



The Ford Amateur Astronomy Club Newsletter

Volume 5, Number 10

October 1996

THE UNEXPECTED PAST OF A DWARF GALAXY

From the European Southern Observatory, PR 11/96 1 August 1996

THE UNEXPECTED PAST OF A DWARF GALAXY

The Local Group of Galaxies consists of a few large spiral galaxies - for instance the Milky Way galaxy in which we live, and the Andromeda galaxy that is visible to the unaided eye in the northern constellation of the same name - as well as two dozen much smaller galaxies of mostly irregular shape. Whereas the larger galaxies have extended halos of very old stars, no such halos have ever been seen around the smaller ones.

Now, however, Dante Minniti and Albert Zijlstra [1], working at the ESO 3.5-metre New Technology Telescope (NTT), have found a large halo of old and metal-poor stars around one of the dwarf galaxies in the Local Group. This finding is quite unexpected. It revises our understanding of star formation in these galaxies and provides important information about the past evolution of galaxies [2].

GALAXY HALOS

The Milky Way galaxy is surrounded by a large, roughly spherical halo of old stars. The diameter is about 100,000 light years and the stars therein, known as Population II stars, are among the oldest known, with ages of 10 billion years or even more. They also differ from the younger stars nearer to the main plane of the Milky Way (in which our 4.7 billion year old Sun is located) by being very metal-poor. Many of the halo stars consist almost solely of hydrogen and helium, reflecting the composition of matter in the young Universe. This halo is important for our understanding of the processes that led to the formation of the Milky Way galaxy. It is believed that many of the halo stars and those of the same type found in globular clusters existed already before the Milky Way had fully formed.

GALAXY CANNIBALISM

Many astronomers suspect that galaxies evolve and gradually grow larger and heavier by practising cannibalism on their own kind. In this picture, when two galaxies collide in space, the stars and nebulae in the smaller one will disperse and soon be taken over by the larger one, which in this way effectively 'eats' the smaller one. Thus the Milky Way may contain the remains of many smaller galaxies it has met and consumed in the past. A natural consequence of this theory is that the Milky Way halo may at least partially consist of stars which originally belonged to these smaller galaxies. However, it is also possible that some of the halo stars formed during the early collapse of the gas cloud from which the Milky Way formed.

Like the Milky Way, the two nearest, large spiral galaxies (the Andromeda nebula and M33 in the neighbouring Triangulum constellation) are also surrounded by halos of old stars. Contrarily, investigations of the smaller galaxies in the Local Group have until now not shown that they possess such halos. These dwarf galaxies greatly outnumber the large spiral galaxies - to date about two dozen are known - and they are considered to be the last survivors of the earlier cannibalism phase. The nearest are the well-known Magellanic Clouds, about 170,000 (Large Cloud) and 250,000 light years distant (Small Cloud). They can be seen with the unaided eye from the Southern hemisphere. Recent studies indicate that they orbit the Milky Way and that they may eventually fall prey to our galaxy in a future round of cannibalism.

So far, no evidence has been found of an old halo around the Magellanic Clouds. This does not necessarily imply that all dwarf galaxies must likewise lack halos: it is also possible that the halos of the Magellanic Clouds were stripped away when they came too close to the Milky Way sometime in the past.

THE ISOLATED WLM DWARF GALAXY

Down in the southern sky, in the constellation of Cetus (the Whale or the Sea Monster), lies a relative faint and distant, small galaxy which astronomers normally refer to as the WLM dwarf galaxy. It was first seen in 1909 by the famous astrophotographer Max Wolf on photographic plates obtained at the Heidelberg Observatory (Germany), but it was only in 1926 that its true nature was understood by Knut Lundmark and P.J. Melotte. The designation WLM is shorthand of Wolf-Lundmark-Melotte. More recent investigations have fixed its distance at about 2.9 million light years, somewhat farther away than the Andromeda galaxy (2 million light years) and placing it at the very edge of the region occupied by the Local Group. WLM is one of the most isolated members; its nearest neighbour dwarf galaxy, IC 1613, is more 1 million light years away.

A HALO AROUND WLM

The ESO astronomers recently obtained deep CCD images of WLM with the 3.5-m ESO NTT and the ESO Multi-Mode Instrument (EMMI). With the excellent imaging capabilities of this facility, they were able to see large numbers of individual stars in this galaxy. WLM appears to be quite elongated, and surprisingly, its largest extension is about 8000 light years or more than twice as large as thought before. Nevertheless, this is still 12 times smaller than the Milky Way galaxy.

There is a clear excess of very faint stars that extends to the edge of the sky field covered by the NTT exposures. Some of these are probably foreground stars inside the Milky Way, but there are many more than expected, and their numbers increase closer to WLM. These stars look quite different from the ones in the central region of that galaxy: they are much redder and relatively faint; this is a strong indication that they are much older. The distant stars thus appear to belong to an old halo around this dwarf galaxy. This shows that WLM must be very old, perhaps as old as the Milky Way, and in any case much older than indicated by the ages of the stars near its centre. The present discovery furthermore proves that a halo may also form around a dwarf galaxy, and it is not a feature exclusively reserved for large spiral galaxies.

IMPLICATIONS OF THIS DISCOVERY

WLM is so isolated that it has most probably never been disturbed by the other galaxies in the Local Group. It is also very small, and it is improbable that it has ever itself cannibalized an even smaller galaxy. It thus is quite likely that the newly discovered halo of WLM dates back to the formation of this galaxy and has remained undisturbed since that time.

It is now desirable to search for signs of similar old stellar halos in other isolated dwarf galaxies, to see whether such halos are common features or if the halo around WLM is a unique case. But this discovery of a halo in at least one dwarf galaxy already indicates that some halos are as old as the galaxy they surround and moreover, that the early formation process is similar for small and large disk galaxies. This is a very important finding which will also be most useful for the interpretation of the very deep images of the Universe recently obtained with the Hubble Space Telescope, and which demonstrate how different galaxies looked in the distant past.

NOTES:

[1] Albert Zijlstra is a staff astronomer at the European Observatory and Dante Minniti, who also worked at ESO until recently, is now with the Lawrence Livermore National Laboratory, California, USA.

[2] A scientific article describing these results will soon appear in the *Astrophysical Journal Letters*; it is also available as ESO Scientific Preprint no. 1145.☆

SKY & TELESCOPE NEWS BULLETINS

from the editors of SKY & TELESCOPE magazine

MARTIAN LAUNCH PADS?

On August 7th, researchers announced that primitive life may have once existed on Mars, based on their careful study of a meteorite blasted from somewhere on the Martian surface 16 million years ago. Now planetary scientist Nadine Barlow (U. of Central Florida) reports that she has identified two craters that might be the source of the meteorite. Her catalog of 42,283 Martian craters, compiled from Mariner and Viking data, includes two elongated ones 23 and 11 km long with sharp rims and fresh ejecta blankets. Both lie in Mars's ancient southern highlands and show evidence that water once flowed nearby. All this is consistent with the meteorite's age of 4.5 billion years and the presence of carbonate inside it, which normally form in the presence of water.

