

# WAS NEWS

Monthly Newsletter of the Worthing Astronomical Society  
www.was.org.uk



Number 188

July 2005

## ALMANAC

All times U.T.

### July/August/September

#### LUNAR

July	Date	Time	Rise	Set
New moon	6 <sup>th</sup>	12.02	02.58	21.08
First Quarter	14 <sup>th</sup>	15.20	12.31	23.07
Full Moon	21 <sup>st</sup>	11.00	20.54	03.12
Last Quarter	28 <sup>th</sup>	03.19	22.40	13.37
<b>August</b>				
New moon	5 <sup>th</sup>	03.05	04.16	20.22
First Quarter	13 <sup>th</sup>	02.39	14.18	22.03
Full Moon	19 <sup>th</sup>	17.53	19.38	03.47
Last Quarter	26 <sup>th</sup>	15.18	21.26	14.02
<b>September</b>				
New moon	3 <sup>rd</sup>	18.45	04.31	18.54
First Quarter	11 <sup>th</sup>	11.37	14.47	21.15
Full Moon	18 <sup>th</sup>	02.01	18.23	05.52
Last Quarter	25 <sup>th</sup>	06.41	21.32	15.07

#### EARTH

July	Sunrise	Sunset
6 <sup>th</sup>	03.51	20.18
14 <sup>th</sup>	04.00	20.12
21 <sup>st</sup>	04.08	20.04
28 <sup>th</sup>	04.18	19.55
<b>August</b>		
5 <sup>th</sup>	04.30	19.41
13 <sup>th</sup>	04.43	19.27
19 <sup>th</sup>	04.52	19.15
26 <sup>th</sup>	05.03	19.00
<b>September</b>		
3 <sup>rd</sup>	05.16	18.42
11 <sup>th</sup>	05.29	18.24
18 <sup>th</sup>	05.40	18.08
25 <sup>th</sup>	05.51	17.52

### PLANETS (As at August 13th)

Constellation	Rises	Sets	Mag.
<b>Mercury</b> Cancer	04.00	18.33	-0.4
Unfavourable till the end of the month			
<b>Venus</b> Virgo	08.03	20.35	-4.0
Evening object in the west			
<b>Mars</b> Aries	21.59	12.07	-0.7
Bright in the east south east			
<b>Jupiter</b> Virgo	09.53	21.09	-1.8
Evening object in the South west			
<b>Saturn</b> Cancer	03.11	18.45	+0.3
Morning object later in the month			
<b>Uranus</b> Aquarius	19.58	06.40	+5.7
At opposition on Sept. 1 <sup>st</sup>			
<b>Neptune</b> Capricornus	19.06	04.30	+7.8
At opposition on Aug 8 <sup>th</sup>			
<b>Pluto</b> Serpens cauda	15.13	00.48	+13.9
At opposition on June 14 <sup>th</sup>			

### PHENOMENA

Day	Hour	July
13 <sup>th</sup>	18	Jupiter 0.7° N. of moon
23 <sup>rd</sup>	03	Mercury at stationary point

23 <sup>rd</sup>	17	Saturn in conjunction
27 <sup>th</sup>	17	Mars 4° S. of moon
<b>August</b>		
4 <sup>th</sup>	06	Saturn 5° S. of moon
5 <sup>th</sup>	06	Mercury 9° S. of moon
6 <sup>th</sup>	00	Mercury in inferior conjunction
8 <sup>th</sup>	05	Venus 1° S. of moon
8 <sup>th</sup>	16	Neptune at opposition
10 <sup>th</sup>	07	Jupiter 1° N. of moon
16 <sup>th</sup>	04	Mercury at stationary point
23 <sup>rd</sup>	23	Mercury at greatest elongation W. 18°
25 <sup>th</sup>	04	Mars 5° S. of moon
31 <sup>st</sup>	19	Saturn 4° S. of moon
<b>September</b>		
1 <sup>st</sup>	03	Uranus at opposition
2 <sup>nd</sup>	00	Jupiter 1° N. of Venus
2 <sup>nd</sup>	11	Pluto at stationary point
2 <sup>nd</sup>	12	Mercury 3° S. of moon
6 <sup>th</sup>	22	Jupiter 2° N. of moon
7 <sup>th</sup>	09	Venus 0.6° N. of moon
18 <sup>th</sup>	03	Mercury in superior conjunction

