educator and the Amateur Astronomer of the Year Awards. If you have someone who you think is worthy of either of these honors, please let me know. We will soon have a committee in place to evaluate candidates and make nominations.

Finally, it is more than worth noting that our own Al Webber celebrated his 101st (yes, that's right, 101st!!!) birthday on October 10. Be sure to offer your congratulations. I, for one, would love to know how he did it!

MCAO PUBLIC NIGHTS ■ *Emil Volcheck*



The Mt. Cuba Observatory Public Nights continue year round! In addition to learning about many aspects of the heavens, you'll have a chance to visit and

view our new all-digital full-dome planetarium, one of the first of its kind in the entire United States! You can pick up a schedule when you next come to a meeting - or get the latest updated version off the website at: <http://MountCuba.org>. Programs are presented on Monday nights at 8pm. Some upcoming events are:

Oct 20 - Lynn King "Life & Times of Caroline Herschel"

Nov 3 - Sheila Vincent "Tales of the Night Sky"

Nov 17 - Don Wilson "The Solar System"

STAR PARTIES AT MT. CUBA ■ *Tom Sidowski*

Star parties are usually held on the grounds of the Mt. Cuba Astronomical Observatory. You can bring your own scope or just come to observe through others. Telescopes in use may include the club's 12.5" Newtonian reflector, 17" Coulter Odyssey 2, or 6" Orion SkyQuest XT6 Dobsonian (when not on loan). Star parties are always weather permitting.

Friday, Oct. 20th - at dusk

Friday, Nov. 7th - 8:00pm

Friday, Dec. 5th - 7:30pm

2009 OBSERVER'S HANDBOOK ■ *Bob Mentzer*

It is now time to order the *2009 Observer's Handbook*. The cost will be \$18. You can reserve a copy by calling, emailing, or seeing me at the October meeting.

Robert Mentzer-764-1926-RobMentzer@comcast.net

VOLUNTEER NEEDED FOR MCAO LIBRARY ■

The Mt Cuba Observatory is looking for a volunteer to help out its library. The work involves cataloging new additions to the collections (we have a number of uncataloged items now), selecting and arranging for magazine binding and just plain clean up, fix up. No special background knowledge is required, tho learning some of the Dewey decimal cataloging system is needed.

The time commitment is a few hours a week (tho initially more will likely be needed to get up to speed). If you are interested and can help, please contact Emil Volcheck at mtcuba@udel.edu or 302-654-6407.

MAGAZINE SUBSCRIPTIONS ■ *Bob Mentzer*

You can now mail *Sky and Telescope* subscriptions, at the club rate, directly to S&T. If the renewal card says \$32.95 you will save 5 cents over the \$33 we charge for a renewal. Both S&T and *Astronomy* send out renewal notices about 6 months before your subscription expires. These renewal forms don't have the expiration date for your subscription. But this information is part of the mailing label that is printed on the front cover of each month's magazine. So if you're not sure of your expiration date, check the magazine label before you send S&T a check. *Astronomy* subscriptions must still be processed through the club to get the favorable subscription rate.

LOANER TELESCOPES ■ *Tom Sidowski*

One of the best advantages of being a member of the Delaware Astronomical Society is that all members have the privilege of being trained to use and then borrow equipment owned by the club for personal use. Currently, we have two scopes available for loan: a Celestron 8" Schmidt-Cassegrain, and a 6" Orion SkyQuest XT6 Dobsonian reflector. The loan is for at least a month. If you're interested in checking out either of these scopes, contact Tom Sidowski at 239-1844.

LIBRARY NEWS ■ *Glenn Bentley*

At the end of the September meeting Michael Cimorosi stopped by the library to donate "*Solar Interior and Atmosphere*" presents observational data derived from the world's largest solar telescopes, which is correlated with theoretical discussions in nuclear and atomic physics by contributors representing a wide range of interests in solar research. I would like to thank Michael for his generous donation and invite members to the library at the end of our next meeting.

PLANETARIUM FULLY OPERATIONAL ■ *Scott C. Jackson*

Any one who knows how to do live shows can do that now. The automated shows that Rob Lancaster had put together are not there because they got lost when the hard drive was reformatted some time ago. We are working on getting a few automated shows. But we are now fully operational.

DAS ASTROPHOTOGRAPHY SPECIAL INTEREST GROUP ■ *Bill Hanagan*

The next meeting of the AP SIG is scheduled for 7:30 P.M. on Friday, November 14 at Mt. Cuba. The DAS astrophotography special interest group (DAS AP SIG) meets on Friday nights at 7:30 P.M. every other month at Mt. Cuba regardless of weather. The SIG also meets for photo shoots scheduled on 1-2 day notice to synchronize with the weather.