COMET-ASTEROID CONUNDRUM

Two recent discoveries have blurred the distinctions between comets and asteroids. First came an 18th-magnitude object, captured on ESO Schmidt plates by Guido Pizarro but first noticed in early August by Eric Elst in Belgium. Calculations show it to be moving in a hum-drum orbit, much like those of thousands of main-belt asteroids. However, this one has a short tail! There's some speculation that the tail of Comet Elst-Pizarro (P/1996 N2) may be quite new — perhaps the result of a dust-emission episode in late May or June.

Meanwhile, NASA's Near-Earth Asteroid Tracking project, directed by Eleanor Helin, has spied something in a decidedly comet-like orbit among the hundreds of new asteroids it finds each month. There's no trace of a tail or coma yet, so this object is being called minor planet 1996 PW for now. Its extraordinary orbit extends 10 times farther out than Pluto, and 1996 PW is now near perihelion between Mars and Jupiter. The last time it came around, the Egyptian pyramids were being built! If this object proves to be a dead comet, rather than an asteroid, it could tell astronomers more about what happens to comets as they plunge our way from the remote Oort Cloud.

FAST AT LAST!

NASA's Fast Auroral Snapshot Explorer (FAST) finally made it to orbit after a two-year delay caused by problems with the Pegasus XL winged rocket. On August 21st a redesigned Pegasus was dropped from an L-1011 carrier airplane 13 km above the Pacific Ocean. A few seconds later the rocket ignited to boost FAST into orbit. The satellite uses numerous electromagnetic sensors to monitor particle acceleration in the aurora on very short time-scales.

SIDESWIPE IN SPACE

A French military satellite named Cerise has been damaged by high-speed debris in the first documented case of two known objects colliding in orbit. On July 24th a small piece from an Ariane rocket smashed into Cerise at nearly 50,000 km per hour, sending the satellite tumbling end over end. The Ariane stage had been launched in 1986 and later exploded into hundreds of fragments when leftover propellants accidentally ignited. Cerise has been restabilized, so its measurements of radio noise in orbit can continue.

PRIMORDIAL PROTOGALAXIES

Astronomers have used the Hubble Space Telescope (HST) to zero in on possible star-forming objects in a distant galaxy cluster in the constellation Hercules. Because of its great distance, we see the cluster as it appeared only two or three billion years after the Big Bang. As reported in the journal Nature for September 5th, 18 amorphous objects stood out in HST frames due to emissions from hot hydrogen gas. The enigmatic blobs typically span only a few thousand light-years, a small fraction of the size of our Milky Way, and they appear to contain a few billion stars each. The researchers speculate that these entities are destined to coalesce together, eventually forming elliptical or spiral galaxies. However, the blobs could remain separate and thus simply be the precursors of dwarf galaxies like the Magellanic Clouds.

GALILEO's FLYBY OF GANYMEDE

The Galileo orbiter made its second close flyby of Ganymede at 19:00 UT on Sept. 6th, skimming just 262 kilometers above the giant moon's surface. That's three times closer than the pass back in late June and closer (NASA points out) than Space Shuttle flies around the Earth. A computer glitch on August 24th caused a temporary "safing" of spacecraft systems. But Galileo was up and running again well before the flyby, during which its scientific instruments spent about 4 hours mapping Ganymede with unprecedented resolution and probing its atmosphere and newly discovered magnetosphere. Minute changes in Galileo's velocity during this close pass will provide a precise measurement of Ganymede's gravity field and should provide insights on its internal structure.

(continued on page 7)

STAR STUFF

Monthly Publication of the Ford Amateur Astronomy Club

Star Stuff Newsletter

P.O. Box 7527

Dearborn, Michigan 48121-7527

1996 CLUB OFFICERS

President:	Bob MacFarland	33-79750
Vice President:	Patti Forton	84-51740
Secretary:	Harry Kindt	313-835-1831
Treasurer:	Kevan Granat	24-87628

GENERAL MEETINGS

The Ford Amateur Astronomy Club holds regular general meetings open to the public on the fourth Thursday of the month at 5:00 PM. Meetings are held at the Ford Motor Credit Company (FMCC) building, Northeast of the World Headquarters build in Dearborn, in conference room 1491, lower floor, East side of the building.

OBSERVING SITE

The Ford Amateur Astronomy Club has an established observing site, by permit, at the Spring Mill Pond area of the Island Lake Recreational Area in Brighton, Michigan located near the intersections of I-96 and US-23. Members are responsible for opening and closing the gate after the parks 10:00pm closing time. The combination for the lock should be available on our hotline number. Always close the gate behind you after 10:00pm whether entering or leaving the park.

OBSERVING HOTLINE NUMBER - (313) 39-05456

On Friday and Saturday nights, or nights before holidays, you can call the hotline number up to 2 hours before sunset to find out if we will be observing that night. Assume that any clear Friday or Saturday night is a candidate observing night unless something else is going on or none of the club officers are able to make it.

WWW PAGE

Computers inside the Ford network or on the Internet can access the F.A.A.C. web page at one of the following addresses:

Ford Intranet: <http://av3168.pd8.ford.com:8080/faac/faac.html>
Internet: <http://www.id.net/~erik/faac.html>

MEMBERSHIP AND DUES

Membership to the Ford Amateur Astronomy Club is open to both Ford and Non-Ford Motor Company employees. The general public is also welcome to join. The dues structure is as follows:

Annual Individual/Family	\$20.00
Lifetime Membership	\$100.00

Membership benefits include a subscription to the Star Stuff newsletter, discounts on subscriptions to Astronomy and/or Sky & Telescope magazine(s), after hour use of the observing site at Island Lake, and discounts at selected area astronomical equipment retailers.

NEWSLETTER STAFF





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NEWSLETTER SUBSCRIPTION

A yearly subscription at a rate of \$12.00 is available to those who are not members of the Ford Amateur Astronomy Club. Subscriptions are free to other astronomy clubs wishing to participate in a newsletter exchange.

Articles presented herein represent the views and opinions of their authors and not necessarily those of the Ford Amateur Astronomy Club or the Star Stuff Newsletter. Commercial advertisers appearing in the newsletter are not endorsed or in any way affiliated with Ford Motor Company, the FAAC, or Star Stuff newsletter.