### Minima of Algol

July 21 <sup>st</sup> 00.48	23 <sup>rd</sup> 21.36		
August 10 <sup>th</sup> 02.30	12 <sup>th</sup> 23.18	15 <sup>th</sup> 20.06	30 <sup>th</sup> 04.06
September 2 <sup>nd</sup> 00.54	4 <sup>th</sup> 21.48	19 <sup>th</sup> 05.48	

### Lunar Occultation's Times as at Old W.A.S. Observatory

Date	U.T.	S.A.O. No	Mag	Phase
<b>July</b>				
h. m. s.				
14 <sup>th</sup>	21.13.12	157989	8.5	Diss
24 <sup>th</sup>	00.42.43	165243	7.9	Reapp
26 <sup>th</sup>	23.39.07	109753	6.2	Reapp
28 <sup>th</sup>	01.23.30	92795	7.9	Reapp
29 <sup>th</sup>	00.46.57	93189	5.9	Reapp
<b>August</b>				
22 <sup>nd</sup>	00.29.58	128571	8.0	Reapp
23 <sup>rd</sup>	22.12.33	92590	8.3	Reapp
23 <sup>rd</sup>	22.30.50	926008	8.7	Reapp
23 <sup>rd</sup>	22.47.08	92612	8.8	Reapp
23 <sup>rd</sup>	22.58.07	92603	8.9	Reapp
24 <sup>th</sup>	22.45.00	93014	8.1	Reapp
24 <sup>th</sup>	23.35.23	0	9.6	Reapp
<b>Sept</b>				
13 <sup>th</sup>	20.24.29	188429	7.7	Diss
14 <sup>th</sup>	21.15.53	189640	8.5	Diss
14 <sup>th</sup>	21.43.39	189669	7.2	Diss
14 <sup>th</sup>	22.43.16	189703	7.9	Diss
15 <sup>th</sup>	20.04.48	164593	4.8	Diss
15 <sup>th</sup>	22.52.18	164657	7.5	Diss
15 <sup>th</sup>	23.06.47	164674	7.5	Diss

The list above is a selection of about 20% of the more easily observed events

Dave Wells

## *Editors Note*

A slightly larger issue than normal this month to keep you all going over the summer months.

Some great articles from inside & outside the society and all your usual favourites.

Hope to see you all in September

Rob

## *Dates for your Diary*

### Perseid Meteor Watch

Alex Vincent

On Friday August 12 2005, I am doing a Perseid meteor watch from our Ferring Beach observing site to watch out for any meteors and to look at the planets Jupiter & Venus. We will start at 8.00PM and hope for clear skies. Bring a camera if you wish to do any meteor photography

### 40th Anniversary evening at the Chichester Planetarium

Nick Quin

As part of the 40th anniversary celebrations, the committee have arranged a visit to the South Downs Planetarium in Chichester. This will take place on Saturday 22nd October from 7.00pm, with John Mason starting his 1 hour presentation at 7.30pm. Afterwards, there will be a speech by the President, a buffet including a birthday cake, and champagne!

The planetarium holds just over 90 people so this will be the maximum number of tickets sold. In the event of over-subscription members will take priority over non-members. Tickets are available from the Treasurer at 12 pounds each. Please make cheques payable to 'Worthing Astronomical Society'. Tickets can be ordered for collection at the September meeting, or if you wish to have them posted, please include a SAE. The closing date for orders is the 21st September. You will have to make your own way to Chichester, but the Planetarium is very close to the station, and we hope to be able to arrange car sharing.

If you require any further information then please ask any member of the committee.

## *Reports*

### Solar Section Report - June 2005

Section Director, Brian Halls

Solar activity continues to fluctuate, as certain sunspot active longitudes of the Sun drift into and out of view due to solar rotation.