The monthly meetings are informal and typically include the presentation of astrophotos taken by the members along with an extended question and answer period. Objects commonly photographed include constellations, auroras, lunar eclipses, and planetary photos, as well as a wide variety of deep-sky objects such as nebulae, galaxies, star clusters, etc. The topics discussed cover the entire gamut of astrophotography, from how to get started with a minimum of equipment, to polar aligning your telescope, all of the way to the fine points of using auto-guiders and post-processing digital images.

You can get started in astrophotography with just your current camera mounted on a tripod or a motorized telescope by taking wide field photographs of meteor showers, conjunctions, constellations, and star trails. As you move to progressively fainter and smaller subjects, you'll need better equipment. Joining the AP SIG is a great way to learn what equipment you need and what works well before you spend your money.

If you are interested in joining the AP SIG, just email your name, address, and phone number to me at hanaganw@comcast.net (using "@" and "." in place of ? and ?).

Finally, please consider submitting one or more of your favorite astrophotos for publication in the Focus. You can email your photo(s), along with a brief description of how you made them, to our new Focus editor, Joe Neuberger (jrneuberger@gmail.com). Please include a brief description of how you made each photo along with a by-line so each photo can be properly credited.

SAWIN OBSERVATORY REMINDER ■ *Tom Sidowski*

The DAS maintains a club observatory on the grounds of the Mt. Cuba Astronomical Observatory. The Sawin Observatory houses the club's permanently mounted 12.5" reflecting telescope and a 17.5" Coulter Odyssey 2 Dobsonian telescope. It is for the use by club members once they are trained and checked-out in a simple operating procedure. Members who are interested in becoming key holders of the Sawin Observatory should contact me at 239-1844 to arrange for training in the use of the facility.

DAS AMATEUR TELESCOPE MAKING SPECIAL INTEREST GROUP ■ *Bill Hanagan*

The DAS Amateur Telescope Making (ATM) Special Interest Group (SIG) meets on evenings and weekends according to the availability of the members and the particular projects that are underway. The general range of activities of the ATM SIG includes all manner of telescope making, mirror making, and the making of accessories for telescopes and observing.

Anyone interested in joining the ATM SIG should email their name, address, and phone number to me at hanaganw@comcast.net (using "@" and "." in place of ? and ?). Meeting dates are announced primarily by email, so if you are interested in telescope making, be sure to let me know!

DAS FORUM / E-MAIL SITE ON YAHOO

■ *Don Shedrick*

This is a restricted e-mail service for use by DAS members for DAS purposes. To use this site, go to <http://groups.yahoo.com>; search for Delaware Astronomical Society; and click on the link that comes up. To join, you must have a Yahoo ID and password; if you don't, you can register at this time by following Yahoo's instructions. You will then be allowed to "Join the group" upon clicking in that box. You must then register for the DAS group and add your profile by clicking on "add new profile" and completing the form. When adding or editing your profile, you will need to enter your actual name in the "Real Name" box so you can be identified as a DAS member so Don Shedrick can approve your application to join the DAS group, and everyone will know to whom they are communicating. Finally, specify your desired email address for delivery of messages. Note- you may choose to not have your name and email address displayed to anyone other than DAS members who are members of the Yahoo DAS email group.

For more detailed instructions, go to the DAS website under DAS Resource Links.

MEMBERSHIP EXPIRATION NOTICES

If you receive the *FOCUS* by email, you will be notified by email. If you receive it in the mail and the mailing label on the envelope containing your *FOCUS* is marked with Red Marker, your membership is expiring or has expired. To continue to receive the *FOCUS*, *Sky and Telescope* or *Astronomy*, and *Reflector*, send the renewal form below with your check to:

DAS, c/o Robert Mentzer
605 River Road
Wilmington, DE 19809

The DAS 12.5" Newtonian

Member Records Its History & Proposes
It Be Named for *Gerard Edmund Audy*

(PART 1 OF 2) ■ *Emil Volcheck*

[Story reviewed for accuracy by long, long time members, Jack Snyder and James Kauer, both of whom played key roles in the featured projects.]

The year 2000 was the 40th anniversary of the completion of the DAS's *Leroy S. Sawin Observatory*. In 2002, we reached the 40th anniversary of the completion of the 12.5-inch Newtonian reflecting telescope that has been the club's prime observing instrument since mid 1962.