OCTOBER 1996

SUN	MON	TUE	WED	THU	FRI	SAT
		1	2	3	4 	5
6	7	8	9	10	11	12 
13	14	15	16	17	18	19 
20	21	22	23	24 FAAC Meeting	25	26 
27	28	29	30	31		

Oct 03	Mercury At Its Greatest Western Elongation (18 Degrees)
Oct 04	Asteroid Juno at Opposition
Oct 04	Last Quarter Moon (8:36 am)
Oct 05	Comet Hale-Bopp occults PPM 200723 (9.0 magnitude star)
Oct 07	Comet 1996 Q1 (Tabur) closest approach to Earth (0.48148)
Oct 09	Draconids Meteor Shower
Oct 12	New Moon (10:44 am)
Oct 12	Partial Solar Eclipse
Oct 15	Comet Machholz 1 Perihelion
Oct 19	First Quarter Moon (2:40 pm)
Oct 20	Jupiter Occults SAO 187307 (9.1 Magnitude Star)
Oct 21	Orionid Meteor Shower
Oct 21	Possible Mars Occultation of SAO 98819 (8.8 Magnitude Star)
Oct 22	Asteroid 1989 UQ Near-Earth Flyby (0.1505 AU)
Oct 23	Asteroid 4947 Ninkasi Near-Earth Flyby (0.2131 AU)
Oct 25	Asteroid 4197 1982 TA Near-Earth Flyby (0.0846 AU)
Oct 26	Full Moon (10:41 am)
Oct 27	Daylight Savings (Set Clock Back One Hour)
Oct 27	Asteroid 3908 1980 PA Near-Earth Flyby (0.0613 AU)
Oct 29	Asteroid 243 Ida Occults GCS 18961636
Oct 29	Asteroid 1991 VE Near-Earth Flyby (0.0853 AU)
Oct 29	Asteroid 1780 Kippes Occults PPM 70306 (7.1 Magnitude Star)
Oct 29	Possible Mars Occultation of SAO 98968 (8.8 Magnitude Star)
Oct 29	Comet IRAS Perihelion (1.70 AU) ☆

MEETING ANNOUNCEMENT

The Ford Amateur Astronomy Club (FAAC) holds regular general meetings on the fourth Thursday of each month, except November and December. Our next meeting will be **Thursday, October 24, at 5:00 pm**. The program for the meeting has not been determined at this time.

The FAAC meets in the Ford Motor Credit Company (FMCC) building, conference room 1491, located on the lower east side of the building. FMCC is the low building immediately northeast of (but not attached to) Ford World Headquarters in Dearborn. The FMCC building is secured with a card entry system. The easiest way to enter the building for meetings is to park in the northeast lot (Employee Lot 7) and enter through the lower northeast or lower east doors. At 5:00 pm no one seems to have trouble getting in because many people are leaving around that time. At the east door you can dial 0911 on the security phone and say you are here to attend a Ford club meeting, and security will admit you. You may find your way into the building any way you see fit, but direction signs will only be posted at lower northeast and lower east doors. ☆

MEETING MINUTES (9/26/96)

by Harry Kindt (Sec'y FAAC)

The meeting was called to order by our president Bob MacFarland at 5:05 PM. There were 23 members and guests present. The treasurers report was read and accepted.

George Korody reported on the availability of a new publication called The Astronomy and Space desk calendar. Cost of this calendar is \$8.95. A sign up list was passed around to determine the interest, by the membership, in purchasing this item.

October 1996

Paul Mrozek asked the members for more participation in submitting articles for our newsletter. If you have any thoughts, anecdotes, or viewing experiences you would like to share with other members, please put them in writing and submit them to Paul for inclusion in the newsletter.

George Korody asked for a list of the members who were interested in re-instituting the telescope building classes. The classes are to be held at George & Pat Korody's home during the upcoming winter months. Patti Forton reported on the availability of the T-Shirts commemorating our 4th annual star party at Island Lake on Sept. 7th. Cost of the shirts is \$8.00. If you are interested, please contact Patti for details.

Over pizza and pop, we held our usual round table discussion where members introduce themselves and briefly describe their viewing experiences since our last meeting. Greg Burnett showed some slides he had taken at the Sept. 7th star party (or, as it became known by those present, the Hurricane Fran party). Our thanks go out to those members and guests who showed up at Island Lake despite the unfavorable weather conditions. A special thanks to Barry Craig for his efforts in providing those present with an interesting and informative show.

Don Klasser reported on the progress of our re-scheduled star party on October 19, 1996 at our Island Lake observing site. Plans have been completed and now all that remains is that we get the word out about the event. With this in mind, flyers were distributed to those present and they were asked to re-distribute them to their local schools, post them at their workplace, and in general, see that the event is well publicized.



The question of Messier Certification was brought up for discussion. Doug Bock mentioned that The Astronomical Society has a Messier log book available for sale to its membership. A list was passed around to determine the interest in purchasing a packet of these log books for re-sale to our members. Doug Bock also presented two new proposals for discussion by the membership. Proposal one was to form a deep sky observing sub-group. Proposal number two was to form a remote observing group. This second proposal would involve those members who have access to a computer, modem, and the proper software, too enable them to control a telescope from a remote location. A list was passed around to determine the interest in either one or both of these suggestions. More information on both of these proposals will be provided as it becomes available.

The remainder of the meeting was taken up by going over the answers to a 20 part Astronomy Quiz which was provided to us earlier in the evening by George Korody. The meeting was adjourned at 6:30 PM. ☆

OCTOBER SPACE HISTORY

The following October events come from the 8/24/96 edition of "Space Calendar." This calendar is compiled and maintained by Ron Baalke (baalke@kelvin.jpl.nasa.gov).

Oct 10	150th Anniversary, William Lassell's discovery of Neptune's moon Triton
Oct 22	30th Anniversary, Luna 12 Launch (Soviet Lunar Orbiter)
Oct 24	145th Anniversary, William Lassell's discovery of Uranus moon Umbriel and Ariel
Oct 25	325th Anniversary, G. Cassini's discovery of Saturn's moon Iapetus
Oct 29	5th Anniversary, Galileo Flyby of Asteroid Gaspra
Oct 30	15th Anniversary, Venera 13 Launch (Soviet Venus Lander) ☆

OCTOBER 1996 SPACE EVENTS

The following October 1996 events come from the 8/24/96 edition of "Space Calendar." This calendar is compiled and maintained by Ron Baalke (baalke@kelvin.jpl.nasa.gov). Note that launch dates are subject to change.

Oct ??	Kompass Shtil-2 Submarine Launch
Oct ??	Bion-11 Cosmos Launch (Russia)
Oct 08	Galileo, Orbital Trim Maneuver #12 (OTM-12)
Oct 15	Insat-2D Ariane 4 Launch
Oct 15	Progress M-33 Launch (Russia)
Oct 21	SAC-B/HETE Pegasus XL Launch
Oct 31	STS-80, Columbia, Wake Shield Facility (WSF-03) ☆

STAR WARE 2 SURVEY

From: Phil Harrington (starware@juno.com)

As you may know, in 1994, I released my book STAR WARE: THE AMATEUR ASTRONOMER'S ULTIMATE GUIDE TO CHOOSING, BUYING, AND USING TELESCOPES AND ACCESSORIES. The purpose of this book is twofold. First, it explains various terminology and concepts that those who are new to astronomy often find confusing. It also surveys, in an unbiased and objective way, the astronomical equipment marketplace in an attempt to answer the age-old question that so many stargazers ask: "Which telescope is right for me?" Unlike most other telescope books, STAR WARE names names! Which telescopes are good, and which are not? Sales of STAR WARE have been great, but to keep it up-to-date, it is time to re-examine the market, and see what has changed. There are a lot of new telescopes out there! Are the good telescopes still good, or is there something better?

