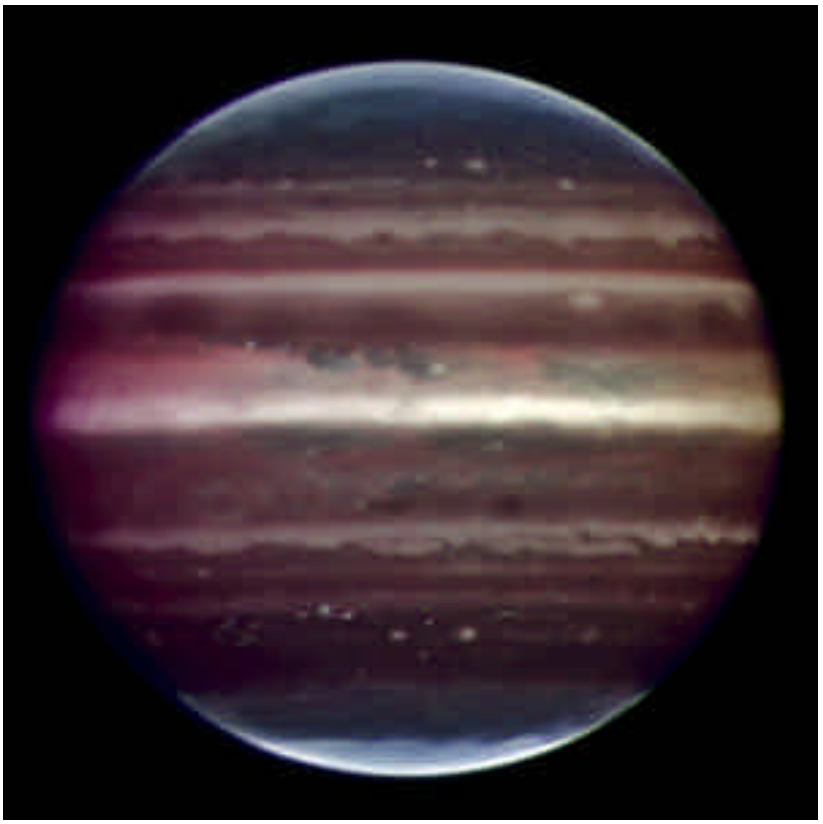
TRANSIT

The Newsletter of

Cleveland & Darlington Astronomical Society

05 October 2008



Best Ground-Based Image of Jupiter — Ever!

Front Page Image –.The Very Large Telescope (VLT) performed a record two-hour observation of Jupiter using a breakthrough technique to remove atmospheric blur.

Last meeting : 12 September 2008. Presidential Address:
Title : "George Ellery Hale and the Palomar 200" Telescope"
by Jack Youdale FRAS, Honorary President of CaDAS

Next meeting : 10 October 2008. "A Deep Look into your Telescope" by Dr Jurgen Schmoll of Durham University and CaDAS/DAS

Letter to the Editor

None this month

Public Observing Night at Wynyard Plantarium, 26th September 2008

Friday 26th seemed a good, clear evening, so I loaded my car and headed up to the Planetarium. It was about 19:30 and Dave Blenkinsop had already arrived and had set up his Bresser 3" refractor and started to assemble his 16" Dobsonian but was surrounded by a group of folks as he talked about Jupiter which was the only object so far clearly visible in the twilight.