Many years ago, the observatory building was named in honor of its designer, Roy Sawin, and was commemorated by a ceremony and the installation of the plaque that is mounted on the outside, south wall of the building. The story of that project has been told elsewhere, however, it may not be clear to our present members as to why the building and the telescope it houses have significantly different completion dates and who was responsible for those completions.

My purpose in writing this account is to update our members on the history of the Sawin Observatory and to propose that the special telescope it houses be named in honor of the key person who made its existence possible - Mr. Gerard (Gerry) Edmond Audy. Obviously, in a project of this kind, one person did not do it single-handedly; and a lot of then DAS members helped - but I hope that this summary will make clear Gerry's major role and why I feel that honoring him for the work is long overdue!

To start the story, we first should recall that the DAS was "officially" founded in November 1956, at a meeting held at the home of Mr. Rene Van Caneghem - who was then a design engineer in the Engineering Department of the Du Pont Company and became the second president of the club in 1958. It was, therefore, only in the second full year of the club's operation that the idea for an observatory was hatched, and the project took on real form in 1959. At that time, Emil Volcheck was appointed chair of the recently formed Observatory Committee - which was assigned the challenge to select a design and build a club observatory and telescope to enhance the member's abilities to observe the heavens (in what, by the way, was a significantly better sky than that which we now "enjoy"!!).

The committee had a number of meetings on just how to tackle the project, including a chicken and egg question relating to the primacy of the building or the telescope...

Those deliberations led to the strategy of constructing and putting into operation the building first, to be followed at some, then undefined later date, a telescope, also of undefined type. The rationale for this sequence was that getting the building up and operating would provide a shelter for member scopes, club paraphernalia and library. All would be usable no matter how long the then-undefined telescope construction might take.

Note: purchase of land in Maryland was agreed on. However, Mr. Harcourt C (Ace) Vernon and other members of the then fledgling Mt. Cuba Astronomical Observatory (MCAO) made an offer to DAS of a spot on the property that was being donated by Dr. Arthur Valk for that facility. They also offered to aid the fund raising for the DAS building and telescope with dollar-for-dollar matching funds up to \$1,000 for each project. They wanted to have one place in Delaware that would be the focus of astronomy-related activities.

Then the committee solicited ideas from all the members as to the kind of building that we should put up - primarily the question was "should it be a dome or roll-off roof type"? One of the committee members, Leroy Sawin, proposed the "winning" roll-off roof design and we still have the exhibit that he offered to the committee to illustrate his ideas.

With the acceptance of Roy's proposal, the club undertook a fund raising drive (under the auspices of Recreation, Promotion & Services, Inc. to provide for tax deductible contributions) that generated the money to hire a contractor to construct the building. Roy took the lead role in providing the detailed drawings that were used to obtain the bids - and in awarding the contract to Mr. Joe Maciey, a local builder. His prompt, and workman-like, operation resulted in the completion and opening of the building in 1960. As we noted, there was no telescope in the building; but it was ready for one (including the 3-foot square hole in the floor for the future telescope pier)! So, while members could bring their own telescopes out to the site - and even store some in the new building - we now had this great, but EMPTY building to provide the impetus for a telescope to fill it!

In about April of 1960, somewhere around the time that the building was nearing readiness, the

(Continued on Page 6)

**DELAWARE ASTRONOMICAL SOCIETY
BOARD OF DIRECTORS'
MEETING MINUTES**

September 16, 2008

PRESENT: Hank Bouchelle, John Case, Bob Mentzer, Lynn King, Bill Hanagan, Dan Chester, Bob Karcha, Greg Lee, Glenn Bentley, Sarah Baird, Tom Sidowski, Joe Neuberger

TREASURER'S REPORT: Bob M. reviewed finances. Report attached to hard copy of the minutes. Astronomy Magazine sent 4 meteorites as a promotion. Use them as door prizes for Christmas party or May Dinner. Gained approx \$800 (3 months) Focus going from being mailed out to posting on Website.

LIBRARY: Glenn B. suggested that library get a Barlow lazer collimator for possible use by members. Glenn and Bill H. will discuss what model would be good and cost (\$100 – 150) and get back to Board. Tom S. asked from what part of budget funds would be allocated. Hold off until cost is researched.

ASTRONOMY COURSE: Hank asked Greg L. to come up with some weeks. Coordinate with MCAO. Need new/fresh course material. Bob M. will look on DelawareOnline for ad prices. Bill H. brought up that once we paid for an ad, it is possible News Journal would not consider public service add.

