



# TRANSIT

The Newsletter of



5 February 2006. Julian Day 2453772



Saturn images by Keith Johnson

## **Editorial**

### **January 2006 Meeting – Members Night :**

An excellent contribution to Members Night from those members brave enough to face the as-ever critical Society membership.

Michael Roe provided us with his detailed account of what the Apollo 11 Lunar team actually got up to on their short but heavily work-loaded visit to the Lunar surface. We all know they landed and took off again and in between said some memorable words and flew the flag, the usual inadequate media bites we have become used to. The talk was accompanied by Michael's usual high standard of hand-drawn sketches.

Again Rob Peeling surprised a lot of us by delving deeper into the NASA imaging archives than we usually surf for in our magazines and website trawling. I didn't realize the Mars Rovers were taking images above the horizon, I was amazed at their sky astro-images including a possible meteor trail. We will all now look a bit deeper ourselves.

John Crowther, our Society wordsmith, entertained us on the subject of "Time" and our use or abuse of it in the English language.

Jurgen Schmoll, our professional perennial enthusiast showed us through his slide show how he got started in the business as a youngster. Although limited by his teenage purse he showed that a level of professionalism could still be applied to astro-imaging with limited performance equipment and with bucketsful of enthusiasm. On top of all this he made us laugh with his humorous delivery, a welcome sound in the Parish Hall.

### **10<sup>th</sup> February meeting :**

"Mining the Milky Way" by Dr Melvin Hoare of Leeds University.

### **Transit content :**

As you will more than likely notice most of the content of this month's Transit is downloaded content from the Internet. As enthusiastic Society members could I appeal to you for more self-written articles. Firstly, they are great fun to research and write and secondly, all of us are proud to see a fellow member's article in print. I am looking forward to seeing that envelope arrive on the doormat or the attachment to an e-mail containing a home-grown article.

**"In theory, there should be no difference between theory and practice, but in practice, there is."**

## Letters to the Editor :

Any new observations, any comments on local or international astronomy, anything you want to share with your fellow members?

Dear Editor

“A (further) and sadder state of affairs”

Going on from what John Crowther reported (page 9 January Transit) Dick Gordon crew member with Pete Conrad and Alan Bean on Apollo 12 was at a public meeting when a young woman came up to him, points at the image of him sitting on the Agena rocket during his Gemini 11 spacewalk and says :

“Is that really you?”

“Yes” he tells her, “that was in 1966”

“Wow” she replies. “That was when Star Trek was getting going. An amazing decade”.

(From page 71; “Moon Dust” – in search of the men who fell to Earth” Andrew Smith – Bloomsbury Publishing).

Brian W Cooper.

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## **Fly-tipping in Space ?**

from NASA

More than 9,000 pieces of space debris are orbiting the Earth, a hazard that can only be expected to get worse in the next few years. And currently there's no workable and economic way to clean up the mess.

The pieces of space junk measuring 4 inches or more total some 5,500 tons, according to a report by NASA scientists J-C. Liou and N. L. Johnson in Friday's issue of the journal *Science*.

Even if space launches were halted now – which will not happen – the collection of debris would continue growing as items already in orbit collide and break into more pieces, Liou said in a telephone interview.

“On the other hand, we are not claiming the sky is falling,” he said, “We just need to understand what the risks are.”

The most debris-crowded area is between 550 miles and 625 miles above the Earth, Liou said, meaning the risk is less for manned spaceflight. The International Space Station

operates at about 250 miles altitude, and Space Shuttle flights tend to range between 250 miles and 375 miles, he said.

But the junk can pose a risk to commercial and research flights and other space activities.

Much of the debris results from explosions of satellites, especially old upper stages left in orbit with leftover fuel and high pressure fluids.

A 2004 NASA report identified Russia as the source of the largest number of debris items, closely followed by the United States. Other sources were France, China, India, Japan and the European Space Agency.

Even without any launches adding to the junk, the creation of new debris from collisions of material already there will exceed the amount of material removed as orbits decay and items fall back to Earth, the researchers estimated.

Only removal of existing large objects from orbit "can prevent future problems for research in and commercialization of space," they wrote.

