STAR STUFF

The Newsletter of the Ford Amateur Astronomy Club

August 1999
Volume 8 Number 8

MIR to De-Orbit THIS MONTH (???)

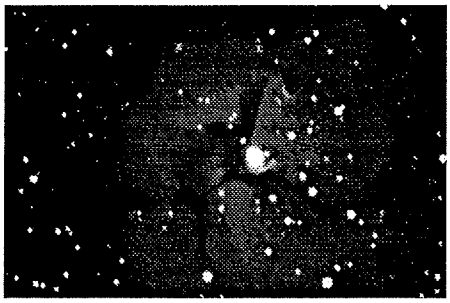
IN THIS ISSUE...

CCD ASTRONOMY - GETTING STARTED

by Jack Kennedy

The technology that brings CCD imaging to us amateur astronomers is pretty amazing. With a modest investment in equipment we can put together a system to take images of objects that not long ago were only accessible to professional astronomers and their equipment. We owe this to the development of the CCD chip.

To take an image of the night sky requires a CCD imager and a mount that can track the night sky accurately. Most CCD cameras need a computer to control the camera and receive the image. This means having a computer close to the telescope. From the computer you take an exposure that is then downloaded from the camera to the computer screen and you see your image. Getting an image this quick allows us to see what corrections you may need to make before the next image. Now lets look at the equipment necessary for imaging.



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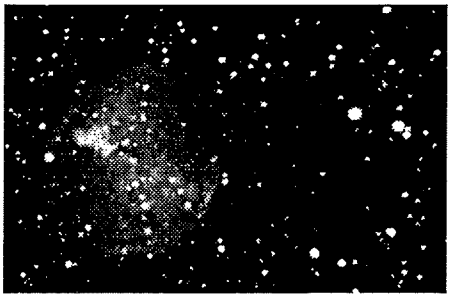

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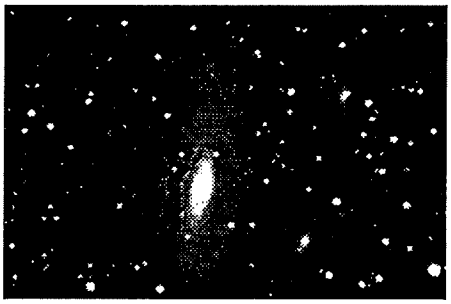

NGC 7331

The Telescope -- The telescope will need to have a drive system to track the object you would like to image. Accurate tracking can be accomplished in two ways, assuming most amateur telescope mounts have less than perfect tracking. We can guide the scope using a set of optics like a guide scope or off-axis guider equipped with a reticle eyepiece. We align on a star and manually guide the telescope, or we use a CCD camera to send corrections to the telescope mount.

The CCD Camera -- Before a particular CCD camera is purchased you need to look at the sizing of the particular CCD chip to the particular telescope and its focal length. The rule of thumb is to have each pixel cover 2 arc seconds of sky. For a further discussion on this topic see the article "CCD Basics" on the Northern Cross Observatory web site or past issues of the Star Stuff *[see the March 1999 issue. -Ed.]*. The CCD camera needs to be attached to the telescope. This is normally done by attaching the camera in the same manner you attach an eyepiece. The camera then needs to be linked to the computer for control and download of the image.

The Computer -- Because we are working outside, it is normally recommended we use a laptop computer.

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Your submissions to STAR STUFF are welcome. Please write to the address above or contact the editor...

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Ford Amateur Astronomy Club

Officers:

President	Dan Kmiecik
Vice President	George Korody
Secretary	David Beard
Treasurer	Ray Fowler

General Meetings:
The Ford Amateur Astronomy Club holds regular general meetings on the fourth Thursday of each month (except the combined November/December meeting held the first Thursday of December) at 5:00 PM in conference room 1491 in the Ford Credit building in Dearborn, Michigan.