FOCUS: Problems accessing through link and web site. Bob M. sent out Focus reminder emails.. Lynn K. accessed Focus through MCAO's web site. Discussion about sending attached to email notice and link to web site. Sarah pointed out that some people might not have current Adobe software to open attachment. Bill H. had question about why pictures came out darker than his original pictures. Joe asked that pictures be sent to him in a size that he doesn't have to modify.

C-8 and STORAGE: Per Tom S., proposal submitted to MCAO and accepted. The C-8 #39 is on permanent loan to MCAO for display. There is space allocated in the storage room to the DAS.

LOANER TELESCOPES: Lynn K. brought up Bill H's mention of the two loaner scopes not being a good choice for visual observing. He would like to add an 8-10 inch Dobsonian. Lynn suggested selling two loaners and buy one that is more user

friendly. Also possibly consider a 4 – 5 inch refractor for astrophotography. Consider a scope that people could try out astrophotography – cost would make it prohibitive. Bill H. would like to see Sawin used. 8-inch Dobs are most practical. Observatory and Equipment group will discuss selling the 2 Schmidts and buying an 8-inch Dob that is more user friendly. Discussion of go-to scopes – more expensive. Consider Dobs that have “push-to” technology. Orion has a push-to Dob. Bill H. questioned quality of optics.

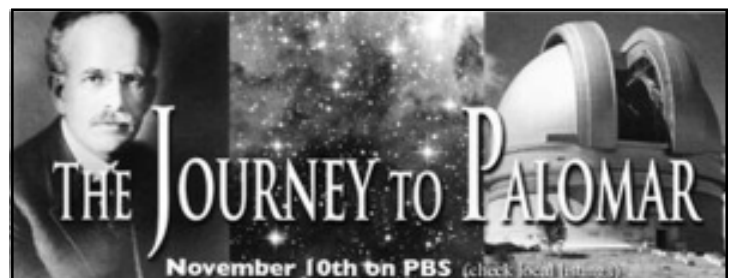
OBSERVING: Greg Lee reported a busy summer at Bellevue St. Park (twice a month during summer) star gazing and full moon hikes. They requested to extend monthly stargazing through Sept, Oct., Nov.

MONTHLY PROGRAMS: Hank B. put out question of remuneration for speakers. Last year we gave speaker \$75. Discussion, who should be paid, who shouldn't and how much. Do we set a precedent? Dinner speaker - \$100, meeting speaker \$75. Members of group not paid. Something given to featured outside speakers/travel expenses. For minutes: Going forward, pay only dinner speaker; for meeting speakers - expenses to be determined on case by case by basis.

MISCELLANEOUS: Looking for Refreshment Chair. Need someone to stay and lock up. Sending out reminder email notices of different events coming up with an opt out option. Suggestion - calendar on web site that would post upcoming events. Discuss DAS Calendar on web site next meeting.

12-INCH SCOPE: Emil V. proposes to name the scope after the person who was instrumental in it construction – Gerry Audy. A 2-part history of the Sawin Observatory and telescope in Focus good idea.

Respectfully submitted,
K. Lynn King
Secretary



12.5" NEWTONIAN

(Continued from Page 4)

Observatory Committee put out an appeal for assistance in selecting a telescope design, of about 12" aperture, and the modus to get it in place.

While the observatory was being finished, the telescope design process continued. Members were solicited for actual designs, should they so choose, in addition to features suggestions. I believe that, in addition to many suggestions of features, we actually received three fairly detailed design proposals. One of the most detailed of those designs was provided by Gerry Audy.

Gerry's design was for a very rugged, fairly conventional German equatorial mounted Newtonian reflector - with a rotatable eyepiece end to overcome some of the awkward aspects of using such a scope. The design called for use of large castings from which some of the final parts would be machined. Gerry's offer to make those patterns and oversee the casting, plus shepherd the whole construction, tipped the selection in favor of his proposal.

One bone of contention, once a Newtonian had been chosen, was the focal length of the mirror. There were two schools - the ambitious future astrophotographers who wanted something like an f/4-5 system - and the planetary guys - who wanted more like an f/10! We ended up splitting the difference - an f/7, a somewhat unconventional focal length for such a scope.