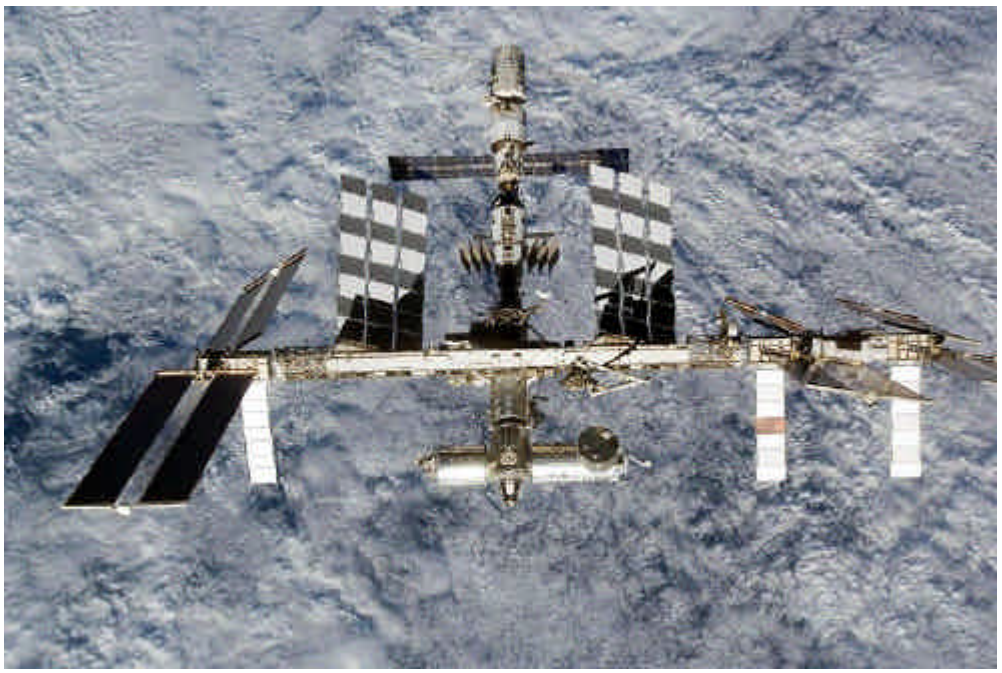
As I set up my 12" telescope, a colleague from work, together with his son said hello. They've been to 3 or 4 shows and public observing sessions I think. It turned out to be one of the best supported public observing sessions without a planetarium show beforehand that I can recall. There seemed to be three main family groups plus my colleague and two or three other couples and individuals. I was impressed with how interested they all seemed. Two people stood out for me.

One was a teenaged lad who was incredibly enthusiastic and absolutely delighted when I let him direct my 12" telescope at a number of stars all by himself. I admit my heart sank a bit when he showed me his own telescope. It was a perfect example of what Sir Patrick Moore dismisses as High Street store telescopes. I think this particular example was from M&S. Unfortunately it would only give the dimmest view of Jupiter. I am glad to say that the lad and his grandfather took my rather less than fulsome praise in their stride as I demonstrated to them Dave's Bresser bargain from Lidl which performed many times better and cost Dave about the same as their telescope.

The other person that stood out was a lady that Ed brought across and introduced. After looking at a number of objects, we stood away from the telescope and I showed her the principle stars and constellations in the sky. She was a bit puzzled by the location of Polaris, saying she'd always thought it was closely to the horizon. From her point of view she was quite right. The last time she'd looked carefully at the night sky she was in Fiji!

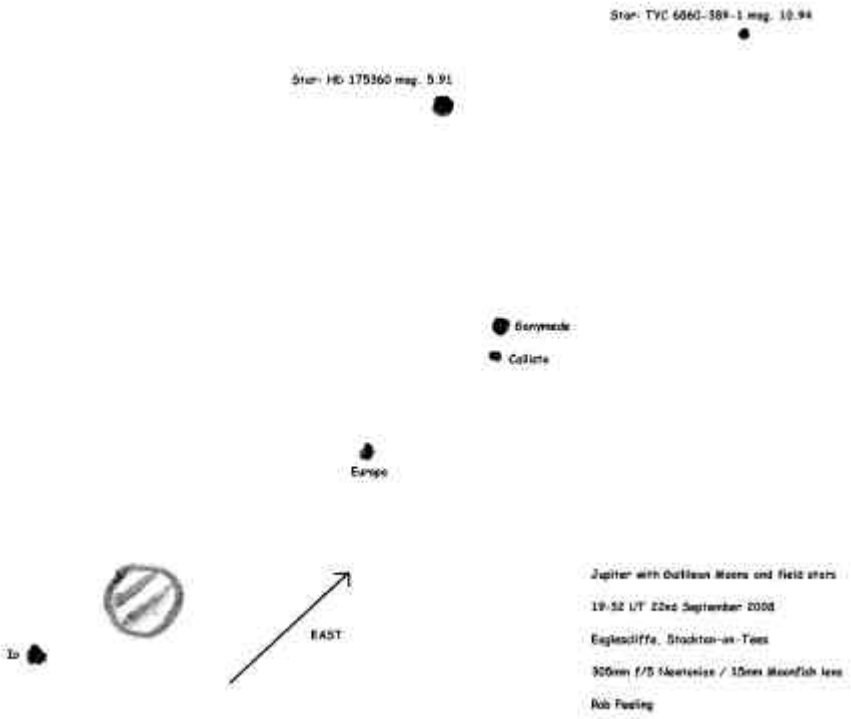
Despite early promise, the seeing conditions deteriorated so any faint deep sky objects were out of the question and we packed up for the night not long after the last family had left us at around midnight.