"As of now there is no viable solution, technically and economically, to remove objects from space," Liou said. He said he hopes the report will encourage researchers to think about better ways to do this.

Tethers to slow down orbiting materials and cause them to fall back to Earth sooner could work, but attaching tethers to the space junk would be excessively expensive for the benefit gained, the researchers said.

Newly launched satellites and boosters could include engines that would direct them back to Earth, but that would require costly and complex power and control systems.

And use of ground-based lasers to disturb the orbits of satellites isn't practical because of the mass of the satellites and the amount of energy that would be needed.

"The bottom line is very simple." Liou said. "Although the risk is small, we need to pay attention to this environmental problem."

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## **NASA'S HUBBLE DISCOVERS NEW RINGS AND MOONS AROUND URANUS**

From Ray Worthy

NASA's Hubble Space Telescope photographed a new pair of rings around Uranus and two new, small moons orbiting the planet. The largest ring is twice the diameter of the planet's previously known rings. The rings are so far from the planet, they are being

called Uranus' "second ring system." One of the new moons shares its orbit with one of the rings. Analysis of the Hubble data also reveals the orbits of Uranus' family of inner moons have changed significantly over the past decade.

"The detection of these new interacting rings and moons will help us better understand how planetary systems are formed and sustained, which is of key importance to NASA's scientific exploration goals," said Dr. Jennifer Wiseman, program scientist for Hubble at NASA Headquarters.

Since dust orbiting Uranus is expected to be depleted by spiralling away, the planet's rings must be continually replenished with fresh material. "The new discoveries demonstrate that Uranus has a youthful and dynamic system of rings and moons," said Mark Showalter of the SETI Institute, Baltimore.

Showalter and Jack Lissauer of NASA's Ames Research Center, Moffet Field, Calif., propose that the outermost ring is replenished by a 12-mile-wide newly discovered moon, named Mab, which they first observed using Hubble in 2003.

Meteoroid impacts continually blast dust off the surface of Mab. The dust then spreads out into a ring around Uranus. Mab's ring receives a fresh infusion of dust from each impact. Nature keeps the ring supplied with new dust while older dust spirals away or bangs back into the moon.

Showalter and Lissauer have measured numerous changes to the orbits of Uranus' inner moons since 1994. The moon's motions were derived from earlier Hubble and Voyager observations. "This appears to be a random or chaotic process, where there is a continual exchange of energy and angular momentum between the moons," Lissauer said. His calculations predict moons would begin to collide as often as every few million years, which is extraordinarily short compared to the 4.5 billion year age of the Uranian system.

Showalter and Lissauer believe the discovery of the second ring, which orbits closer to the planet than the outer ring, provides further evidence that collisions affect the evolution of the system. This second ring has no visible body to re-supply it with dust. The ring may be a telltale sign of an unseen belt of bodies a few feet to a few miles in size. Showalter proposes that a previous impact to one of Uranus' moons could have produced the observed debris ring.

Hubble uncovered the rings in August 2004 during a series of 80, four-minute exposures of Uranus. The team later recognized the faint new rings in 24 similar images taken a year earlier. Images from September 2005 reveal the rings even more clearly.

Showalter also found the rings in archival images taken during Voyager 2's flyby of Uranus in 1986. Uranus's first nine rings were discovered in 1977 during observations of the planet's atmosphere. During the Voyager encounters, two other inner rings and 10 moons were discovered. However, no one noticed the outer rings, because they are

extremely faint and much farther from the planet than expected. Showalter was able to find them by a careful analysis of nearly 100 Voyager images.

Because the new rings are nearly transparent, they will be easier to see when they tilt edge-on. The new rings will increase in brightness every year as Uranus approaches its equinox, when the sun shines directly over the planet's equator. When it happens in 2007, all of the rings will be tilted edge-on toward Earth and easier to study.

These research data will appear in an upcoming issue of the journal *Science*.

NASA's first probe bound for the planet Pluto and beyond rocketed toward the distant world Thursday after two days of delay due to weather.