At the moment, these sunspot bearing areas appear about the second week of the month.

Some of these spots are extremely active and during June Graham reported one such group as being of naked eye magnitude.

However, due to solar rotation, these active groups rotate out of view as the days proceed and during the latter part of the month the sun showed some spotless days or days with few small spots apparent, indicating that solar activity is very much on the downward trend of the present cycle.

The spot active regions remain active however. While at the end of June sunspot activity was low – 1 group present, as the 1<sup>st</sup> of July came along sunspot activity increased once more as the active longitudes once more rotated into view. The first week of July recorded 9 sunspot groups of varying types and sizes.

I would recommend observing the Sun regularly for spots and would like to hear from anyone who is recording these groups at the moment, either visually or photographically.

Sunspot groups tended to the southern hemisphere for much of the month.

Reports were received from, Graham Boots (25 days) and the Director (11 days) with other details in this report from the daily Space Environment Center reports and weekly reports from the Solar Influences Data Analysis Center, Royal Observatory of Belgium.

WAS derived MDF= 2.43 ; R= 36.56

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*June Lecture Reviewed - Report by Peter Atkinson*

### Extra Solar Planets

Dr Christian Kaiser Southampton University

The lecturer began by considering what constitutes a planet which might be of interest to us. The basic criteria are –

- A body which orbits a star, not a moon orbiting another planet
- Terrestrial in form – with a firm surface and a habitable zone with an atmosphere and liquid water

Our own Solar System contains four terrestrial and four jovian type planets. The inner planets all have a surface which could be landed on while the four major outer planets are all gas giants.

A computer simulation was used to illustrate star formation in collapsing gas clouds. Proto stars with an accretion disc have been found statistically virtually certain to have planets forming in the disc. The Hubble Space Telescope (HST) has found such discs, for example in the Orion Nebula. But finding extra solar planets is by no means easy. They are very close to their star which means that they cannot be separated visually from very far away. For instance resolution of the Earth and the Sun as separate bodies could only be done within 3 light years distance. Also the stars outshine the planets by many times making direct observation impossible. So four other possible means of detection were considered –

1. Interferometry. By using a pair of large telescopes it is theoretically possible to cancel out the glare of the star. In practice using two 4 metre telescopes has not so far found any planets. It is hoped to attempt a similar experiment using 10 meter telescopes but this is likely be 10 years off..
2. Observable ‘wobble’ of stars. Slight changes in radial velocity can produce a measurable Doppler effect.
3. Astrometry. Measurement of the movement of stars against the celestial background over a period of years has been used to some effect. This is obviously not a fast method of finding planets.
4. Transits. Eclipses/occultations which could not be seen from the ground are now observable with HST.

With these means a total of 136 stars with planets have now been identified – 155 with a planet, 15 with multiple systems. Mostly they are large, massive jovian planets but this probably does not reflect the actual distribution of large and small planets. Simply that the small ones are so much harder to detect.

The question “Is there anybody there” is purely speculative. We cannot expect to visit outside our galaxy, or even very far inside it so the search is naturally for radio emission. Using modern sensitive Radio Telescopes

it is easy to separate emission from stars from the background noise. So how many advanced civilisations can we expect?

Here Christian introduced the only equation in his lecture: the *Drake Equation*. Formulated in 1961 and generally accepted by the scientific community –

$$N = R_* \cdot f_p \cdot n_e \cdot f_l \cdot f_i \cdot f_c \cdot L$$

where,

- N = The number of communicative civilizations
- R<sub>\*</sub> = The rate of formation of suitable stars (such as our Sun)
- f<sub>p</sub> = The fraction of those stars with planets (Current evidence indicates that planetary systems may be common for stars like the Sun)
- n<sub>e</sub> = The fraction of Earth-like objects per planetary system
- f<sub>l</sub> = The fraction of those Earth-like planets where life develops
- f<sub>i</sub> = The fraction of life sites where intelligence develops
- f<sub>c</sub> = The fraction of those on which communications technology (electromagnetic) develops
- L = The lifetime of communicating civilizations

Dr. Frank Drake’s own solution to this equation estimates 10,000 communicative civilizations in the Milky Way.