Observing:
The Ford Amateur Astronomy Club observes at Spring Mill Pond within the Island Lake State Recreation Area near Brighton, Michigan. The club maintains a permit for after-hours access. Weather permitting, the club observes on Friday nights, Saturday nights, and nights before holidays.

Hotline:
Observing schedules and additional club information is available by calling the Observing Hotline at (313) 390-5456.

Club Membership:
Membership in the Ford Amateur Astronomy Club is open to Ford employees and non-employees. Write or call for an application.

Annual -- new: $ 25 renewal: $ 20
Lifetime -- $ 100

Membership includes a subscription to the STAR STUFF newsletter, discounts on ASTRONOMY and SKY & TELESCOPE magazines, after-hours access to the observing site, and discounts at selected area equipment retailers.

Care should be taken using devices that require 110 volts where they could get damp or wet. The computer needs to have sufficient disk space to store the night's images. The screen of even laptops can be very bright even in the "night mode" of most imaging software. This can interfere with your night vision and also those near you. You will want to enclose the computer screen in some way, either with an enclosure or with red film over the screen.

Alignment -- The first step in imaging is to make sure your telescope is properly aligned. Time should be taken before attaching the camera to assure accurate alignment. Alignment does two things for us. We need to point the telescope at an object and have it pointed accurately enough to have the object within the field of view (FOV) of the CCD chip. Most amateur CCD cameras have fairly small chips. The next thing a good alignment does for us is track the object close enough to keep the object or stars in the field of view from blurring or appearing larger than they should.

Focus -- One of the more difficult steps in CCD imaging is focusing the desired object. There are a few ways to make this more manageable. With the telescope pointed at a medium bright star we take an image. Assuming for the moment that the star is in the field of view of the chip, we get an image. If we see a donut shape like we see when we take a star out of focus with an eyepiece, then we need to adjust the focus. A rough focus can be achieved by placing translucent tape over the visual back with the camera removed. We can then see the image on the tape and try to make it as small as possible. This can also be accomplished with what is called a parfocal eyepiece.

The parfocal eyepiece has the same focus point as the camera. If we put this eyepiece in and focus, we will get a good focus with the camera. Once focused we reattach the camera and go back to the computer. Most camera control software has a focus function. This will allow us to sharpen the focus. The camera will take rapid images and display them as we adjust the focus on the telescope. If the camera being used can "bin" pixels, we use the maximum binning to speed up the image acquisition. Some software also has a graphic representation of the star to help maximize the brightness and minimize the size.

The image -- CCD camera's have electronic noise due to their components. This noise will show itself as white pixels on our images that are not part of the object we wish to record. This noise is fairly constant for a given temperature and exposure time. The more we lower the temperature of the CCD chip, the less noise we collect. To remove this unwanted addition to our images we take what is called a dark frame.

The dark frame is an image of the noise. We take a dark frame by taking an exposure of the same duration and temperature as the desired image, but with the shutter closed or the telescope aperture covered. With this dark frame we can subtract this image from the image of our object. This give us a fairly clean image.

Once we take our image and subtract the dark frame we see a good representation of the data we collected. This is our raw data. The longer the exposure, either by one long exposure or multiple combined images, the greater the signal compared to the noise. This is the signal to noise ratio. With digital processing techniques we can often bring out more detail or balance the brightness and contrast to make the image more appealing.

Advanced Imaging Techniques

Remote operation can be accomplished by using a "GoTo" telescope mount like the Meade LX200 series or the Astro Physics GoTo mounts. These mounts allow us to point the telescope from a computer. We can now point the telescope and take an image from a computer. With the addition of an electric focuser we can also automate that operation. With this type system in place we can completely control our

imaging session from the computer, possibly a more comfortable location.