STAR WARE 1 relied heavily on people's opinions of their telescopes and accessories. The response back then was terrific! This time around, I'm asking people to complete a simple one-page survey, telling me what they think of their telescopes and accessories. I've attached a copy of the form at the end of this note. People may then fill out the form and send it back to me at 54A Dillmont Drive, Smithtown, New York 11787. If people would prefer to receive an electronic copy of the survey, they may write me at this address or at STARWARE@JUNO.COM. Or, for the "Web surfers" in the crowd, they may visit <http://www.rahul.net/resource/surveys.html>.

I am also looking for homemade projects to highlight in the book. I'm not so much interested in complete telescopes, but rather "gadgets." In STAR WARE 1, I included plans for such diverse things as an LED flashlight, light-pollution shield, binocular mount, a wireless radio-controlled focuser, an observing chair, and even a complete observatory. If you have an interesting project along those lines, I would like to hear about it, and possibly feature it in STAR WARE 2. No project is too small to be considered, but I am looking for a "stand-alone" project, not just a modification to a particular telescope. If a project is selected for the book, the "inventor" will receive a free copy when it is released in mid-1998. Ideas may be submitted either my regular mail or e-mail above, or on the WWW at <http://www.tiac.net/users/atm/starware.html>.

I want to expand the global nature of the book, and am hoping the WWW will help me. That's why I am sending this same request to clubs all around the world, asking them to spread the word about the STAR WARE 2 survey. Perhaps together, we can help manufacturers serve our needs better! Thank you very much for any help you can give me. I truly appreciate the effort! If you have any questions or comments, please drop me a line. Clear Skies,

STAR WARE 2: ASTRONOMICAL EQUIPMENT SURVEY

Instructions: Please answer all (or as many) of the questions below as possible. If you own more than one telescope, I'd like to hear about each. USE AS MUCH ROOM AS YOU WANT! I'll save each response and reference them when it comes time to write the reviews. Note, however, that I will not name specific individuals in the book, in order to preserve anonymity. Also, your name/comments will NOT be circulated to any mail lists or manufacturers.

Your name:

Address:

City:

State:

Zip:

E-mail:

Years in astronomy?:

Do you consider yourself a: Beginner Intermediate Advanced

TELESCOPE

How many telescopes do you own?

(If more than one, please describe each below. Note which one you use most often.)

Telescope model:

How old is it?

Are you the original owner?

What do you like about it?

What don't you like about it?

Has it lived up to your expectations?

Would you buy it again?

Have you ever had to contact the company about a problem?

Was it resolved? Explain.

EYEPIECES

What eyepieces do you own?

How do they work? Any particular likes or dislikes? (Please list your impressions separately for each)

ACCESSORIES

What accessories do you own? (anything and everything...binoculars, books, software, filters, finderscope, etc.)

Any particular likes or dislikes? (Please list your impressions of each separately)

Your vote for the best telescope of yesteryear (only models that are no longer made):

Please send completed surveys to Star Ware 2, c/o Phil Harrington, 54A Dillmont Drive, Smithtown, NY 11787 or e-mail to starware@juno.com.

☆

FAAC STAR TRAILS

by Bob MacFarland

No one would have believed that our 4th Annual Island Lake Star party would have been affected by a hurricane. But it sure was! Even still we had over sixty people show up during the rains. Thanks to the backup efforts of **Barry Craig** and several others we made a success of in the Spring Mill Pond shelter. Pizza was served, a comet being made, some prizes were given out, some CCD images were displayed and edited and we had a great time despite the weather. About 11:00 PM, the clouds did clear enough overhead to get a glimpse of the Summer Triangle. My thanks goes out to all of you who worked so hard on this effort. I only regret that some of the projects were dampened by the weather.

You might think that we might have been discouraged by the rain out. However, I was quite encouraged when I got the feedback on how many calls were placed to City Camera, the FAAC Hotline and the Island Lake park office with people asking if we were going to reschedule the event. For those of you who have not heard, Yes! It has been rescheduled to the 19th of October. I was especially encouraged by the fact that 12 of the 60 some people were students whose science teachers had told them about the Star Party. Some of these students wanted us to give them something to show that they had attended so that they could get the extra credit that their teachers had offered. Many of the students brought along friends and family. See the attached table.

Keeping in mind that our party was held only one week after some of the school districts had started classes, we had a great turnout! Imagine how many people we can get out to the party if we get out to the schools between now and the star party! What I'm asking each of you to do is to make a copy of the October 19th Star Party flyer which came in this issue and take it to at least one school science teacher in your area to help get the word out. Let them know what an great opportunity this is. And then encourage them to distribute copies of the letter to their students. Let them know that we will support all of their extra credit seeking students.

We still have prizes and surprises for the 19th. Persons who finish our sky tour will get a certificate and a reward that can be used long after that night. If cloudy skies come again, we will have some very interesting backup activities in the shelter. Come on out yourself and bring your families and friends. There is no event like this in the area! Be part of it! Looking forward to seeing you there!

FUTURE DIRECTIONS

At this month's meeting, we had several offers or proposals for activities within the club. Look for more information on these in the upcoming weeks.

- **Ram Date** starting a library committee for the purchase and loan out of books, video tapes and slides.
- **Doug Bock** made a proposal for a Deep Sky group for astrophotography, Messier Certification and a special interest group for remote observing.
- **George Korody** is soliciting members who may want to build their own telescopes this winter.

It is projects and suggestions such as these which demonstrates that the club is strong and active. Thank you Gentlemen for your ideas and your energies. Keep it up! I encourage others to join in on these efforts and/or to start others which will keep the club interesting to all amateurs in the hobby.

SEPTEMBER 7TH STAR PARTY REGISTRATION RESPONSES

Where did you hear about the Star Party?

Club Members/Families	19
Teacher/School	12
Family/Friend/Coworker	8
Unregistered estimate	6
No comment made	4
Astronomy Magazine	4
Web/E-Mail	3
Attended Before	3
Sky & Telescope magazine	2
Flyer at work	2
Total	63

What is your address?

- Ann Arbor
- Detroit
- Fraser
- Harper Woods
- Hazel Park
- Lincoln Park
- Livonia
- Northville
- Pickney
- Saginaw
- Scio
- St. Claire Shores
- Sterling Heights
- Troy
- Warren
- (• = Schools which sent students)

(NOTE: The above locations cover approximately a 3000 sq. mile area) ☆

STAR PARTY REPORT

The First Annual (Not!) Island Lake Hurricane Party
by Greg Burnett

It was wet. Trees dripped, eaves drizzled. The dampness rode on a persistent north wind, magnifying the chill. Low, scudding clouds brought showers now and again,... and again,... and again. Evasive bits of blue sky taunted from behind the insistent, scowling clouds. Not exactly star party weather. A reluctant rainbow, hiding above the massing clouds, only reinforced water's claim on the sky. But there we were, the hard core. Intrepid, undaunted. We had promised the world a star party, and come what may, a star party there would be! Registration forms were ready, information packets prepared, donation jar primed. At length our tenacity was rewarded as first a few, then more curious visitors, out and about despite dismal weather, began to arrive in search of things astronomical. They must not be disappointed. We would see to it.