A Lockheed Martin-built Atlas 5 rocket flung the New Horizons spacecraft spaceward at 2:00 p.m. EST (1900), sending the probe speeding away from Earth at about 36,250 miles per hour (58,338 kilometers per hour)— the fastest ever for a NASA mission. The probe should pass the Moon at 11:00 EST (0400 Jan. 20 GMT) on a nine-year trek towards Pluto.

"The United States has a spacecraft on its way to Pluto, the Kuiper Belt and on to the stars," said New Horizons principal investigator Alan Stern during a post-launch press conference. "I have July 14, 2015 emblazoned on my calendar."

Initial reports indicate that the probe is in good health. Ground stations received their first signals from New Horizons at about 2:50 p.m. EST (1950 GMT), which showed the spacecraft's radioisotope thermoelectric generator (RTG) – which uses heat from decaying plutonium dioxide to generate power – is online and performing as expected, mission managers said.

"The vehicle looks to be right where it needs to be," NASA launch manager Omar Baez, said just after liftoff. "It was Mother Nature that was holding us back earlier, but we got through it."

### **Weather woes**

Indeed, nature was the bane of New Horizons' launch from the beginning.

Flight controllers were forced to scrub an initial Jan. 17 launch attempt when winds proved too strong at the spacecraft's Complex 41 launch pad at Cape Canaveral Air Force Station in Cape Canaveral, Florida. One day later, severe storms in Maryland prevented a second launch attempt when they knocked out power at New Horizons' mission control center at Johns Hopkins University's Applied Physics Laboratory. The laboratory is managing the mission for NASA.

Earlier, thick cloud cover repeatedly forced flight controllers to push back New Horizons' planned liftoff from 1:08 p.m. EST (1808 GMT), until the weather eased to meet launch guidelines.

“It was suspenseful, there was no question,” Stern said of today’s countdown, holding up a small stub of a pencil. “This has been our mascot for years, this little ground-down pencil...it represents perseverance.”

New Horizons mission managers took today’s launch as an opportunity to honor Pluto’s past.

Riding aboard the NASA spacecraft are ashes of the late astronomer Clyde Tombaugh, who discovered the planet in 1930 at the Lowell Observatory in Flagstaff, Arizona. Tombaugh died in Jan. 17, 1997, nine years to the day of New Horizons first launch attempt this week.

"I want to point out what a great honor it is to have Clyde's widow [and family] here with us," Stern said of Patsy Tombaugh, her daughter Annette and son-in-law.

Jim Kennedy, NASA’s Kennedy Space Center director, said earlier this week that a Florida quarter – bearing the image of a space shuttle – is also accompanying the probe to Pluto.

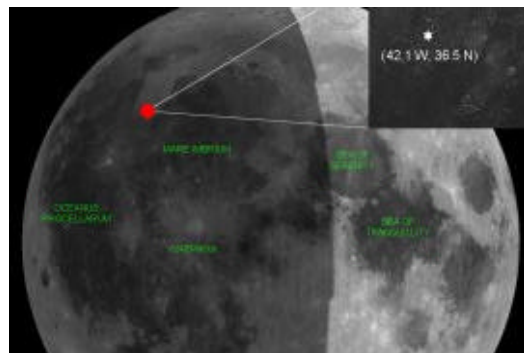
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## **Explosion on the Moon**

from NASA Website

**December 23, 2005:** NASA scientists have observed an explosion on the moon. The blast, equal in energy to about 70 kg of TNT, occurred near the edge of Mare Imbrium (the Sea of Rains) on Nov. 7, 2005, when a 12-centimeter-wide meteoroid slammed into the ground traveling 27 km/s.

**Right:** The red dot marks the location of the Nov. 7, 2005, meteoroid impact. Credit: NASA/MSFC/Bill Cooke.



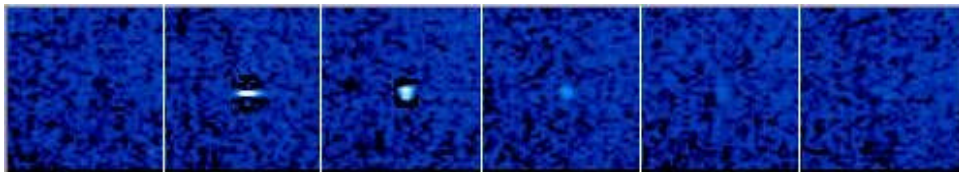
"What a surprise," says Marshall Space Flight Center (MSFC) researcher Rob Suggs, who recorded the impact's flash. He and colleague Wes Swift were testing a new telescope and video camera they assembled to monitor the moon for meteor strikes. On their first night out, "we caught one," says Suggs.