Color images can be achieved using a CCD camera with color capability, or by adding a color wheel to your existing camera. The normal method to achieve a color image is to take a set of images and combine them. We need to take a red, green, and blue image and combine them. This gives us an RGB or true color image. This can also be done with multiple images stacked together to give the desired exposure time. ☆

HEART OF NEW MEXICO STAR PARTY

by Dick Lawrence

On the weekend of July 9,10,11 the first star party was held at Corazon Hill RV Park near Las Vegas, New Mexico. Friday night was not clear enough for stargazing as there was a lot of thunderstorm activity that day. I was told that 4 inches of rain fell in two hours. But things cleared up for Saturday night and we had a beautiful clear night. An old astronomer stated that he had seen objects that night that he had not been able to see in over 20 years. It appeared to be an exceptional night from my point of view but I would be the first to admit that I have limited experience in astronomy. Sunday morning was also delightful as many people were leaving for the trip home after a good breakfast and gab session.

Everyone agreed that this was the cleanest campground they had ever visited. The restrooms and showers were spotless, as were as the grounds. The owners of the campground could not have been more helpful. They even helped park and level campers. The only failure we had was mine. I did not realize that they were able to furnish us with a beautiful freshly bar-b-qued dinner for $10.00 per person. I will take the blame for that, but I am sure we will take advantage of that meal next year.

Our main speaker on Saturday night was Raymond T. Martin, a solar astronomer from Cheyenne, WY. (His biography will be posted to over-land.com/starparty.html) Mr. Martin is a very interesting speaker and captivated the group with his slide talk and discussion. I am certain that if our group heard his talk we would soon have a solar group in the Ford club. Ray spends about an hour per day in his backyard observatory making solar measurements, which he shares with the professional solar astronomers. Anyone interested can contact Ray at ramartin@wyoming.com By the way, we can expect an article from Mr. Martin on how to build a spectrograph for sky observing. ☆

FUSION

by Greg Burnett

Fusion power is back in the news. Government and university research programs continue to pour millions of dollars into efforts to harness nuclear fusion energy. Of the two basic types of nuclear reactions, fission and fusion, fusion is by far the cleanest and most efficient. Fusion holds the promise of cheap, inexhaustible energy from a mere whiff of hot hydrogen gas. By comparison, present day fission reactors require expensive and dangerous radioactive fuels, and produce considerable quantities of very undesirable waste products.

"Cold fusion*" notwithstanding, there are basically two techniques under investigation for controlling a fusion reaction: inertial confinement and magnetic confinement. *(* The cold fusion theory proposed by Fleischmann and Pons a few years ago has been largely discredited, although there are a few zealous holdouts still experimenting with it.)* Inertial confinement essentially means causing the fusion fuel to react so quickly that it can't get out of its own way. In current prototype reactors, this is accomplished with Armageddon-class banks of high-power lasers, which heat small fuel pellets to the required temperatures almost instantaneously (on

the order of 10^{-9} second), so the pressure of the resulting fusion reaction is "confined" by the inertia of the fuel pellet itself (it isn't "confined" very long!). Such reactors have produced some energy output, but so far they have not been able to produce as much energy as is required to get the fusion reaction started. Thus, they are not "self-sustaining."

Magnetic confinement employs elaborate arrangements of superconducting magnets that attempt to hold a hot plasma of hydrogen isotopes captive within a structured magnetic field. The plasma is heated by electric current, microwaves, or neutron beams until it is hot enough for fusion to occur. Existing reactors have produced momentary bursts of fusion energy, as much as 20 million watts, but sustained energy production continues to be confounded by persistent instabilities in the plasma, which allow it to escape its magnetic cage.

I have a proposal for a controlled fusion technique that the scientific community has overlooked, even though it is right under their noses: gravitational confinement. Here's how it works...

First, one obtains a considerable quantity of hydrogen gas, say about $2x10^{33}$ grams of it. That's a lot, but hydrogen is cheap and plentiful---it is, after all, the most abundant element in the universe. Now, (and this is the cool part!) left to itself, this hydrogen will collapse under its own gravitational attraction, and begin to compress itself and heat up. While this is happening, it is highly recommended that the experimenter(s) remain at a safe distance, say about $93x10^{6}$ miles. Eventually, the resulting ball of hydrogen (this much hydrogen will have a strong tendency to form a sphere, regardless of

any attempts you may make to direct it otherwise) will become hot enough, through compression heating, that a fusion reaction will begin at its center. Once the whole thing stabilizes, the reaction will continue for a long time, possibly as long as 10^{10} years, maybe longer. As a result of this process, a great deal of energy is liberated.