How to begin? If a reclusive universe refused to reveal itself, we would fabricate our own! From base elements—Earth, Air, Fire, and Water—that most fleeting of celestial interlopers was conjured up in our very midst. Barry's comet was the archetypal dirty snowball, if a little soapy. It fizzed and popped with volatile effervescence, a frozen relic from the Oort cloud, here for us to touch. How many can say they have felt the deep-space cold of a comet on their own fingertips? How many can describe first-hand the tormented hissing of primordial volatiles escaping from the shrapnel of creation? Barry made it so (with help from Ben!). For the grand finale, even an ersatz Big Bang was created on the Spring Mill Pond beach!

While the faint of heart quailed before the tempest, boldly did we press on. No astro-dogs this outing. More befitting an FAAC gathering, PIZZA was summoned to still the growling bellies of the assembled company. Under gloomy skies the thick cheese and spicy pepperoni were even more satisfying than usual. Appetites sated, the persevering participants were rewarded with a seemingly endless outpouring of gifts. Hats, planispheres, and glow-bracelets, whose pinkish auras recalled the gentle luminescence of glimmering nebulae, all found happy new owners among those who had braved the elements to be part of the Island Lake Star Party experience.

Following the comet creation and the feast of prizes, the afterglow was filled with magical images on video, also courtesy of Barry: Jupiter and his attendant Galilean Moons, the mysterious and evocative markings on the surface of Mars, and extraordinary images of mankind's technology convolved in improbable contrast with an ancient natural vista: a silhouetted 747 slicing across the craggy surface of the Moon.

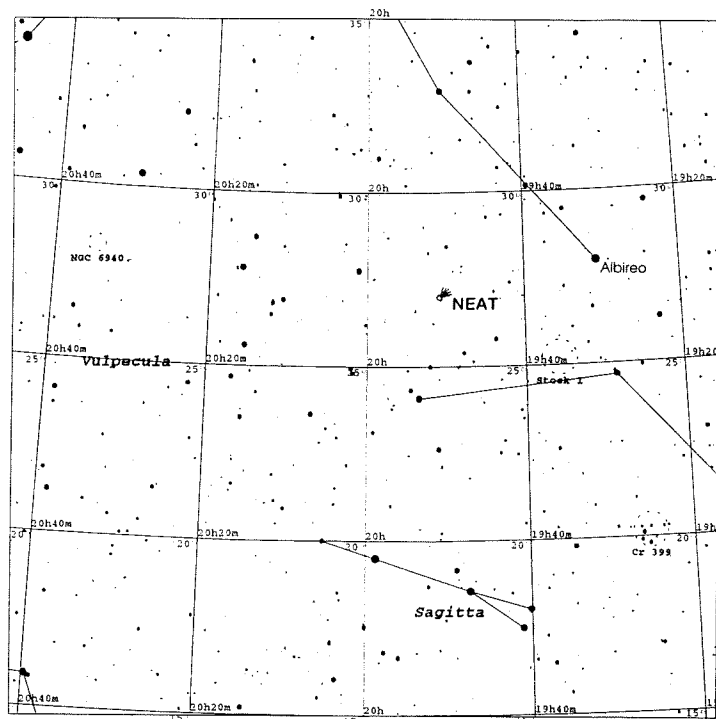
At least one telescope was deployed as darkness fell, in readiness against the possibility of momentary clearing. It's not known whether that observer's sincerity and determination were eventually rewarded.

Earlier that afternoon, the GOES-8 satellite, keeping vigil from 23,000 miles in space, downlinked an image revealing the distinct and unmistakable vortex of a hurricane, lacking only a well-formed eye, centered over Cleveland (what better place?), bringing the low clouds, rain, and northwesterly winds into our area. This particular hurricane had been named FRAN, and she arrived in Detroit direct from her destructive engagement in the Carolinas and Virginia. How often does a scheduled event in Detroit collide with a hurricane?!? Could this be an omen?

Astronomers are not typically a superstitious lot. They tend to lean on firm laws of physics, as embodied in the unfailing revolutions of the heavens. But if ever there was an unfortunate coincidence of unfavorable circumstances, this was it. Without doubt, we are now "due" for a long, unbroken string of pristine nights offering unparalleled transparency and rock-steady seeing. Just superstition of another sort? I think not. I await reparations! Hope to see you there! ☆

OCTOBER POINTS OF INTEREST

On the night of our Mini-Star Party (Saturday, October 19, 1996) the modern constellation Vulpecula, The Fox, will be roughly overhead around 9:00 PM. While some people may be tempted to once again look at the area's most famous member, M27, The Dumbbell Nebula, there are several other points of interest.



NGC 6940

Magnitude: 6.3
Size: 31'

Magnitude of brightest stars: 9.3
Number of stars: 60

STOCK 1 (J. Stock catalog)

Magnitude: 5.3
Size: 60'

Magnitude of brightest stars: 7.0
Number of stars: 40

CR 399 (P. Collinder catalog)

Magnitude: 3.6
Size: 60'

Magnitude of brightest stars: 5.2
Number of stars: 40

When the above picture is turned upside-down, it can be seen why Cr 399 is also referred to as The Coathanger. ☆

ASTRONOMY WORKSHOP

The following articles were reprinted from AstroNet, Issue 46, September 1, 1996. For more information, please contact resource@resource-intl.com.

Coma, how do you recognize it?

From: Stephen Johnson (skj@mrj.com)

One description of coma is that, at off-axis field points, the focal length varies with aperture. The amount is proportional to the distance off-axis and the diameter of the aperture. The symptom is that a star image on-axis exhibits the classical Airy diffraction pattern (concentric rings, etc.) but forms a non-symmetric blur off-axis. The blur has a sharp point where the rays from the center of the aperture are coming to a nice focus, and a "tail" which spreads out a little like a tiny comet (notice the common Latin root for "coma" and "comet"). The blur will always lie roughly on a radial line through the center of the field, so move the star around the edges and see if the elongated blur always points toward the center of the field.

Spherical aberration is (almost) independent of the field position. It is strictly an "aperture" effect, and should not vary at all with the location of the star in the field. Another aberration which degrades off-axis imagery is astigmatism.

"All about Telescopes" by Sam Brown and "Modern Optical Engineering" by Warren Smith are among the many books which explain these different aberrations with good pictures.

Limiting magnitude tests

From: Dave Nash (nash@aries.scs.uiuc.edu)

I use a couple of methods, but the one I've used most for the last 3 or 4 years — particularly at very dark sites — is to take a region of sky roughly 5 degrees across, without checking star atlases beforehand, and draw all the stars I can see in it. Later, I check the stars with binocs or a star atlas (to make sure which ones really "do" exist up there) and look up their magnitudes. I have a computer program at home which contains stars down to +8.0, which is adequate for most purposes.

