Of the several double stars personally observed this summer, Hercules possessed many of the best in colour, contrast and difficulty. During the course of my observations I used a 6" apochromatic refractor with an adjustable iris to reduce its aperture when desired. This allowed me to enlarge the diffraction disks for better colour determinations. I usually limited myself to two eyepieces of 25mm and 9mm producing about 76x and 200x respectively. Doing this gave me a feel for the field sizes and comparative separations. Other eyepieces were employed only when no separation could be discerned at 25mm.

My arsenal of oculars for double star work include; a 25mm Ramsden, 18mm Kellner, 12mm Kellner, 9mm symmetrical, 7mm symmetrical, and 6, 5 and 4mm Orthoscopics. As long focus refractors are very forgiving, humble Ramsdens and Kellners will perform just as well as any 'modern' high class eyepiece. You may be further surprised to know that these oculars are 15 year old Unitrons of the .965 inch variety!

Alpha Hercules is the first star on my list. The magnitudes of the pair are 3.5-5.3. The historical name is Rasalgethi and it lies not too far from Rasalhague in Ophiuchus. Rasalgethi is truly a showpiece pair and should be part of your summer repertoire along with Albireo of Cygnus and Almach of Andromeda. At 4.6 seconds of arc separation and 109 degrees position angle, it can be easily split at 25mm (76x). At 9mm (200x) and 4 inch aperture, this pair is at its most striking. Described as orange and green, my own impressions bordered close to a yellow gold colour with a pea green companion. The position angle is slowly increasing and has changed to 110 degrees as of 1962.

100 Hercules. 5.9-6.0 magnitude, 14.2" at 183 degrees p.a. The 100 is Flamsteed's catalogue number for that star in Hercules in order of right ascension. This pair is striking due to the easy split of similar magnitude stars. The separation at 25mm is wide and at 9mm my colour impressions were both white with a tinge of blue.

95 Hercules. 5.1-5.2 6.3" at 258 degrees p.a. as of A very easy split at 18mm. Magnifications great enough to produce diffraction disks.

(Continued on page 7)
The Warren Astronomical Society, Inc., is a local, non-profit organization of amateur astronomers. The Society holds meetings on the first and third Thursdays of each month, starting at 7:30 PM.

General Meeting on 1st Thursday:
- Cranbrook Institute of Science
- Bloomfield Hills, MI

Business meeting on 3rd Thursday:
- Macomb Community College
- South Campus, Building B, Room 216
- 14500 Twelve Mile Road
- Warren, MI

Membership in the Society is open to all. Annual Dues are:
- Student: $10
- Senior Citizen: $15
- Individual: $20
- College: $15
- Family: $25

Along the many benefits of membership are:
- Discount magazine subscriptions:
  - Sky and Telescope: $16.00 (12 monthly issues)
  - Astronomy: $14.00 (12 monthly issues)
  - DeepSky: $8.00 (4 Quarterly issues)
  - Telescope Making: $8.00 (4 Quarterly issues)
  - Odyssey: $12.50 (12 monthly issues)
- Free copy of each WASP newsletter.
- Free use of Stargate Observatory.
- Special interest subgroups. (see subgroup chairperson)
- Call list - don't miss unexpected events.
- Free membership in Astronomical league.
- Free Reflector (Astronomical League Newsletter)
- Free use of W.A.S. Library. (see librarian)
- Rental telescopes (see observatory chairperson)

Warren Astronomical Society Paper. The Wasp is the official publication of the Society. Each new issue of the WASP is made available at the annual meeting on the third Thursday. Non-members will be charged $1 for each new issue. Back issues, when available, are free.

Requests by other clubs to receive copies of the WASP and other correspondence should be submitted to an editor on or before the first Thursday of each month.

Editor: Nancy Rowe 544-9081
2005 Hyland
Ferndale, MI 48220

Tom MacLaney
Mike O'Dowd
Ken Kelly

Stargate Observatory is owned and operated by the Society in conjunction with Rotary International. Located on the grounds of Camp Rotary on 29 Mile Road, 1.8 miles east of Romeo Plank Road, Stargate features a 12.5 inch F17 club-built Cassegrainian telescope under a steel dome. The observatory is open to all club members in accordance to the 'Stargate Observatory Rules.' Those wishing to use the observatory must call the Observatory Chairman by 7:00 PM on the evening of the session. The Observatory Chairman is: Robert Halsall 781-6784

Lectures are given at Stargate Observatory each weekend. The lecture will be either Friday or Saturday evening, depending on the weather and the lecturer's personal schedule. Lecturers should check with the ranger at Camp Rotary early in the week to determine whether scouts will be at the camp, and to inform the ranger of the day and time of the lecture. If you cannot lecture on your scheduled weekend, please make arrangements to switch weekends with another lecturer, or call the chairman as soon as possible. Upcoming lecturers are:

Scott Jorgenson 9/21/22 11-2/3
Frank McCullough 9/28/29 11-9/10
Robert Halsall 10/5/6 11-16/17
Jeff Bondono 10/12/13 11-23/24
Francis Stabler 10/19/20 11-30 12/1
Riyad Matti 10/26/27 12-7/8

The Call List is a list of people who wish to be informed of spectacular and unexpected astronomical events. Anyone who notices such an event calls the next person on the call list, who informs the next person, etc. A call list member can specify that he or she not be called at certain times. Any Society member is welcome to join the call list and can do so by notifying Jeff Bondono, 731-4706.