For me there were two astronomical highlights in the evening. The first was a pass by the International Space Station (ISS). I was able for a short period to catch it and track it with my 12 inch telescope with a 15mm lens. The ISS was very bright and yellowish. I had time to get an impression of a central structure with extensions to either side at the front end. Almost a sort of clover leaf type appearance. The following morning I looked on the internet for a recent picture of the ISS and this one immediately provides a good interpretation of what I saw.

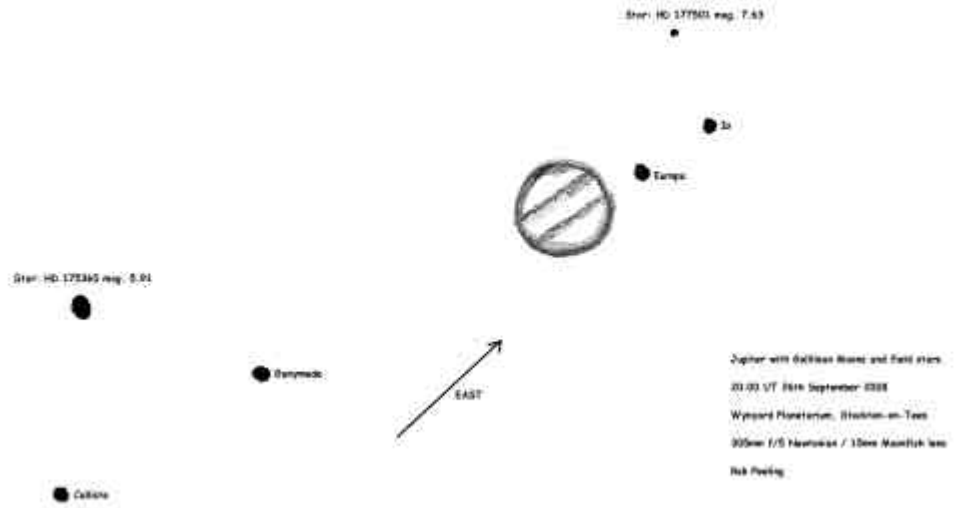


This view was from space shuttle Discovery during STS-124 in June 2008. Clearly what I was seeing was the solar panel assemblies reflecting sunlight to my eyes.

Jupiter was for me the other highlight of the night. On the previous Monday, I happened to make a sketch of Jupiter because I was attacted by the field stars that were also in view together with the four Gallilean moons.



I later marked up the sketch to show which moons were which and to label the stars I had recorded. On Friday, the eastwards or prograde motion of about 13 arc-minutes of Jupiter was beautifully demonstrated when I found it the other side of star HD 175360. OK, mankind has known the planets move for about 6000 years, but it is still always satisfying to check things that "everyone knows" for yourself!



I came back to Jupiter several times in the evening to show it to people. In this way the rapid changes of the positions of Europa and Io were obvious and

around 21:00 Europa had disappeared as it made a transit across the disc of the planet.

Not much deep sky hunting for faint fuzzy objects but a still a very good evening after all the clouds and rain through the summer.

Wynyard Planetarium YouTube channel

By Ed Restall

We've recently opened a planetarium YouTube channel where you can see some videos of planetarium events and activities: www.youtube.com/wynyardplanetarium

For those of you unfamiliar with YouTube, it's an on-line video site where anyone can upload their own material for the general entertainment and education of the rest of the world. Quality isn't always great and subject matter can be very dubious, but there's a lot of good stuff on there.

You've probably heard from society meetings about the Faulkes telescope system (now part of ***Las Cumbres Observatory Global Telescope*** Network), made available for free to schools across the UK, but perhaps wondered what it's all about and how it works? Those of you who haven't sat in on a school session with John McCue or myself, can now view snippets on-line via our YouTube channel. YouTube limits these to a maximum of 10 minutes, so if you would like to view full sessions you can watch Macromedia Flash movies on our www.heliophysical.org.uk microsite, on the Outcomes page. There's a session on the northern hemisphere telescope in Hawaii and the southern hemisphere telescope in Australia. The technical complexity of these sessions can lead to hiccups along the way, you get to see everything "warts and all".

These Faulkes telescope sessions were recorded in a virtual classroom, on-line, so that schools, myself and CaDAS volunteers, Alex Menarry and Rod Cuff, could all join in from the comfort of their own location without everyone having to come to the planetarium. An indirect consequence of this is that the sound quality of both the YouTube and the Flash movies isn't as good as it could be. If you are interested enough to want to see these sessions in more audio & visual detail then on the same heliophysical website under the Resources page you will find the full sessions below the Virtual Learning Environment heading. To watch these you will be asked to download a JAVA plug-in from a company called Elluminate in order to view the material. Many thanks goes to Alex and Rod for their help with these sessions.