The ‘Search for Extra Terrestrial Intelligence’ (SETI) currently targets approximately 1,000 stars within 200 light years. The Allen Telescope Array will extend this to 100,000 stars.

Dr. Kaiser concluded a most informative and enjoyable lecture with the observation that no one has tried to contact us yet!

Christian answered questions from the floor and noted in particular that even using electromagnetic emission detection we can only search within part of our own galaxy as the power of radio emission diminishes with the square of the distance.

## *Notices*

### New Assistant Chairman!!!

**C**ongratulations to Glen our Chairman and Mrs Chairman on the birth of there daughter Louise Victoria

### First Aiders Wanted

**A**ny members who are qualified First Aiders, who are fairly regular attendees of society events, in particular, monthly meetings and who are willing to volunteer their services to WAS can they please contact any committee member.

## Recent Additions To The Was Library

Librarians - Linda and Dave Storey

The following titles have been added to the library stock.

SILK	On the Shores of the Unknown
PEPIN	Care of Astronomical Telescopes and Accessories
GOLDSMITH	Einstein's Greatest Blunder
MOORE	More Small Astronomical Observatories
GRIBBIN	How Far is Up?

### Stellar & Deep Sky Section

Graham Boots

I have been Stellar & Deep Sky section director since 1997 and have not had the time to fulfill this position over the last year. I therefore feel it best to resign and offer this position open to the membership. Interest has already been shown. Anyone interested should submit to the committee their written intentions on how they would operate this section for the benefit of members.

### *Was Pic*

#### Jupiter

Ed Sampson



20h 03m UT on the 13<sup>th</sup> June 2005 North is to the top and west is to the left. Two satellite shadows are showing. The telescope used was a 20.3 cms Sch/Cass

## *Articles*

### Messier Objects - Continued

Janet Young

The Messier Objects are so called because they were a list of fuzzy objects in the night sky compiled by Charles Messier (1730-1817) a French comet hunter. While hunting for comets he kept finding these faint and fuzzy objects, so decided to compile a catalogue of them to avoid them being mistaken for comets. He listed them as M or Messier followed by a number. Charles Messier did discover several comets, but it is for the Messier catalogue he is best remembered.

M16

Constellation: Serpens

RA 18hrs 16m

Dec -13.48

Distance: 7,000 light years

Type: Nebula/Cluster

NGC 6611

Also known as the Eagle Nebula, it contains a star cluster discovered by P.L. de Cheseaux in 1746 but the nebula had been documented by Messier twenty years earlier. Best viewed in low power and is one of most unusual objects in the sky.

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M17

Constellation: Sagittarius

RA 18hrs 18m

Dec -16.12

Distance: 6,000 light years

Type: Nebula/Cluster

NGC 6618

Known as the Omega Nebula it was originally discovered by Cheseaux in 1746 and catalogued by Messier in 1764. Is reddish graduating to pink in colour. Can viewed in small telescopes.

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M18

Constellation: Sagittarius

RA 18h 17m

Dec -17.09

Distance: 6,000 light years

Type: Galactic Cluster

NGC 6613

Total visual brightness is of a 7.5 magnitude star. Looks like a nebula but in a small telescope more than a dozen stars can be viewed.

M19  
Constellation: Ophiuchus  
RA 16h 59m  
Dec -26.11  
Distance: 20,000 light years  
Type: Globular Cluster  
NGC 6273

Has a magnitude of 7. Messier documented this cluster in 1764. Stars in the cluster are of approximately 16<sup>th</sup> magnitude.

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## The summer deep sky

Ed Sampson

Summer is a wonderful time of the year the weather is warm (usually) most of us have holidays and we can do so much more with our evenings- Unless you're an amateur astronomer. Over the next few months is it really worth getting out the telescope when it gets dark late?

In my opinion yes, there are so many striking deep sky objects all you will need is a 75mm scope (3 inches in old money) and a star atlas.