The object that hit the moon was "probably a Taurid," says MSFC meteor expert Bill Cooke. In other words, it was part of the same meteor shower that peppered Earth with fireballs in late October and early November 2005. The moon was peppered, too, but unlike Earth, the moon has no atmosphere to intercept meteoroids and turn them into harmless streaks of light. On the moon, meteoroids hit the ground--and explode.

"The flash we saw," says Suggs, "was about as bright as a 7th magnitude star." That's two and a half times dimmer than the faintest star a person can see with their unaided eye, but it was an easy catch for the group's 10-inch telescope.

Cooke estimates that the impact gouged a crater in the moon's surface "about 3 meters wide and 0.4 meters deep." As moon craters go, that's small. "Even the Hubble Space Telescope couldn't see it," notes Cooke. The moon is 384,400 km away. At that distance, the smallest things Hubble can distinguish are about 60 meters wide.

This isn't the first time meteoroids have been seen hitting the moon. During the Leonid meteor storms of 1999 and 2001, amateur and professional astronomers witnessed at least half-a-dozen flashes ranging in brightness from 7th to 3rd magnitude. Many of the explosions were photographed simultaneously by widely separated observers.



**Above:** The Nov. 7th lunar Taurid explosion, shown as a sequence of 6 false-color video frames. Credit: Wes Swift/NASA.

Since the Leonids of 2001, astronomers have not spent much time hunting for lunar meteors. "It's gone out of fashion," says Suggs. But with NASA planning to return to the moon by 2018, he says, it's time to start watching again.

There are many questions that need answering: "How often do big meteoroids strike the moon? Does this happen only during meteor showers like the Leonids and Taurids? Or can we expect strikes throughout the year from 'sporadic meteors?'" asks Suggs. Explorers on the moon are going to want to know.

"The chance of an astronaut being directly hit by a big meteoroid is miniscule," says Cooke. Although, he allows, the odds are not well known "because we haven't done enough observing to gather the data we need to calculate the odds." Furthermore, while the danger of a direct hit is almost nil for an individual astronaut, it might add up to something appreciable for an entire lunar outpost.



**Right:** An artist's concept of the Nov. 7, 2005, explosion. Credit: NASA/MSFC.



Of greater concern, believes Suggs, is the spray—"the secondary meteoroids produced by the blast." No one knows how far the spray reaches and exactly what form it takes.

Also, ground-shaking impacts could kick up moondust, possibly over a wide area. Moondust is electrostatically charged and notoriously clingy. Even a small amount of moondust can be a great nuisance: it gets into spacesuit joints and seals, clings to faceplates, and even makes the air smell when it is tramped indoors by moonwalkers. Could meteoroid impacts be a source of lunar "dust storms?" Another question for the future....

Suggs and his team plan to make more observations. "We're contemplating a long-term monitoring program active not only during major meteor showers, but also at times in between. We need to develop software to find these flashes automatically," he continues. "Staring at 4 hours of tape to find a split-second flash can get boring; this is a job for a computer."

With improvements, their system might catch lots of lunar meteors. Says Suggs, "I'm ready for more surprises."

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"On a clear dark night away from city lights, the star-spangled heavens can create an overwhelming sense of infinity. Seemingly countless points of light, so far away, urge one to contemplate the insignificance of a lone planet amid the incomprehensible breadth of the universe."

-- Robert Roy Britt, Senior Science Writer,

"The night sky is the world's largest national park with its stark beauty available to anyone who steps outside and looks up."

-- Geoff Chester, US Naval Observatory

## **The Leap Second and its future**

From the Scotsman

SINCE the dawn of human existence, people have lived by the rising and setting of the sun - but now American corporations want to change for ever the way time is measured.