Of course YouTube is all about fun so on our channel you'll see some more light-hearted clips, like our "rocket day" where kids have a huge amount of fun, making & flying pop-bottle rockets – launching them for themselves on John & George Gargett's patent rocket launchers! Feel free to rate and comment on anything you see.

All of the planetarium microsites (some still under development) can be reached from the main planetarium homepage at www.wynyard-planetarium.net

The Thomas Wright Trophy 2008 – Results

The Thomas Wright Trophy quiz was hosted by York A.S. on Friday 3 Oct,

The winner was CaDAS with 54 points, DAS with 51 points and YAS with 38 points. Our congratulations go to Darran Summerfield, Rob Peeling and Michael Roe – the CaDAS A-team!.

Why Pluto is No Longer a Planet

Written by Fraser Cain

This has got to be be one of the most heartbreaking questions I get asked, "Why Isn't Pluto a Planet". And I get it a lot. I was expecting that a few years after the International Astronomical Union's controversial decision, the debate would have settled down and people would finally accept it. But no, it's still a sore point for many people - Pluto is not a planet (let that sink in). In this article, I'll explain the events that led up to the decision, the current state of planetary definition, and any hope Pluto has for the future. Let's find out why Pluto is no longer considered a planet.

Pluto was first discovered in 1930 by Clyde W. Tombaugh at the Lowell Observatory in Flagstaff Arizona. Astronomers had long predicted that there would be a ninth planet in the Solar System, which they called Planet X. Only 22 at the time, Tombaugh was given the laborious task of comparing photographic plates. These were two images of a region of the sky, taken two weeks apart. Any moving object, like an asteroid, comet or planet, would appear to jump from one photograph to the next.

After a year of observations, Tombaugh finally discovered an object in the right orbit, and declared that he had discovered Planet X. Because they had discovered it, the Lowell team were allowed to name it. They settled on Pluto, a name suggested by an 11-year old school girl in Oxford, England (no, it wasn't named after the Disney character, but the Roman god of the underworld).

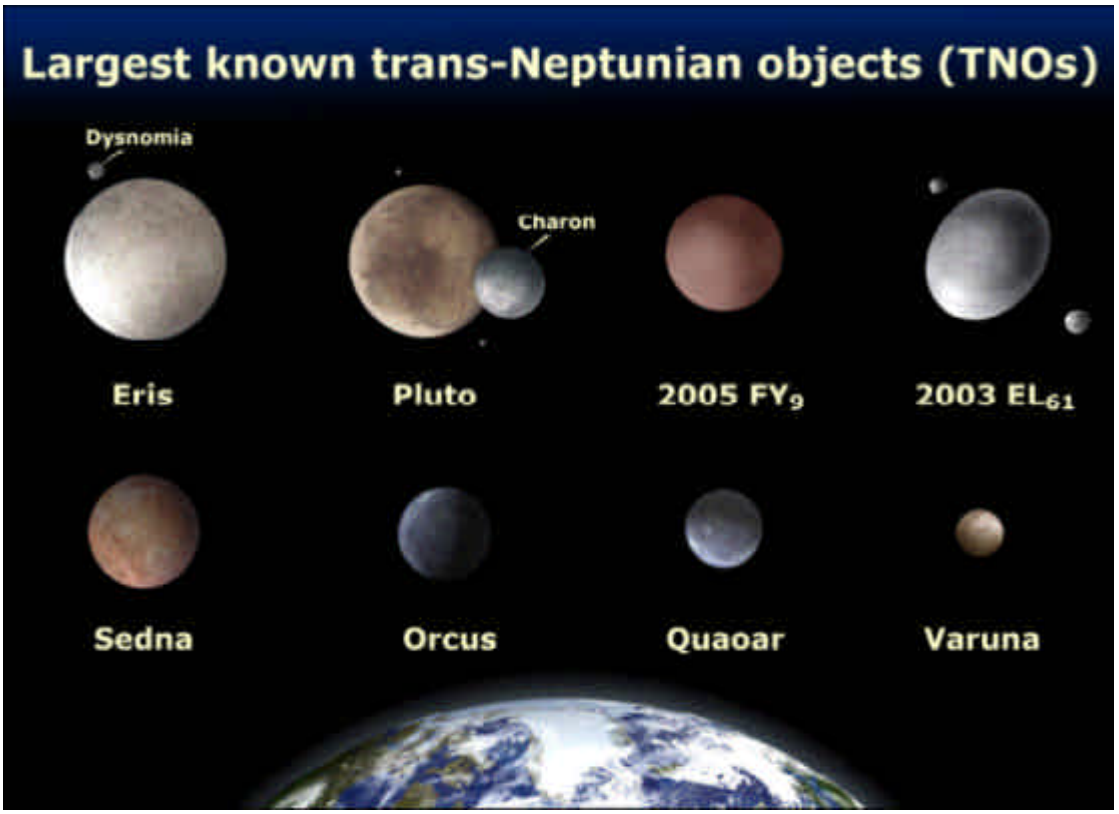
The Solar System now had 9 planets.