Why not see what the UK skies have to offer at our latitude and seeing conditions. A good place to start is in the constellation of Hercules, this constellation is easily recognised due to the 'Keystone' shape of the constellation.

Some of the stars worth a mention are Alpha her, this is a reddish irregular variable with a lovely yellow companion, these two stars have a beautiful contrast and it is always worth another visit due to the changing brightness of the primary. Another star of worthy note is 95her this is my personal champion for stunning colour contrast I have seen (and imaged) beautiful colours of cherry red and apple green, What can you see?.

Two fine Globular Clusters of reside in Hercules M13 and M92. The latter is more compact fuzz with a bright core a lighter halo whereas M13 is a giant in comparison. Some people say this is the finest Globular in the northern hemisphere, a beautiful sight in any Telescope and the first of the 'wow' showpieces I tend to give on a tour. One thing worth trying to see is the Y-shaped lanes in the cluster but you need a 100mm scope to resolve it.

Over now to Lyra and again it's worth looking at the stars first. Alpha Lyrae is stunning it's the 5<sup>th</sup> most luminous star in the sky. It is also a double with a bright white primary and a faint 10<sup>th</sup> magnitude bluish companion

unfortunately these are only line of sight doubles. Beta Lyrae is another example of a good contrast double. Epsilon Lyrae is in my opinion the finest multiple star in the region at low power you will see to white stars, increase power to 100-150x and each star becomes a double in its own right, making this a quadruple system.

A final stop is to M57 the famous Ring Nebula a fine object that stands magnification well. A ghostly smoke ring, this planetary nebula represents a star in its twilight years who has ejected its surface.



*A home shot of M57*

Heading slightly east it is worth dropping by beta cygni or Albireo, the contrast of this double is fantastic a deep blue and orange contrast never fails to impress.

A short hop away is the fantastic M27 the 'Dumbbell' this is one of those DSOs that reveal more when viewed with a nebula filter but weather you have one or not you cannot fail to see the large ghostly hourglass shape this planetary reveals.

If you are lucky enough to have a south facing garden then summer opens up some of the finest and lowest constellations, all of which have many open and globular clusters.

A fine example of an open cluster is M11 the 'Wild Duck' this cluster resides in Scutum and is resolvable in any telescope. My 8 inch scope reveals a treasure of multiple colour jewel stars in a triangular shape. It's always worth spending time to see the wonders and spectral types of the distant cluster.

Scorpius if it is at all possible for you to see has some great attractions starting with the Reddish giant Antares (rival of mars), this has a tiny greenish companion and is an easy star to see colour with the naked eye.

## WAS Ad

### Sussex Astronomy Centre

**F**or all your astronomy needs  
Meade, Celestron, SkyWatcher, Tal Telescopes  
Large range of accessories, software, books etc  
16 Mulberry Lane  
Goring by sea  
Worthing, West Sussex.  
Telephone 01903-247317  
Email [worthingastronomy@tiscali.co.uk](mailto:worthingastronomy@tiscali.co.uk)  
Web Site. [www.sussex-astronomy-centre.co.uk](http://www.sussex-astronomy-centre.co.uk)  
Ask for Paul Farmer (Club Member)

### *What's on the Box*

**Sunday 24<sup>th</sup> July 2005**



0023 to 03.00: **2001: A Space Odyssey**

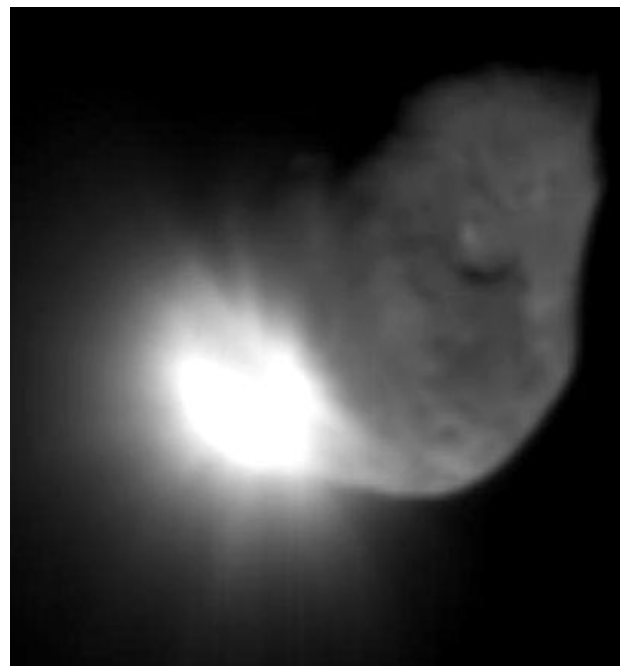
**S**tanley Kubrick and Arthur C Clarke's magnificent collaboration.