An international argument has developed between British astronomers and scientists working for American telecommunications firms who have called for the abolition of the "leap second" - the additional time unit used to keep modern atomic time-measuring systems in line with the earth's movement round the sun.

Removing that extra second would make some communication systems run more smoothly, but very slowly the clock would start to fall out of sync with the sun, eventually leading to 12 noon falling in the middle of the night.

The Royal Astronomical Society says the proposal has been raised by United States firms involved with the Global Positioning System, because design flaws mean GPS struggles to cope with leap seconds.

But the astronomers say losing the extra time would disrupt many other communications and "disconnect people" from the rotation of the earth.

Mike Hapgood, secretary of the RAS, said: "It's breaking the link between human time and the natural world."

It would be thousands of years before the change had a noticeable impact on the correlation between the clock and daylight, but the astronomers say it would immediately affect scientific projects, such as the satellite system used to track the progress of Hurricane Katrina.

The proposals to abolish the leap second from 2007 are to be discussed at a meeting of the International Telecommunications Union in Geneva.

Dr Hapgood said: "This proposal is from the US precision timing people involved with GPS, which was never designed very well to handle leap seconds - although it could have been. They need to think again.

"We've followed the rules and they work for most situations."

There have been 21 leap seconds since 1972 and the next was added at the end of 2005.

Their use is determined by the International Earth Rotation Service, sponsored by scientific bodies.

Those seeking to end the leap second say it causes problems such as GPS receivers losing track while the system adapts.

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## Onward to Pluto

From NASA

The \$700 million New Horizons mission began in earnest as the probe popped free from its third stage to begin the long, nine-year trek toward Pluto. The spacecraft should swing past Jupiter, grabbing a gravity boost in the process, in late February 2007, NASA officials said.

“This mission is going to the far frontier of our solar system,” said Richard Binzel, a science team co-investigator from the Massachusetts Institute of Technology (MIT), before today’s launch. “In some ways, our basic knowledge about Pluto could fit on a three-by-five inch note card.”

Pluto is the only member of the traditional nine-planet solar system not visited by a spacecraft, a statistic New Horizons hopes to change. The probe carries seven primary instruments to study Pluto, its moon Charon and two other objects – currently dubbed P1 and P2 – discovered orbiting the planet last year.

The spacecraft is designed to begin observing Pluto about five months before its scheduled flyby in July 2015, which will take place about three billion miles (five billion kilometers) from Earth on the 50<sup>th</sup> anniversary of Mariner 4’s flyby of Mars – NASA’s first ever red planet flyby, Stern said.

Mission managers expect New Horizons to speed past the planet at about 31,000 miles per hour while using its instrument package to build detailed maps of the planet, as well as study its composition and tenuous atmosphere.

About nine months after the encounter, the 1,054-pound (478-kilogram) spacecraft should finish sending its Pluto observations to Earth, which will take about 4.5 hours to reach researchers on the ground.

The information New Horizons will send to Earth about Pluto and its moons will likely alter our view of the distant, icy world, researchers said.

“I think it’s exciting that all the textbooks will have to be rewritten,” Stern said.

Thursday’s space shot marked the second Atlas 5 launch for NASA – the Mars Reconnaissance Orbiter flight was the first – and the seventh flight overall for the Lockheed Martin rocket. The launch also marked the second success for NASA this week.

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"The contemplation of celestial things will make a man both speak and think more sublimely and magnificently when he descends to human affairs."  
Marcus Cicero, 106-43 B.C.

– then we ask him to write an article for “Transit”