Once the fusion reaction is underway, it is a simple matter to extract useable energy from this device. Radiant heat will be absorbed by any object exposed to the thermal radiation emanating from the device--the darker the object the more efficiently it will absorb the energy. This heat can then be used directly for a number of purposes, or it can be converted into other forms of energy, such as chemical or electrical. Photovoltaic cells can be employed to generate electricity directly from the incident radiation. Chlorophyll in green plants will convert some of the energy to chemical forms. Most of these are somewhat bulky and inefficient, but they have the advantages of a long shelf life and convenient handling characteristics. Some can be used to build houses, and other stuff.

Therefore, I recommend that the scientific community abandon present efforts to harness fusion, which have produced only marginal results to date, and adopt my proven technique. As it happens, there are already a number of these devices in operation, which are available for your examination---consult any reputable astronomy supplier for a catalog. ☆

A NOTE ON RADIO ASTRONOMY

by Dick Lawrence

As many of you know, I have one of the radio receivers built by the electronic professionals who are members of Society of Radio Astronomers (SARA), an amateur worldwide group. I am anxious to get it into operation at my new home, which is to be in New Mexico. This is one of only nine receivers, I believe, that have been built. I have come to realize that the amateur is really limited in what he can do in radio astronomy. The professional today has such an array of very sensitive radio equipment that the amateur cannot afford. In addition, in most cases the antenna needed is much too large and costly for the amateur to be able to get the gain he needs for serious exploring. I have no illusions about what my capabilities will be, but I consider the self satisfaction and education I will gain to be worth the effort. I would be glad to discuss with others what little information I have on the subject. Contact me at kb8exz@gatecom.com ☆

MIR CONTEST UPDATE

by Chuck Boren

Due to the fact that the current MIR crew is not schedule to disembark from MIR until the 23rd of August, the dead line for our contest to guess the time and/or day for the end of the MIR mission has been extended. The new dead line will be **Midnight August 22, 1999.** Please email your guesses to our email address faac1992@hotmail.com on or before then. There will be two prizes awarded, one for the correct day or closest guess, and one for the correct time or closest guess. ☆

HEARD ON THE NET

by Bob Lambeck

From the sci.astro.amateur newsgroup...

The newsgroup was recently graced with a long and rambling discussion as to whether the ancient Babylonians may have invented the telescope. At one point in the discourse, Steve O'Hagan wrote: "I wonder if the Babylonians were even able to make clear glass? I have seen early examples of Egyptian glass in a museum which were almost opaque!"

And Mark Gingrich, with tongue in cheek, concluded: "Thus we can credit the ancient Egyptians with the invention of the neutral-density filter."

Ralph Brown then wrote: "Wow, that must mean that they were heavy into solar astronomy and discovered sunspots and prominences as well. Whew - this gives all new meaning to "dark" ages."

And Stephen Tonkin explained: "That is not so. But you have happened upon the reason for the demise of ancient Egyptian civilization -- the Egyptians used the opaque glass to make eyepiece solar filters for use with Babylonian telescopes; they were enormously popular but fractured in use, resulting in blindness and a recognition that punishment had been meted out for daring to gaze upon the face of Ra. The subsequent mass-hysterical guilt complex meant that an entire population spent a whole year in self abasement. During this year no agricultural work, with the exception of building temples to Ra, was performed and mass-starvation was the inevitable consequence. This event is known as Terminal Abasement Syndrome (Cultivation Overload) and has in more recent times been used, in acronym form, by purveyors of eyepiece solar filters made of almost opaque glass." ☆

MEETING MINUTES

by Mike Kruskie

The July 22 meeting of the Ford Amateur Astronomy Club was called to order at 5:05pm and everyone soon availed themselves of the pizza and pop. The first order of business was the passing out of our new FAAC Club "business" cards. It was noted that the post office box number is printed incorrectly on the cards, so we will have to get them redone. The cards will be available to members to help promote our club. The cards have our address, hot-line number, club e-mail address, etc.