### *WAS News News*

#### Deep Impact is a smashing success

By William Harwood  
Story Written For CBS News "Space Place"

**P**ASADENA, Calif. (CBS) - A scientific smart bomb crashed into Comet Tempel 1 early today, blasting a sparkling shower of icy debris into space in a 23,000-mph Fourth of July spectacular 83 million miles from Earth.



*This image shows the initial ejecta that resulted when NASA's Deep Impact probe collided with comet Tempel 1 at 1:52 a.m. EDT. The picture was taken by the mothership's medium-resolution camera 16 seconds after impact. Credit: NASA/JPL-Caltech/UMD*

It is also worth paying beta scorpi a visit this double comprises of 2 lovely bluish white doubles. Near Antares is also a great Globular cluster this appears to be one of the loosest Globulars I have ever seen and always worth comparing to M13.

Our final part of the summer tour is the centre of the Milky Way itself Sagittarius there are so many deep sky objects here and a few are notable exceptions. M22 is a huge Globular cluster that would easily rival M13 if it was not so low.

One of my all time favourite Messier objects is M17 the 'Omega or Swan' nebula this is one of the brightest nebula in the sky and I think it is a summer equal of the great Orion nebula. One final object worthy of our attention is M8 or the 'lagoon nebula'.

It comprises of an open cluster and nebula and shows up well in any scope so long as a southern view permits. Both M17 and M8 show even more detail when used with a nebula filter even at such a low altitude.



*The swan from my backyard*

For all of you who have no practical way of viewing the southern horizon one deep sky object worthy of note is the double cluster in Perseus. (NGC869-884). Why these were not recorded by messier we will never know. These are northern showpiece clusters and show up well in any size telescope, they also benefit a lot from a rich field view. I personally can see a large population of red stars in both clusters which are unsurprising as they are both very old.

Next time you are sat in your garden or porch and the sun is setting, dust of that scope and bag a few of the Deep sky objects you will be glad you did.

"Jeez, and we thought it was going to be subtle!" marveled comet expert Donald Yeomans as images of the impact were received at the Jet Propulsion Laboratory. "We've had a far bigger explosion than we anticipated. ... I can't imagine how this could go any better."

Said Rick Grammier, the Deep Impact project manager: "It came together quite well, just phenomenal. It went very much like clockwork. We didn't exercise a single contingency plan."

As it closed in on Tempel 1 at 11 times the speed of a rifle bullet, the impactor beamed back a stream of ever more detailed pictures, showing circular craters, plain-like areas, a long, snaking ridge and jumbled-looking terrain similar to regions on the moon.

"It's illuminating some extremely interesting surface features," Yeomans said, describing the pictures as they as they came in. "That's going to keep the scientists going for a long time. The navigation was perfect, it couldn't have been any better. The impact was bigger than I expected, bigger than most of us expected. So this is going to tell us a great deal about how this comet is put together."

The 820-pound impactor spacecraft, programmed to place itself directly in the comet's path, collided with Tempel 1 at 1:52 a.m. EDT (10:52 p.m. PDT Sunday), releasing the energy equivalent of 4.5 tons of TNT as it vaporized in a sudden, spectacular flash.

Looking on 5,250 miles away, the Deep Impact mothership that ferried the impactor to Tempel 1 trained two telescopes and an infrared spectrometer on the impact site, studying the subsurface ices blown into space by the collision.