The advantage of this method is that it removes most sources of bias — if I don't know in advance what stars are in the field (and how bright they are), I can't pull a Martian-canals type of illusion. The disadvantages are (a) it is time-consuming, (b) getting the stars accurately drawn is difficult (though it gets better with practice), and (c) it is not exhaustive (near the limit not "all" stars get seen, and if only one or two very dim ones are seen, there may be some question of their validity, particularly if they are much fainter than the bunch).

The "count the stars in a triangle of sky" method, sometimes used by meteor observers, has never worked well for me because it requires recognizing and counting "all" the stars in a given magnitude range, which rapidly becomes tough near the limit — averted vision kills your resolving ability, so stars tend to merge. The method invariably proves conservative, by a large margin, for me.

For the curious — the fields I used for NSP 3 were Equuleus, a region north of the Keystone in Hercules, and a Y-shaped asterism in northwest Andromeda (Iota, Kappa, Lambda, and Psi). For NSP 2 they were the Keystone proper, the head of Draco, and a region in Pegasus near Alpha Pegasi (the northwestern corner of the Great Square). Even though the Great Square is normally a black hole from light-polluted skies, the Pegasus field proved too crowded to be easy to work with on that night.

I do use labeled charts, like in the RASC Observer's Handbook, but these are mostly for quick estimates. Fields I've used in the past, such as the Keystone and the inside of Corona Borealis, also serve for these purposes. ☆

ASTRONOMY BOOK REVIEW

The Soul of the Night—An Astronomical Pilgrimage

by Chet Raymo, Hungry Mind Press, Saint Paul, Minnesota, 1996, \$15.00.

Chet Raymo is an amateur astronomer, one who, true to the word "amateur," pursues it out of love. Raymo's love of the night sky comes through clearly in The Soul of the Night. He takes the reader on a sensitive, almost poetic tour of the universe, bringing the beauty and mystery of the cosmos down to Earth by exploring the connections between familiar elements of our natural world and the wonders of the heavens.

Raymo challenges us to see our familiar astronomical targets in new, deeper ways. His description of M42, the Great Nebula in Orion, evokes images of dynamic, overpowering energy:

"There is movement and violence; the nebula seems charged with a terrible malevolent power... It is the face of Leviathan, wrenching us into a space as deep and terrible as the bowels of the sea. It is God's sturdy hand, the fist that grips us in its clinched infinities. This is the power that hides in the colorless night like rocks in foaming breakers that crack a ship, or the white whale that drags all who seek him into black oblivion."

But few of Raymo's interpretations are as dark. More typical of his reflections, the life cycle of a butterfly becomes a metaphor for the creation and flow of matter through the universe. Born in the cores of stars, matter circulates through everything; through planets, through rocks and living things alike, through you and me, through butterflies.

For those of us who pursue amateur astronomy, Raymo reminds us why. For those who do not, The Soul of the Night could be the inspiration they have been waiting for.

— Reviewed by Greg Burnett

Chet Raymo is a professor of physics at Stonehill College, in Boston, Massachusetts. He writes a weekly column for The Boston Globe and is the author of several books. He resides part of each year in County Kerry, Ireland. ☆

STATISTICALLY SPEAKING

Location (Dearborn, MI): 42°19'12" N, 83°10'48" W, 180 meters elevation
Local Time = Universal Time - 4 hours (Eastern Daylight Time)

Abbreviations used in reports:

FM Full Moon FQ First Qtr Moon LQ Last Qtr Moon NM New Moon
MR Moon Rise MS Moon Set SR Sun Rise SS Sun Set

Calendar Report for October 1996

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 SR: 7:30 SS: 19:14 MR: 22:27 MS: 12:16	2 SR: 7:31 SS: 19:12 MR: 23:14 MS: 13:11	3 SR: 7:32 SS: 19:10 MR: None MS: 14:01	4 SR: 7:33 SS: 19:08 MR: 0:04 MS: 14:46	5 SR: 7:35 SS: 19:07 MR: 0:56 MS: 15:26
6 SR: 7:36 SS: 19:05 MR: 1:50 MS: 16:02	7 SR: 7:37 SS: 19:03 MR: 2:46 MS: 16:35	8 SR: 7:38 SS: 19:02 MR: 3:42 MS: 17:06	9 SR: 7:39 SS: 19:00 MR: 4:40 MS: 17:36	10 SR: 7:40 SS: 18:58 MR: 5:39 MS: 18:06	11 SR: 7:41 SS: 18:57 MR: 6:38 MS: 18:36	12 SR: 7:42 SS: 18:55 MR: 7:40 MS: 19:08
13 SR: 7:44 SS: 18:53 MR: 8:42 MS: 19:42	14 SR: 7:45 SS: 18:52 MR: 9:45 MS: 20:21	15 SR: 7:46 SS: 18:50 MR: 10:48 MS: 21:05	16 SR: 7:47 SS: 18:49 MR: 11:50 MS: 21:54	17 SR: 7:48 SS: 18:47 MR: 12:48 MS: 22:50	18 SR: 7:49 SS: 18:45 MR: 13:42 MS: 23:52	19 SR: 7:51 SS: 18:44 MR: 14:31 MS: None
20 SR: 7:52 SS: 18:42 MR: 15:16 MS: 0:57	21 SR: 7:53 SS: 18:41 MR: 15:55 MS: 2:06	22 SR: 7:54 SS: 18:39 MR: 16:32 MS: 3:15	23 SR: 7:55 SS: 18:38 MR: 17:08 MS: 4:25	24 SR: 7:57 SS: 18:37 MR: 17:43 MS: 5:35	25 SR: 7:58 SS: 18:35 MR: 18:18 MS: 6:44	26 SR: 7:59 SS: 18:34 MR: 18:55 MS: 7:52
27 SR: 7:00 SS: 17:32 MR: 18:35 MS: 7:58	28 SR: 7:02 SS: 17:31 MR: 19:18 MS: 9:00	29 SR: 7:03 SS: 17:30 MR: 20:04 MS: 9:59	30 SR: 7:04 SS: 17:28 MR: 20:54 MS: 10:52	31 SR: 7:05 SS: 17:27 MR: 21:46 MS: 11:40	Lunar Events Oct 04 LM: 8:06 Oct 12 NM: 10:14 Oct 19 FQ: 14:10 Oct 26 FM: 10:11	