## The Sky - February 2006

### **Moon**

New moon: 14:14 29-Jan-2006 First quarter: 06:29 05-Feb-2006

Full moon: 04:44 13-Feb-2006 Last quarter: 07:17 21-Feb-2006

### **Sun and Planets**

- The SUN is in Capricornus. It rises at 07:53, transits the meridian at 12:20, and sets at 16:47. The length of the day is 8h 54m.
- The MOON is in Pisces with a phase of 15%, and is 3.2 days old. First Quarter will occur in 3.4 days time. It rises at 09:18, transits at 15:04, and sets at 21:10. It is visible in the evening sky.
- MERCURY is in Capricornus with a magnitude of -1.3, a phase of 99%, and a diameter of 5". It rises at 08:18, transits at 12:39, and sets at 17:00. It is currently too close to the Sun to be observed.
- VENUS is in Sagittarius with a magnitude of -4.5, a phase of 11%, and a diameter of 52". It rises at 05:52, transits at 10:27, and sets at 15:01. It is visible low in the east before sunrise.
- MARS is in Aries with a magnitude of +0.2, a phase of 89%, and a diameter of 9". It sets at 02:43, rises again at 10:33, and transits at 18:37. It is visible in the evening sky.
- JUPITER is in Libra with a magnitude of -2.0 and a diameter of 36". It rises at 01:50, transits at 06:22, and sets at 10:54. It is visible in the morning sky.
- SATURN is in Cancer with a magnitude of -0.2 and a diameter of 20". It transits at 00:03, sets at 07:59, and rises again at 16:02. It is well placed for observation throughout the night.
- URANUS is in Aquarius with a magnitude of +5.9 and a diameter of 3". It rises at 08:50, transits at 14:04, and sets at 19:18. It is visible low in the west after sunset.
- NEPTUNE is in Capricornus with a magnitude of +8.0 and a diameter of 2". It rises at 08:06, transits at 12:38, and sets at 17:11. It is currently too close to the Sun to be observed.
- PLUTO is in Serpens with a magnitude of +14.0. It rises at 04:32, transits at 09:04, and sets at 13:36. It is visible in the morning sky.

### **Stars and Constellations**

- North – Ursa Minor and Draco
- East – Gemini and Cancer nicely placed – Leo starting to rise by 8pm
- South – Orion and Taurus nicely placed – mars still in Aries
- West – Andromeda nicely placed

### **Constellation of the Month – Lepus**

- Lepus sits at Orion's feet

- The main stars are:
- Alpha – a second magnitude F-class star, 1300 Ly away and more than 11,000 L(sun)
- Beta – a 3rd magnitude G-class star 160 Ly away and 145 L(sun)
- Gamma – a 4th magnitude F class star 29 Ly away and 3 L(sun) It is a binary system with a 6th magnitude companion 97 arc seconds away
- Delta – 4th magnitude G class star (sun like) 112 Ly away and 30 L(sun)
- Epsilon (the front foot) is a 4th magnitude K class star – 227 Ly away and 200 L(sun)
- Chi and Eta branch off from alpha as do Mu, Lambda, Nu and Iota. Mu is a B-class variable star which has heavy metals in its spectrum.
- There is a scattering of 5th magnitude and fainter stars in and amongst the main stars of the group
- The main Deep Sky objects are:
- M79 – an 8th magnitude Globular Cluster positioned below Beta and
- IC418 – the Spirograph nebula – a Planetary nebula 1.5 degrees east of Lambda – this is a 10th magnitude object visible with a medium sized telescope – much better to use a big aperture and an Oxygen-III filter to bring out the green colour of the Nebula
- February highlights
- Saturn easy to see – near M44 so get your cameras ready
- Mars still on show
- Orion and M42 easily locatable
- Try finding IC418 in Lepus – just below Orion’s feet

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### **Heavens Above – spotting satellites**

from Bob Mullen

Ed and I were just coming out of the Planetarium door one Friday and eagle-eyed Ed spotted a fast moving satellite. It was very bright and got brighter, then just as quickly it faded to a much lower magnitude. We had seen an Iridium flare.

By some counts, there are as many as 8000 objects bigger than about 10 or so centimeters in low Earth orbit. Some of these objects are pretty small, but others are quite large. Usually they appear as a faint star, moving slowly across the sky. Sometimes they start faint and get brighter (as they get nearer they get brighter), sometimes the brightness oscillates (if the satellite tumbles in orbit), and sometimes you can get a very bright flash off of a reflective surface on the satellite.

The objects with the very bright flashes are almost certainly satellites belonging to the Iridium constellation of small communication satellites. It was planned as a network of 66 inter-working satellites and they thought of using an element number as a catchy

gimmick. Unfortunately 66 is the element number of dysprosium, it was deemed too inelegant as a brand name – more like a stomach powder. Iridium with an element number of 77 was much catchier. It is thought the strength of marketing made them throw up a few more satellites to meet the parameters of the new name – no wonder they went bust a year or so later!