By early 1961, the design had been completed, design drawings had been made by Rene van Caneghem; and these had been sent out to a

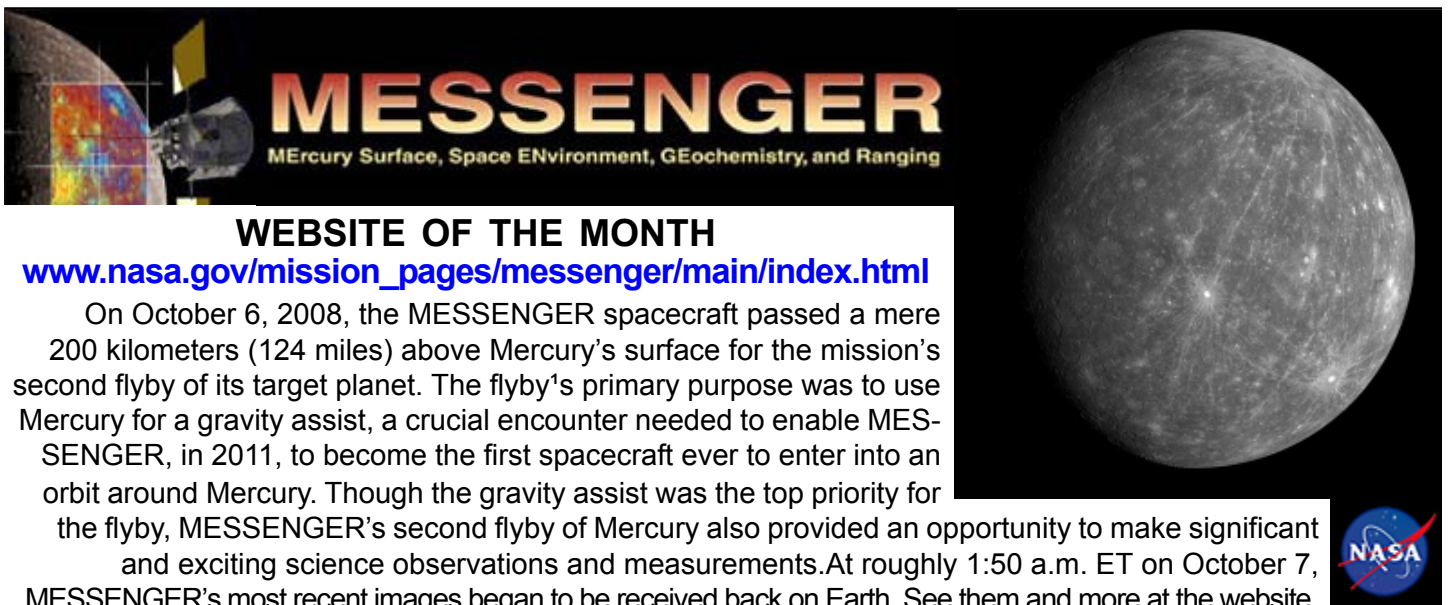
number of machine shops in Delaware and SE Pennsylvania for bids on the machined parts.

We got a break in March of 1961, when Dr. Armand Spitz offered the club a 12.5" mirror blank - which had been serving as sort of an ash tray at his home in Yorklyn. He told us that he had got this blank during celebration of the 200" mirror that went into the Palomar Hale telescope. A number of smaller mirrors - in the 12 to 20" range - had been poured from the same type of glass as used in the actual big mirror. Some of the notables at the ceremonies, like Dr. Spitz, received these blanks. He had started to grind the mirror, but other pursuits had intervened (like running a planetarium company!) and it had become a decoration many years ago. He had also misplaced the tool; so that would have to be replaced for the grinding to proceed. He made his offer to the DAS contingent on our pledge to make an actual working mirror and put it in a working telescope. Naturally, we agreed!!

Later, during the grinding and polishing of the mirror, we came to appreciate the extremely low thermal expansion of this special glass. It held its figure over a very wide temperature range; testing of the mirror could be done almost immediately after the glass was worked, rather than waiting for it to cool down.

Responsibility for managing the fabrication of the mirror was accepted by member Sylvester (Syl) Schneikart, who worked at the Du Pont Experimental Station machine shop (the same organization that then employed Gerry Audy). The story of the mirror making will (I hope) be told elsewhere.


[Part 2 of the story next month]



MESAENGER
MErcury Surface, Space ENvironment, GEochemistry, and Ranging

WEBSITE OF THE MONTH
www.nasa.gov/mission_pages/messenger/main/index.html

On October 6, 2008, the MESSENGER spacecraft passed a mere 200 kilometers (124 miles) above Mercury's surface for the mission's second flyby of its target planet. The flyby's primary purpose was to use Mercury for a gravity assist, a crucial encounter needed to enable MESSENGER, in 2011, to become the first spacecraft ever to enter into an orbit around Mercury. Though the gravity assist was the top priority for the flyby, MESSENGER's second flyby of Mercury also provided an opportunity to make significant and exciting science observations and measurements. At roughly 1:50 a.m. ET on October 7, MESSENGER's most recent images began to be received back on Earth. See them and more at the website.