Planet View Info Report for October 1996

Date	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
Mercury							
10/ 1/1996	5:59	18:38	11h26m33s	4°34'02"	17°35'29"	0.407	0.89696
10/ 8/1996	6:12	18:33	11h56m49s	2°21'30"	16°45'16"	0.712	1.09124
10/15/1996	6:42	18:31	12h37m56s	-2°00'23"	12°33'29"	0.893	1.24914
10/22/1996	7:16	18:29	13h21m34s	-7°01'09"	7°32'22"	0.971	1.35513
10/29/1996	6:51	17:26	14h05m16s	-11°53'21"	2°40'50"	0.997	1.41641
Venus							
10/ 1/1996	3:57	17:38	9h54m37s	12°48'09"	41°42'20"	0.690	1.02179
10/ 8/1996	4:10	17:32	10h26m11s	10°21'31"	40°30'30"	0.716	1.07058
10/15/1996	4:25	17:25	10h57m36s	7°38'21"	39°13'46"	0.740	1.11792
10/22/1996	4:39	17:18	11h28m54s	4°42'02"	37°52'52"	0.763	1.16375
10/29/1996	3:54	16:10	12h00m10s	1°36'12"	36°28'20"	0.785	1.20806
Mars							
10/ 1/1996	2:43	17:07	9h03m21s	18°03'50"	55°05'26"	0.929	1.94431
10/ 8/1996	2:37	16:51	9h20m12s	16°54'52"	57°48'34"	0.925	1.89717
10/15/1996	2:31	16:35	9h36m34s	15°42'40"	60°37'43"	0.921	1.84737
10/22/1996	2:24	16:18	9h52m27s	14°28'02"	63°33'04"	0.917	1.79505
10/29/1996	1:17	15:01	10h07m51s	13°11'47"	66°34'51"	0.914	1.74035
Jupiter							
10/ 1/1996	14:58	0:02	18h39m16s	-23°21'16"	90°54'32"	0.991	5.05099
10/ 8/1996	14:33	23:34	18h42m07s	-23°19'01"	84°39'58"	0.991	5.15837
10/15/1996	14:09	23:11	18h45m31s	-23°15'56"	78°31'22"	0.991	5.26473
10/22/1996	13:45	22:47	18h49m27s	-23°11'58"	72°28'29"	0.991	5.36876
10/29/1996	12:22	21:25	18h53m51s	-23°07'01"	66°30'47"	0.992	5.46932
Saturn							
10/ 1/1996	19:06	7:06	0h15m57s	-1°07'18"	174°27'27"	1.000	8.51964
10/ 8/1996	18:37	6:35	0h13m59s	-1°19'56"	167°24'35"	1.000	8.53678
10/15/1996	18:08	6:05	0h12m06s	-1°31'46"	160°04'35"	1.000	8.56869
10/22/1996	17:40	5:35	0h10m20s	-1°42'28"	152°41'58"	0.999	8.61479
10/29/1996	16:11	4:06	0h08m46s	-1°51'46"	145°19'43"	0.999	8.67421
Uranus							
10/ 1/1996	16:18	1:47	20h12m07s	-20°35'07"	112°34'55"	0.999	19.38001
10/ 8/1996	15:50	1:20	20h11m59s	-20°35'23"	105°39'14"	0.999	19.49401
10/15/1996	15:23	0:52	20h12m01s	-20°35'06"	98°44'11"	0.999	19.61194
10/22/1996	14:55	0:25	20h12m13s	-20°34'16"	91°50'06"	0.999	19.73203
10/29/1996	13:28	22:54	20h12m36s	-20°32'53"	84°57'03"	0.999	19.85252
Neptune							
10/ 1/1996	15:54	1:22	19h47m23s	-20°40'31"	106°53'37"	1.000	29.85202
10/ 8/1996	15:26	0:55	19h47m21s	-20°40'47"	99°59'21"	1.000	29.96860
10/15/1996	14:59	0:27	19h47m26s	-20°40'46"	93°04'54"	1.000	30.08773
10/22/1996	14:31	23:56	19h47m38s	-20°40'26"	86°10'33"	1.000	30.20760
10/29/1996	13:04	22:29	19h47m56s	-20°39'49"	79°16'23"	1.000	30.32647
Pluto							
10/ 1/1996	11:23	22:28	16h06m03s	-8°01'38"	53°59'43"	1.000	30.50646
10/ 8/1996	10:56	22:01	16h06m47s	-8°06'35"	47°33'35"	1.000	30.59549
10/15/1996	10:30	21:34	16h07m35s	-8°11'29"	41°10'24"	1.000	30.67513
10/22/1996	10:03	21:07	16h08m28s	-8°16'18"	34°52'28"	1.000	30.74420
10/29/1996	8:37	19:40	16h09m24s	-8°20'58"	28°43'45"	1.000	30.80177

Planet/Moon Apsides Report for October 1996

10/ 2/1996	Mercury @ Perihelion	Distance from Sun: 0.31 AU
10/ 6/1996	Moon @ Apogee	Hour: 14 Distance: 404786 (km) Dia.: 0.492°
10/22/1996	Moon @ Perigee	Hour: 5 Distance: 368346 (km) Dia.: 0.541°

Meteor Showers Report for October 1996

Date	Meteor Shower	ZHR	RA	DEC	Illum. Frac.	Longitude
10/12/1996	Piscids	??	1h44m	14°	0.00	200°
10/21/1996	Orionids	25	6h24m	15°	0.73	209°

Twilight Report for October 1996

Date	Sun Rise	Set	Astronomical Begin	End	Nautical Begin	End	Civil Begin	End
10/ 1/1996	7:30	19:14	5:52	20:51	6:25	20:18	6:58	19:46
10/ 8/1996	7:38	19:02	6:00	20:39	6:33	20:07	7:05	19:34
10/15/1996	7:46	18:50	6:08	20:28	6:41	19:55	7:13	19:23
10/22/1996	7:54	18:39	6:16	20:18	6:48	19:45	7:21	19:13
10/29/1996	7:03	17:30	5:24	19:09	5:56	18:36	6:29	18:03

(continued from page 2)

COMET TABUR (C/1996 Q1)

A fine new arrival, Comet Tabur, was 10th magnitude when spotted August 19th by Vello Tabur in Australia using an 8-inch reflector. Later, German amateur Jost Jahn pointed out the very strong similarity of Comet Tabur's orbit to that of Comet Liller (C/1988 A1). Dynamicist Brian G. Marsden confirms that these two comets probably separated from one another around the time of their last perihelion passage some 2,900 years ago. Comet Tabur will be at perihelion on November 3rd.

According to S&T Contributing Editor John Bortle, Comet Tabur is now a nice predawn target near magnitude 7. Frank Olsen of Cedar Rapids, Iowa, notes that on the September 18th Tabur had a colorless coma 5.5 arcminutes across and showed no sign of a tail. You'll find this comet high in the southeast before dawn, moving briskly through northernmost Orion and headed for Gemini.

A HALE-BOPP HIATUS?

Observers report that in recent weeks Comet Hale-Bopp has dimmed by about a half magnitude to roughly 6.0. That alone is not a particular cause for concern, in part because right now Earth's orbital motion is carrying us farther from it. However, veteran comet watchers John Bortle and Charles Morris have noticed that, more generally, the comet has not been brightening as fast in the last two months as it was prior to July.

Does this mean Hale-Bopp is starting to fizzle? Opinions differ rather wildly. For example, Bortle says that on its current pace Hale-Bopp will get no brighter than 2nd or 3rd magnitude next spring. Morris is opting for a peak somewhere between 1.6 and 0.3. But comet specialist Daniel Green says it's really too early to get concerned, and he remains confident that Hale-Bopp will break the magnitude-0 barrier. "Don't forget," he reminds us, "Hale-Bopp is a 'big' comet," and it's still a long way from the Sun.