Subgroups exist for those interested in specialized areas. Those interested should contact the chairperson, listed below:

- Solar: Ed Cressman 645-1837
- Lunar/Planetary: Alan Rothenberg 624-9339
- Cosmology: Mike O'Dowd 268-7125
- Deep Sky: Doug Bock 750-9369
- Computer: Larry Kalinowski 776-9720
- Telescope making: Jim Houser 541-8198

The Society maintains a library of astronomy-related books and periodicals at the Macomb Community College meeting room. See the librarian for library rules or to checkout a book.

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CALENDAR OF EVENTS

<table>
<thead>
<tr>
<th>Weekend</th>
<th>Sept. 21, 22</th>
<th>Eagle Point Camping and Observing Weekend.</th>
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<tbody>
<tr>
<td>Thursday</td>
<td>Sept. 27</td>
<td>8:00</td>
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<td>Saturday</td>
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<tr>
<td>Weekend</td>
<td>Sept. 28, 29</td>
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<tr>
<td>Thursday</td>
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<td>Oct. 13, 14</td>
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<tr>
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PUBLIC OBSERVING NIGHTS
MSU OBSERVATORY

24 INCH CASSEGRAIN

Friday & Saturday Nights
Dates will be announced in W.A.S.P.

Planetarium show begins at 8:00 P.M. if you would care to see the show first.

If needed, please keep copy of the map with your files since this is the only issue of W.A.S.P. it will appear in.

The MSU Observatory is located at the corner of Forest and College Roads.

Public Observing Nights are co-sponsored by:
MSU Physics-Astronomy Department, Capital Area Astronomy Club, and Abrams Planetarium.

Call Kim Dyer and he will be glad to escort you to the telescope. 835-0993

If you know of any upcoming events or speakers, that you would like to share with other club members, or have an article to submit, please call Nancy Rowe at 544-9081.

ZIP CODE
If your zip code has changed, please contact Jeff Bondono at 731-4706.

STAR TREK CONVENTION

On October 13 - 14, 1990

Dearborn Civic Center - 15801 Michigan
11:00 A.M. to 7:00 P.M.

GUEST STAR
Michael Dorn
Best known as Klingon Worf

$8.00 in advance (ticketmaster outlets).
$11.00 at the door. Children 6 and under are free.

Come and help promote the W.A.S. If you have a telescope bring it along and admission is free.

CHRISTMAS BANQUET

December 20, 1990
Dinner at 8:00 P.M.
Warren Chateau
6015 East 10 Mile Road
Beef Tenderloin & Gourmet Chicken

$16.75
Contact: Frank McCollough
254-8164
Those of you who have a copy of the program DEEP SPACE should be able to follow Comet Levy's path without much trouble. If you don't have a copy, call me at 776-9720. It's a shareware program that deserves greater distribution. I can mail a copy to you if you leave your name and address or pick up a copy at the next computer meeting (Sept. 27, 8:00 PM). If you're not familiar with it, it will graphically draw a comets path on a star map and print it out for you. You'll need 512K of memory and a dot-matrix printer to accomplish the above. If you have no printer, just view the plotted path on the screen.

John Pawlicki of Warren demonstrated his portable 386 computer at our last meeting. The large LCD screen, hard disk and coprocessor provided fast, powerful portability. We ran DEEP SPACE on it and it really left the XT in the dust. It plotted a ninth magnitude star chart, 100 x 60 degrees, in about one minute, including the comets path. Roger Civic says it takes the XT about seven minutes to do the same job.

Levy's latest orbital elements are:

\[
\begin{align*}
T & = 1990 \text{ Oct 24.6277} \\
e & = 1.001267 \\
q & = 0.938779 \text{ A.U.} \quad (\text{EPOCH 1950}) \\
\text{Peri.} & = 242.6328 \text{ degrees} \\
\text{Node} & = 138.6561 \text{ degrees} \\
\iota & = 131.5951 \text{ degrees}
\end{align*}
\]

The values given above should be plugged into your copy of DEEP SPACE the first chance you get for better orbit calculation.
Several club members had the
pleasure of talking with Brad Smith
of JPL; he told us that the delay in
sending back the first Hubble photos
resulted from NASA public re1ations
insisting that the first photo had to
be a winner, so that congress would
be properly impressed. Sadly, poli-
tics takes precedence over engineer-
ing in these matters. At least its
running now.