Members braved intermittent seeing at the September 20 star party at Mt. Cuba. Here, under the watchful eye of Tom Sidowski, the Sawin



Observatory was opened and the Ring Nebula observed through both the 17" and 12.5" telescopes. Don't miss the next party on October 17 at dusk!

Spread the Word About the 2009 International Year of Astronomy!



In 2009 we celebrate the 400th anniversary of Galileo's first observations of the heavens. Help us spread the word about astronomy's contributions to society. Bring a friend to a star party! How about Friday, October 17th at MCAO!

DAS CONTACTS

Please call any of us with your concerns!

Membership: Any of the following:

President: Hank Bouchelle-----302-983-7830
Vice President: John Case -----302-836-4888
Secretary: Lynn King -----302-764-8816
Treasurer: Bob Mentzer-----302-764-1926
DAS/MCAO Advisor: Emil Volcheck---610-793-5156
Education Chair: Bob Karcha-----302-999-9509
Messier Club: Lynn King -----302-764-8816
Observing: Greg Lee -----302-762-5358
Youth Coordinator: Sarah Baird -----302-561-0810
Archivist: Rene Van Caneghem ---410-392-3718

Board Members at-large:

ATM and AP SIGs: Bill Hanagan -----302-239-0949
Chairman, Observatory Committee and Monthly Star Parties: Tom Sidowski -----302-239-1844
By-Laws: Henry Bouchelle -----302-983-7830
Light Pollution Strategist: Greg Weaver--302-239-1338
Library Chair: Glenn Bentley -----610-869-0706
Ad Hoc Star Parties: Sheila Vincent---302-322-4739
Elections Comm. Chair: Sarah Baird--302-561-0810
Awards Comm. Chair: David Swartout--302-836-4618
FOCUS Editor: Joe Neuberger-----302-655-2142
MCAO Web Page: www.MountCuba.org
DAS Web Page: www.DelAstro.org



FOR NEW MEMBERSHIPS or RENEWALS

If you have questions, call any of the member representatives listed. Otherwise, just check the appropriate boxes and complete the form below. Print it or cut it off and send it with your check to Bob Mentzer at his address on the form. The magazine prices are group rates to DAS members. If you're just joining us for the first time,

THANKS, and welcome to the DAS!

MEMBERSHIP or RENEWAL FORM

Please make checks payable to DAS, c/o Robert Mentzer, 605 River Road, Wilmington, DE 19809

New Member
 Renewal

Senior/Family Membership \$20.00
 Junior membership (16/under) \$10.00
 Sky and Telescope Magazine \$33.00
 Astronomy Magazine \$34.00

NAME _____

STREET ADDRESS _____

Total Submitted _____ \$

CITY _____ STATE _____ ZIP _____ TELEPHONE _____

E-MAIL ADDRESS _____



A circumhorizontal arc or circumhorizon arc (CHA), also known as a fire rainbow.

ASTROPHOTOGRAPHS OF THE MONTH FOR NOVEMBER 2008

PLEASE submit photos to the editor at JRNeuberger@gmail.com

Fire Rainbow and Northern Lights over Yellow Knife Canada

This is a fire rainbow - a very rare natural occurring atmospheric phenomena. Clouds have to be cirrus, at least 20k feet in the air, with just the right amount of ice crystals and the sun has to hit the clouds precisely.

Craig Tracy, Canadian friend of Focus editor Joe Neuberger, sent along these photos from Yellow Knife, Canada of a magnificent arora and testimony to frigid temperatures to come.



Aurora over Yellow Knife, Canada.



Saturn · August 1995

HST · WFPC2

PRC95-31 · ST Sci OPO · August 11, 1995 · P. Nicholson (Cornell University), NASA

Saturn's rings edge on.

The picture at left, from Hubble, reminds us of what's in store next year when Saturn again "loses" its rings

Member Classifieds:

Please feel free to submit classifieds for inclusion to JRNeuberger@gmail.com.

For Sale—Megrez 90 FD APO refractor. Includes case, tube rings and 2" carbon fiber diagonal. Excellent star test and in mint condition. \$600 Contact Dave Sewell 302-757-5000