SO MANY STARS, SO MANY PLANETS...

You probably know that 1996 has been a banner year for finding planets around other stars. But we've only scratched the surface, according to astronomers Steven Beckwith (Max Planck Institute) and Anneila Sargent (Caltech). As they report in the journal NATURE for September 12th, planets could be circling up to half of the 100 billion stars in our Milky Way. However, researcher David Black (Lunar & Planetary Institute) thinks the fraction of stars with planets is closer to 10 percent. Either way, that's a lot of planets! Black has a major article on extrasolar planets in SKY & TELESCOPE's August issue. ☆

PHYSICS NEWS UPDATE

The American Institute of Physics Bulletin of Physics News (physnews@aip.org)

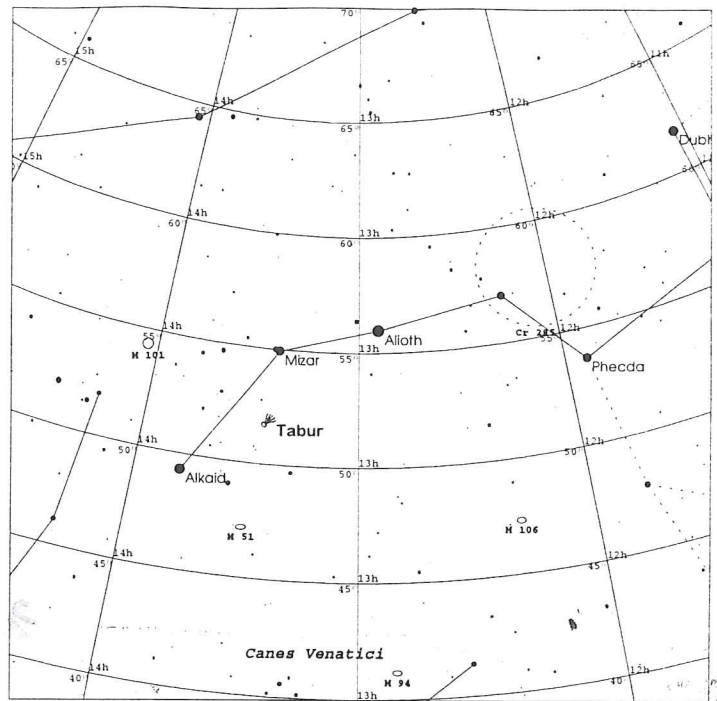
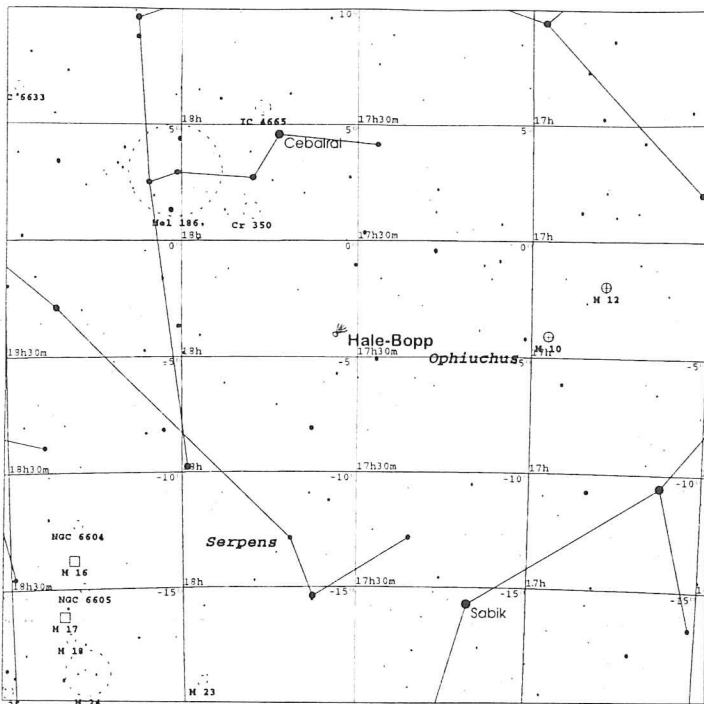
A TRANS-SOLAR SPACE CRAFT

Number 283 August 27, 1996 by Phillip F. Schewe and Ben Stein

A trans-solar space craft, one sailing forth beyond the outer planets, would probably need the help of some novel propulsion system, such as the use of sails which would enable the craft to reach high speeds by patiently but effectively reflecting sunlight. Under study at NASA, the Thousand Astronomical Unit mission would have a number of goals. One would be the closeup study of the Kuiper Belt of asteroids (at a distance of about 40 AU). A second goal would be to locate the heliopause, the zone (at around 110-160 AU) where the outgoing solar wind is halted by the incoming interstellar wind. Third, at a distance of several hundred AU, a 1-m telescope on the craft could by triangulation accurately measure distances to stars across much of the Milky Way. (Currently parallax measurements of distances are limited by the baseline of the Earth's orbit to stars out to about 200 light years.)

Another goal would be the use of the sun as a gravitational lens for imaging distant objects behind the sun. Moreover, tiny modulations in the return signal from the craft (3 days' transit for light over a path of 500 AU) might encode information about passing gravity waves. (Astronomy, August 1996.) ☆

FINDING COMETS HALE-BOPP AND TABUR (10/19/96)



STARS	SOLAR SYSTEM	Galaxy	NOTES
• <0	☿ Mercury	☼ Globular Cluster	
• 1	♃ Venus	☼ Open Cluster	
• 2	♂ Mars	☼ Planetary Nebula	
• 3	♃ Jupiter	☼ Diffuse Nebula	
• 4	♄ Saturn	☼ Asteroid	
	♅ Uranus	☼ Other Object	
	♆ Neptune		
	♇ Pluto		
	♁ Comet		
	♂ Asteroid		

Local Time: 21:00:00 19-Oct-1996 UTC: 00:30:00 20-Oct-1996 Sidereal Time: 20:52:17
 Location: 42° 19' 12" N 83° 10' 48" W RA: 17h30m00s Dec: -5° 00' Field: 30.0° Julian Day: 2450376.5208

STARS	SOLAR SYSTEM	Galaxy	NOTES
• <0	☿ Mercury	☼ Globular Cluster	
• 1	♃ Venus	☼ Open Cluster	
• 2	♂ Mars	☼ Planetary Nebula	
• 3	♃ Jupiter	☼ Diffuse Nebula	
• 4	♄ Saturn	☼ Asteroid	
	♅ Uranus	☼ Other Object	
	♆ Neptune		
	♇ Pluto		
	♁ Comet		
	♂ Asteroid		

Local Time: 21:00:00 19-Oct-1996 UTC: 00:30:00 20-Oct-1996 Sidereal Time: 20:52:17
 Location: 42° 19' 12" N 83° 10' 48" W RA: 13h00m00s Dec: +55° 00' Field: 30.0° Julian Day: 2450376.5208

Ford Amateur Astronomy Club
 Star Stuff Newsletter
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