Of course everyone knows that
there are troubles with the scope.
The main mirror has spherical aberra-
tion which is most noticeable in the
wide field views (just as it would be
on our telescopes). This will limit
the resolution possible in these
views. On the other hand, it will not
much influence the spectroscopes on
board because they do not require fo-
cused light. A recent analysis in
Science pointed out that the flaw in
the main mirror will be much easier
to fix than if it had been in the
secondary. Hopes are that a shuttle
mission will be able to go up and re-
pair Hubble in a couple years.

In the mean time experiments
that require high resolution or the
ability to pick out very dim stars
are being put off and those that use
the spectroscopes are getting priori-
ty. In this way the Hubble can be
used productively without any loss of
telescope time.

Another problem is that the so-
lar panels "shudder" every time the
Hubble goes in or out of the earth's
shadow. A fix using computer software
has been sent up and should reduce
this to a trivial problem, but ini-
tially the shuddering ruined about
half of the Hubble's available dark
time. Hopefully the space telescope
will be doing useful spectroscopic
work for the next year or two, and be
100% in 1993.

Several Princeton scientists re-
cently published predictions of what
the Hubble will be able to tell us.
If you like to watch galaxies, you'd
be interested to know that these men
predict 170 galaxies of magnitude 27
or brighter per square arc MINUTE! That
means the Hubble should be able
to spot several million galaxies over
the entire sky; think of all the super
novas they could find looking at
all those galaxies. As a point of
comparison, they expect only 3 stars
of magnitude 28 or brighter in a
square arc minute. Of course most of
these objects can be seen from the
ground, but the Hubble will show us
shape and size, where ground tele-
scopes reveal their existence and
nothing more.

As excited as galactic astroomo-
ers are, stellar astronomers have
more to look forward to. If the
Princeton group's predictions are
correct, the Hubble telescope will
show a whole new population of stars,
those with very low mass. These so
called "brown dwarfs" are one of the
elusive pieces to the cosmological
problem of missing matter.

Briefly, the problem is that
certain observations indicate that
galaxies have more matter than we can
see, and other observations suggest
that the whole universe has much more
matter than we can see; this suspect-
ed, unseen matter is called missing
matter. Brown dwarfs are one possible
source of missing matter.

The Space Telescope's infrared
camera is predicted to find as many
as 400 brown dwarfs per wide field
picture, provided they exist in the
numbers needed to account for the
missing matter. Of course there may
not be many brown dwarfs. That is why
the Hubble is so important to cosmol-
ogists; if brown dwarfs exist the
Hubble will see them, and if the Hul-
ble does not see many brown dwarfs, then they probably can't account for
the missing matter.

Finally, the Space Telescope may
show us many new quasars. How quasars
work is still a point of disagreement
among theorists. The new observations
may help settle the dispute. All in
all we can look forward to great things from this observatory in
space.

Still, there will always be a
place for ground based and rocket
based observations. Recent x-ray work
done with a rocket-borne telescope
has revealed details down to a few
hundred kilometers in the solar coro-
na. That means details as small as
3/4 of an arc second! At this level
of detail, observers can see ribbon-
like structures in solar flares, fine
filaments above the surface of the
sun and, perhaps most importantly,
they feel that much more detail must
exist at higher resolution. This
means that the sun has a very complex
structure that is connected to the
wild magnetic fields on the surface
of the sun.

In addition, details similar to
what we see through a hydrogen alpha
filter also exists out in the corona,
but the light comes to us as x-rays
since the temperature there is a few million degrees. In the end, all this structure is driven by convection in the sun's interior. By showing us the structure of the corona, these observations help us understand the engine that drives the sun itself.

Question: what is the difference between an asteroid or minor planet and a meteorite parent body? Answer: nothing but perspective. Call these huge rocks in space what you will, they are both the asteroids we know by name, and the source of most meteors that land on earth. Current studies of meteors indicate that many are formed when two asteroids collide. The result is that both bodies shatter, mix, and then fall into a sort of rubble pile in space. This heap of rock is then disturbed by a passing planet and eventually collides with the earth. The big question, still unanswered is, which asteroid did a meteor come from? The answer to that will probably come from an amateur astronomer who notices an asteroid in an odd orbit, an orbit that eventually runs into the earth. Keep your eyes open.

The other source of meteorites is comets, which come to us from the Oort cloud. This cloud is a swarm of comets just barely held in orbit by the sun at distances over 10,000 AU (1 AU being the distance from the sun to the earth). A recent article in Nature reviewed what is known about the Oort cloud. In brief, the cloud contains about five thousand billion comets, mostly in the inner regions, those closest to the sun. Together the comets probably weigh about 50 times as much as the earth. That means a comet weighs a few million tons on average. One of the missions of the space telescope in later years will be to look for the Oort cloud and try to verify some of these predictions.