The network, launched in 1998, offered direct phone access to a satellite from anywhere on Earth. They fly in a lattice of 6 orbital planes with 11 equi-spaced satellite in each plane, operating at a height of 780 km and orbiting every 100 minutes. They are observed travelling from north to south.

Because of the satellites' peculiar shape with three polished door-sized antennas, 120 degrees apart and at 40 degree angles with the main bus, the Iridium satellites have a highly visible satellite flare. The forward antenna faces the direction in which the satellite is travelling. On their orbits, the antennas directly reflect sunlight, creating a predictable and quickly moving illuminated spot of about 10 km diameter when the reflected beam hits the earth.

To an observer this looks like an extremely bright flare in the sky with a duration of sometimes 2- 10 seconds depending on your observation angle. Some of the flares are so bright, up to -8 magnitude, that they can often be seen at daytime, but they are at their most impressive after dusk and before dawn. When not flaring the satellite normally has a +6 magnitude.

Because they have a constant orbit it is a relatively simple matter to produce long term predictions for the passes. This has been made easy by the website [www.heavens-above.com](http://www.heavens-above.com).

You only have to input your location and local time and a timing table of visible passes are displayed. Heavens-above also has the ephemeris of all other satellites visible from our area including the International Space Station and the Shuttle (when it is flying). Some astronomers curse satellites, especially an Iridium flasher but I find it a pleasant viewing interlude when stretching your back after a long session on the telescope. Good viewing.

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“We don’t understand how a single star forms, yet we want to understand how 10 billion stars form.” Carlos Frenk, as quoted by Robert Irion, “Surveys Scour the Cosmic Deep,” Science, Vol 303, 19 March 2004, p. 1750. (You can almost hear him saying it!)

A high-school girl, seated next to a famous astronomer at a dinner party, struck up a conversation with him by asking: "What do you do for a living?" "I study astronomy," he replied. "Really?" said the teenager, wide-eyed. "I finished astronomy last year."

## How Many Colours? – Revisited

By Neil Haggath

Last month, in my article “How many Colours of the Rainbow?”, I asked why the sequence of colours of the spectrum includes the obscure term “indigo” among the more familiar colours, and why it’s necessary at all to have an arbitrary “extra” colour between blue and violet. I suggested that Sir Isaac Newton established this convention, because he believed, for not very scientific reasons, that there “should” be seven colours, rather than six.

I have to admit that, when I wrote the article, it was little more than speculation. I recall reading something about the matter many years ago, but can’t remember where; I couldn’t find any reference in any of my books. An internet search found two encyclopaedia references, but as neither referred to any historical source, their accuracy was questionable. One claimed that Newton decided that there should be seven colours, simply due to supposed mystical associations of the number seven. The other claimed that, more specifically, he correctly believed that the colours of light were analogous to the pitch of sound, and defined seven colours by analogy with the seven notes of the musical scale.

I have since corresponded with Professor Mike Edmunds of the University of Cardiff, who – as those who attended Cosmos V know – is something of an authority on Sir Isaac. Mike has researched the matter, and has found a reference in Newton’s writing, which supports the latter idea.

In 1675, Newton sent a letter, entitled *Hypothesis of Light*, to Henry Oldenburg, Secretary of the Royal Society, in which he put forward his ideas on the nature of light. Mike has sent me an extract from this letter, which is reproduced in one of the seven volumes ( ! ) of *The Correspondence of Isaac Newton* ( Cambridge University Press, 1959-77 ).

In the letter, Newton made several references to the idea of comparing colour with the pitch of sound. Specifically, he wrote:

“And possibly colour may be distinguisht into its principall Degrees, Red, Orange, Yellow, Green, Blew, Indigo and deep violett, on the same ground, that Sound within an eighth is graduated into tones.”

The letter also includes a diagram, which directly compares the division of a spectrum, projected from a prism, into the seven colour bands, with the lengths of a musical string which produced the seven recognised notes.