Next, an announcement was made that Dave Beard, our club secretary, has completed observing the entire Messier List and has been awarded the Messier Club Certificate from the Astronomical League. Since Dave has observed the

entire Messier list his certificate will also be endorsed for Honorary Membership into the Messier Club. Our congratulations Dave! Also, Mike Kruskie has observed over 70 Messier objects and has been approved to receive the Messier Club Certificate of Membership. Congratulations Mike!

Chuck Boren announced that the MIR space station is scheduled to be brought down sometime in August. The club is going to award two prizes for those that guess closest to the date and the time that MIR will splash down. Prizes will go to the earliest entries with the correct date and the correct time. Chuck also mentioned that the Lunar Prospector will be crashed into the moon on July 31st at 5:52AM EST. The crash site will be at approximately the 7 O'clock position (with the naked eye) on the moon.

The treasurer's report is as follows,

Savings	$	2100.79
Checking		538.22
Scholarship Fund		871.89 *

*note: this is included in the Savings figure.

The treasurer also mentioned that (1) scholarship has been paid to date. The second one has been awarded, but is yet to be claimed. Also reported, our insurance bill and our membership into the Astronomical League has been paid. Ray also mentioned that Sienna Software has sent us a prize to raffle off at our star party, a copy of "STARRY NIGHT" software. A letter of thanks will be provided to them.

FAAC recently received some notoriety in a recent issue of "Ford World" for our scholarship fund.

Bob MacFarland gave us an update of the upcoming GLAAC event at Kensington. The Sunset Astronomical Society and the Saginaw Heritage High School will be bringing their recent class project, a 10" reflector made with a wooden tube. Also, updated Flyers and agendas were passed out. Please note that the updated agenda has the "Ask The Astronomers Panel" to be held on the "Cloudy Skies Only" agenda.

Patti Forton mentioned that Wayne State University has a new planetarium and there is an offer for FAAC to have a special viewing. Patti will work on the details and will give an update in the future.

The next agenda item was the "Ask the Astronomer" session. Lots of important questions were asked and there was plenty of lively discussion. ☆

CALENDAR OF EVENTS

Aug 12-15	SMURFS Star Party
Aug 14	Lake Hudson Second Annual Public Stargaze
Aug 20-21	Kensington GLAAC Star Party
Aug 26	FAAC General Membership Meeting
Sep 11	NCO Planning Meeting @ 4:00 PM Followed by Autumnal Equinox Star Party
Sep 11	Lake Hudson Dark Sky Stargaze
Sep 18	Seventh Annual Island Lake Star Party
Sep 23	FAAC General Membership Meeting
Oct 6-10	NCO Wilderness Fall Star Party – Boon, MI (West of Cadillac)
Oct 9	Lake Hudson Dark Sky Stargaze
Oct 28	FAAC General Membership Meeting
Nov 6	Lake Hudson Dark Sky Stargaze
Dec 2	FAAC Joint November/December General Membership Meeting
Dec 11	Lake Hudson Dark Sky Stargaze

Check for updates on the FAAC hotline: 313-390-5456
Also check out these WEB sites: Ford Intranet: http://www.be.ford.com/astro/faac.html
External Internet: http://kode.net/~dougbock/faac/

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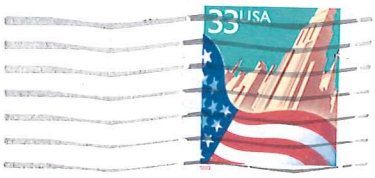

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