Sometimes the Oort cloud is considered the edge of the solar system. In reality the Oort cloud is really in interstellar space. The true edge of the solar system is the heliopause, where the solar wind collides with the interstellar medium. Inside the heliopause the sun dominates, outside it is the space between stars. Some day Voyager will reach that point, and someday may be someday soon. Two radio astronomers have concluded that the heliopause is between 60 and 100 AU away. Voyager 1 is already at 48 AU so it could conceivably be sending back data about interstellar space in just a few years. When we receive that data, mankind will have "visited" deep space for the first time.

Clear Skies

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**EASY SET-UP OF AN EQUATORIAL MOUNT**  
By Don Mick

To simplify the process of setting up a telescope (with equatorial mount) for a short observing session in the backyard, drive three stakes in the ground with shallow holes drilled in the top faces to hold the tripod points. Saw the stakes from an eight inch length of hardwood 2" X 4" tapered to 1/2" square at the lower end and then filed to a blunt point.

To determine the location for the stakes, set up the tripod so that the azimuth adjustment is about midway in its range when the polar axis is north-south. Mark the location of the tripod legs and drive the stakes far enough in so that they won't interfere with grass moving but not all the way to ground level. A little white paint on the top faces will make the stakes easier to find in the dark.

Set up the tripod and scope and make sure the points are seated in the drilled holes. Make a careful adjustment of azimuth and altitude of the polar axis and lock them in place. Now you'll find it quick and easy to get set up for a few minutes of observing when there is a break in the clouds which coincides with a break in your busy schedule.
JEWELS OF THE SKY

(Continued from page 1)

say 9mm, the colours become apparent. A very subtle green primary and a comes (pronounced ko-me-z and means companion) of a pale rose or lavender. A beautiful binary worth a long and careful examination.

Delta Hercules. 3.1-8.8 mag. of 10.0" at 216 degrees. Though duplicity can be detected at 25mm (76x), there is a great disparity in magnitudes. Delta is a nice delicate contrast compared to the previous pairs of nearly equal brightness. Described as greenish/white and purple, they appear as white for the primary with a comes too dim to be accurately judged. Perhaps a 10" aperture would help on this dim companion.

OE338. 7.2-7.4 mag. of 0.8" at 178 degrees. This star is from the catalogue of Otto Struve. Struve stars are always very interesting due either to their closeness or disparity of magnitude. Otto does not here let us down. At 0.8" of arc I could not detect a separation until I reached 12mm (154x). The best view was given at 7mm (263x). This marvelous binary presents an excellent test object for a 6 inch since Dawes limit is 0.79 arc seconds. I could determine no particular colours other than dull white.

Rho Hercules. 4.5-5.4 mag. of 4.0" at 317 degrees. Though split at 25mm, the 18mm (102x) gave a better view. At 9mm the colour became more apparent. Though described as both green, I see one as pale yellow/white. Depending upon the size of the diffraction disk, telescope aperture, etc., the colour determinations can be subjective and difficult. For example, my immediate impression of the comes was a soft pink!

Kappa Hercules. 5.3-6.5 mag. of 29.4" at 12 degrees. Very wide even at the lowest power. With 9mm the primary is yellow with a dull red companion. This agrees well with the old observations.

Zeta Hercules. 3.1-5.6 mag. of 0.5" at 344 degrees. My Astro card errs here, no doubt from the fact that this is a fast moving pair. The ephemerides for 1991 gives a separation of 1.6" at 80 degrees in position angle. The comes split off at 9mm. This is a good test object for an 8 inch reflector. The primary is yellow with a companion too close to call.

E2107 Hercules. 6.8-8.2 mag. of 1.2" at 74 degrees. This star was discovered by Wilhelm Struve and again the Struve's don't let us down in presenting a most severe test object. Requiring 9mm (200x) to separate, the primary is yellow with a comes too dim and close to determine.

56 Hercules. 6.4-10 mag. of 18.4" at 94 degrees. Flamsteed 56 is our last binary. It also has the greatest disparity of magnitude of the lot. An excellent test of sky and visual acuity with a 4", this is a very beautiful pair in its contrast. The split is easy but moderate to high powers may be required to darken the sky enough to bring out the companion. The primary appears dull yellow.

Please give this list a try before we lose Hercules to the coming autumn skies. There is something here for everyone and is the very best introduction to binary stars with all their beauty and diversity. Indeed, it gives a pleasurable break from those old smudgy deep-sky objects.

Positions for Epoch 1950.0

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<tr>
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<th>Dec</th>
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<td>Rasalgethi</td>
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<td>17h</td>
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<td>Delta</td>
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<td>17h</td>
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