At the same time, however, Newton suggested that the division into seven colours arose from purely observational grounds. Because, as he admitted, “my owne eyes are not very criticall in distinguishing colours”, he asked an unnamed friend, to whom he “had not communicated my thoughts” about the nature of colour, to divide the projected spectrum into colour bands. The friend’s divisions agreed pretty well with Newton’s own. In a spectrum projected by a prism, the region from blue to violet takes up roughly as much width as that occupied by the preceding three colours, orange, yellow and green – so

perhaps it was quite logical to also divide that region into three colours, rather than two – effectively dividing the entire spectrum into roughly equal bands.

No one can deny that Sir Isaac *did* frequently concern himself with unscientific mysticism. However, we can conclude that, in this matter at least, his reasoning – though flawed - was, after all, a little more logical and scientific than I previously inferred.

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### **Transit Tailpieces**

Malcolm Bannister has sent the following the attention of the videocam imaging guys  
“While poking around on the web I came up with this site: -

**<http://www.astrosurf.com/astrobond/ebrawe.htm>**

A guy has found an easy way of modifying the firmware inside Philips and Logitech webcams to improve the images, reduce noise and also the capability to output image streams in RAW format. The mods are non-destructive and the firmware can be easily restored at any time.”

### **Custom Telescopes UK**

Glen Oliver, a long-time member of the Society, can supply telescopes and accessories of all kinds. He operates from Hartlepool and has a website,

**<http://homepage.ntlworld.com/glen.oliver/custom.htm>**

**e-mail [glen.oliver@ntlworld.com](mailto:glen.oliver@ntlworld.com).**

Support local businessmen! Glen tells me that he now has an Astronomy and Space books page on his website

**Transit Adverts** If you wish to let members know what you want to sell or what you are looking for, please send an advert for the magazine.

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**CaDAS Website** Don't forget to visit our very own website at

**[www.wynyard-planetarium.net](http://www.wynyard-planetarium.net).**

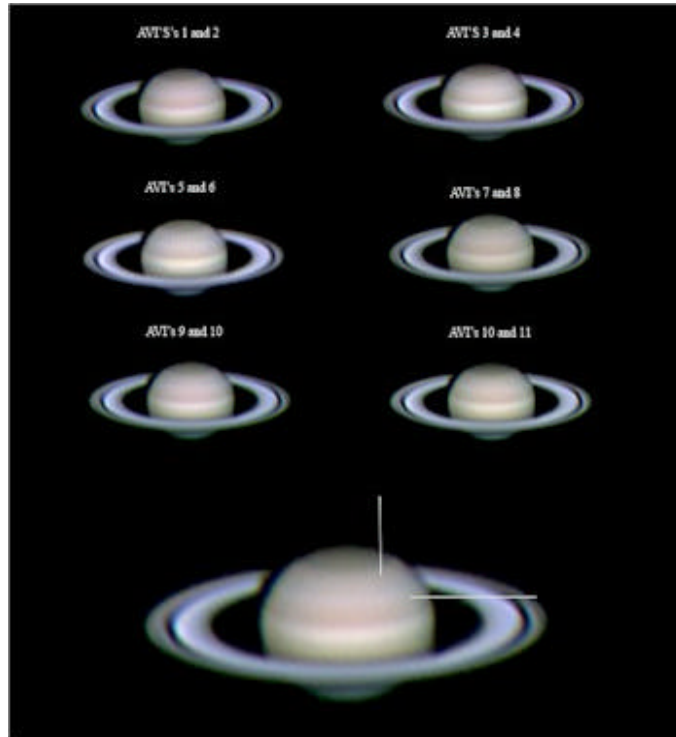
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**For sale** – Helios 240mm reflector with tripod, eyepieces, Barlow etc. Sensible offers considered. Please contact Graham Johnson at the Carlton Outdoor Centre on 01642 712229

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**Articles** Please send contributions for the newsletter to Bob Mullen, 18 Chandlers Ridge, Nunthorpe, Middlesbrough, TS7 0JL, 01642 324939 ([b2mullen@hotmail.com](mailto:b2mullen@hotmail.com))  
Copy deadline date is the 25<sup>th</sup> of each month.





compilation of Saturn Images by Keith Johnson