The crater that almost certainly resulted from the impact was not immediately visible in an obscuring cloud of debris that spread outward into deep space like some ghostly fog.

"Obviously, it was a very big impact," principal investigator Michael A'Hearn said at a post-impact news conference. "Presumably, we have a large crater in one of those images that hasn't played back yet."

"Interpreting the ejecta cone ... is going to take a bit of time. There's a lot of structure in it that's of interest to understanding the nature of the comet. We'll be working that over the next half day and weeks and months and years. I just look forward to a wealth of data that will take me to retirement."

While he provided no details, A'Hearn said flyby craft's infrared spectrometer captured clear chemical signatures of various icy compounds including some that were clearly unexpected.

During the final stages of the encounter flight controllers frequently gasped and broke out in repeated cheers as more detailed images rolled in from space.

"I'm at a loss to explain just how on Earth our little washing machine-sized impactor caused such a disturbance some 83 million miles away," said the normally unflappable Yeomans.. "This is going to take some work to explain, but it's sure taken me by surprise. And I suspect some of my colleagues up in the science area are equally surprised."

The flyby spacecraft had just 13 minutes to collect and transmit its highest-priority data before re-orienting itself, bringing protective dust shields to bear as it fell behind the comet, passing just 300 miles below the Washington, DC-size nucleus at closest approach.

About 27 minutes later, the flyby craft turned back toward the receding comet for additional observations, surviving its close flyby of Tempel 1 in near-perfect health. By then, A'Hearn said, the expanding ejecta cone was larger than the nucleus of the comet and still evolving. Back on Earth, meanwhile, astronomers in virtually every major observatory in the world with a view of the collision aimed their telescopes at Tempel 1 to monitor the flash of the impactor's destruction.

The Hubble Space Telescope, the Spitzer Infrared Telescope and the Chandra X-Ray Observatory also monitored the collision from Earth orbit. Hubble measured a two-magnitude increase in light output, corresponding to about a six-fold jump in brightness. Before-and-after images from Hubble showed a distinct brightening with a fair amount of structure in the debris cloud.

Tempel 1 was just above the southwestern horizon for observers in the extreme western United States, but it was not immediately known how many amateurs might have been able to detect the sudden brightening that signaled the impactor's crash.

But it was the flyby spacecraft that had the best seat in the house, making its own observations while relaying final close-up images from the impactor taken just a few minutes before its kamikaze-like destruction.

In its final few shots, Yeomans estimated the impactor's camera was able to detect features as small as about eight

inches across. The final picture was snapped just 3.7 seconds before impact. For comparison, the European Space Agency's Giotto probe was unable to detect features on Halley's Comet in 1986 smaller than about the length of a football field.

To give the small impactor enough mass to excavate a significant crater, it was loaded with enough copper to make 45,000 pennies. Copper was chosen for the bulk of the impactor's mass because it is not present in comets, allowing astronomers to ignore the remains of the spacecraft in spectroscopic studies of the resulting debris cloud.

While it will take time to fully analyze the downlinked data, astronomers almost certainly will learn more than enough to re-write their textbooks about cometary structure and evolution. On a more fundamental level, the \$333 million Deep Impact mission will shed light on the composition of the cloud of gas and dust that coalesced to form the solar system 4.6 billion years ago.

And while it was not a primary goal of the mission, the deep space fireworks display will give scientists and engineers valuable insights into what might be needed someday to divert or destroy a comet on a collision course with Earth.

"It's considerably brighter, there's considerably more material coming off than I thought," Yeomans said, watching the initial impact images come in. "The predictions on the science team were all over the map. Someone won a fairly large-size pool here with a long-shot prediction of a rather extraordinary impact.

"We've got an object the size of a washing machine going in here creating a crater and ejecta that's just enormous. At least that's the way it looks like now. ... One of our science team members actually predicted the impact would release sub-surface pressure and we'd have a far bigger explosion than they anticipated. That may be what happened, I don't know."

Deep Impact was launched from Cape Canaveral, Fla., Jan. 12. The impactor was released from the flyby spacecraft early Sunday, roughly 24 hours before the collision, at a point in space about 500,000 miles in front of Tempel 1.

As the much-faster comet overtook the two spacecraft, a steady stream of images was transmitted to Earth, revealing more and more surface detail as the distance between the hunters and their quarry closed.

The final few pictures were quickly assembled into a sort of stop-action movie, showing the nucleus grow from a small, unfocused blur of light to a sharply defined, cratered body with a wealth of surface detail.

Tempel 1 originated in the Kuiper Belt, a broad flattened disk of icy debris extending from the orbit of Neptune to well beyond Pluto. Disturbed by gravitational interactions, primarily involving Jupiter and Saturn, a Kuiper Belt comet can fall into the inner solar system and become captured in a so-called short-period orbit.

In the early solar system, gravitational encounters also threw large numbers of comets into a vast, spherical shell known as the Oort Cloud. Comets that eventually fall back into the inner solar system from the Oort Cloud typically have orbits measured in millions of years.

"Comets formed in the outer part of the solar system and preserve clues to its formation," said A'Hearn. "They formed from Jupiter on out to beyond Neptune four-and-a-half billion years ago, together with all the planets. The inner ones got ejected to the Oort Cloud, which extends halfway to the next star, whereas the ones that formed in the Kuiper Belt are probably still in the Kuiper Belt.

"We are examining comets that come in from the Kuiper Belt with Deep Impact. The problem in understanding the comets is, each time the comet goes close to the sun, the surface layer gets heated and this changes the surface layers. So it's only the interior that preserves the clues to the formation of the solar system."

One reason for the current interest in comets is the belief they may have played a major role in the development of Earth's biosphere.

"In terms of their relationship with life, they may well have brought the water and carbon-based molecules to the early Earth that allowed life to form," Yeomans said in an interview for the author's book "Space Odyssey: Voyaging through the Cosmos." "Subsequent collisions may have punctuated the evolution, wiped out the dinosaurs 65 million years ago and so allowed only the mammals to move forward.

"So in a sense, we may owe our position atop the world's food chain to the fact that the dinosaurs checked out as a result of an impact. So I think there's an increased realization that comets and asteroids are not just the flotsam and jetsam of the solar system. They really are, next to the sun itself, probably the most important objects in terms of power over life."

# **WAS BBQ**

**To be held at the home of Colin Knappitt**

**Saturday 13<sup>th</sup> August**

**from 6.30 onwards**

**Cost £4 per person (£6 per couple)**

**Must be booked in advance**

**This will be the nearest Saturday to the Perseids so hopefully  
we will see some meteors!**

**Please bring your own drink and possibly a garden chair!**

**‘Faraway’  
41 Cleveland Road  
Worthing  
Tel: 01903 695044**

**We will also need to know, in advance, if you require a  
vegetarian meal.**

## *Diary*

13th July 2005 'Wish You Were Here Astronomy' - Dr Lilian Hobbs Southampton Astronomical Society

14th September 2005 40th Anniversary Lecture September 1965 – 2005. Black Holes & White Rabbits (physics & magic) - Professor John C. Brown Astronomer Royal for Scotland Dept., of Physics & Astronomy Glasgow University

12th October 2005 Member's Contributions Inc The Super String Theory - David Storey.

9th November 2005 Universe in 4D- Cosmic Light Show - Dr. Christopher Baddiley Infrared Physicist Worcester

14th December 2005 Adventures with a Small Telescope - Neil Bone Meteor Section Director of the British Astronomical Association

All Meetings (**bold**) are held on the second Wednesday of every month unless otherwise stated, at Heene Church Rooms, Worthing at 7.30 p.m. Meetings include the latest astronomical work, reports and, photographs by members. For further information find us on the Internet at [www.was.org.uk](http://www.was.org.uk) or email: [chairman@was.org.uk](mailto:chairman@was.org.uk)

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## *Note to Contributors*

Contributions & Correspondence for the **September** issue of WAS NEWS should be with the Editor by **September 1st**. All material for inclusion should be sent to the Editor.

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