Astronomers weren't sure about Pluto's mass until the discovery of its largest Moon, Charon, in 1978. And by knowing its mass (0.0021 Earths), they could more accurately gauge its size. The most accurate measurement currently gives the size of Pluto at 2,400 km (1,500 miles) across. Although this is small, Mercury is only 4,880 km (3,032 miles) across. Pluto is tiny, but it was considered larger than anything else past the orbit of Neptune.

Over the last few decades, powerful new ground and space-based observatories have completely changed previous understanding of the outer Solar System. Instead of being the only planet in its region, like the rest of the Solar System, Pluto and its moons are now known to be just a large example of a collection of objects called the Kuiper Belt. This region extends from the orbit of Neptune out to 55 astronomical units (55 times the distance of the Earth to the Sun).

Astronomers estimate that there are at least 70,000 icy objects, with the same composition as Pluto, that measure 100 km across or more in the Kuiper Belt.

And according to the new rules, Pluto is not a planet. It's just another Kuiper Belt object.



Here's the problem. Astronomers had been turning up larger and larger objects in the Kuiper Belt. 2005 FY9, discovered by Caltech astronomer Mike Brown and his team is only a little smaller than Pluto. And there are several other Kuiper Belt objects in that same classification.

Astronomers realized that it was only a matter of time before an object larger than Pluto was discovered in the Kuiper Belt.

And in 2005, Mike Brown and his team dropped the bombshell. They had discovered an object, further out than the orbit of Pluto that was probably the same size, or even larger. Officially named 2003 UB313, the object was later designated as Eris. Since its discovery, astronomers have determined that Pluto's size is approximately 2,600 km (1,600 miles) across. It also has approximately 25% more mass than Pluto.

With Eris being larger, made of the same ice/rock mixture, and more massive than Pluto, the concept that we have nine planets in the Solar System began to fall apart. What is Eris, planet or Kuiper Belt Object; what is Pluto, for that matter? Astronomers decided they would make a final decision about the

definition of a planet at the XXVIth General Assembly of the International Astronomical Union, which was held from August 14 to August 25, 2006 in Prague, Czech Republic.

Astronomers from the association were given the opportunity to vote on the definition of planets. One version of the definition would have actually boosted the number of planets to 12; Pluto was still a planet, and so were Eris and even Ceres, which had been thought of as the largest asteroid. A different proposal kept the tal at 9, defining the planets as just the familiar ones we know without any scientific rationale, and a third would drop the number of planets down to 8, and Pluto would be out of the planet club. But, then… what is Pluto?

In the end, astronomers voted for the controversial decision of demoting Pluto (and Eris) down to the newly created classification of "dwarf planet".
Is Pluto a planet? Does it qualify? For an object to be a planet, it needs to meet these three requirements defined by the IAU:

- **It needs to be in orbit around the Sun** - Yes, so maybe Pluto is a planet.
- **It needs to have enough gravity to pull itself into a spherical shape** - Pluto…check
- **It needs to have "cleared the neighborhood" of its orbit** - Uh oh. Here's the rule breaker. According to this, Pluto is not a planet.

What does "cleared its neighborhood" mean? As planets form, they become the dominant gravitational body in their orbit in the Solar System. As they interact with other, smaller objects, they either consume them, or sling them away with their gravity. Pluto is only 0.07 times the mass of the other objects in its orbit. The Earth, in comparison, has 1.7 million times the mass of the other objects in its orbit.

Any object that doesn't meet this 3rd criteria is considered a dwarf planet. And so, Pluto is a dwarf planet. There are still many objects with similar size and mass to Pluto jostling around in its orbit. And until Pluto crashes into many of them and gains mass, it will remain a dwarf planet. Eris suffers from the same problem.

It's not impossible to imagine a future, though, where astronomers discover a large enough object in the distant Solar System that could qualify for planethood status. Then our Solar System would have 9 planets again.

Even though Pluto is a dwarf planet, and no longer officially a planet, it'll still be a fascinating target for study. And that's why NASA has sent their New Horizons spacecraft off to visit it. New Horizons will reach Pluto in July 2015, and capture the first close-up images of the (dwarf) planet's surface.

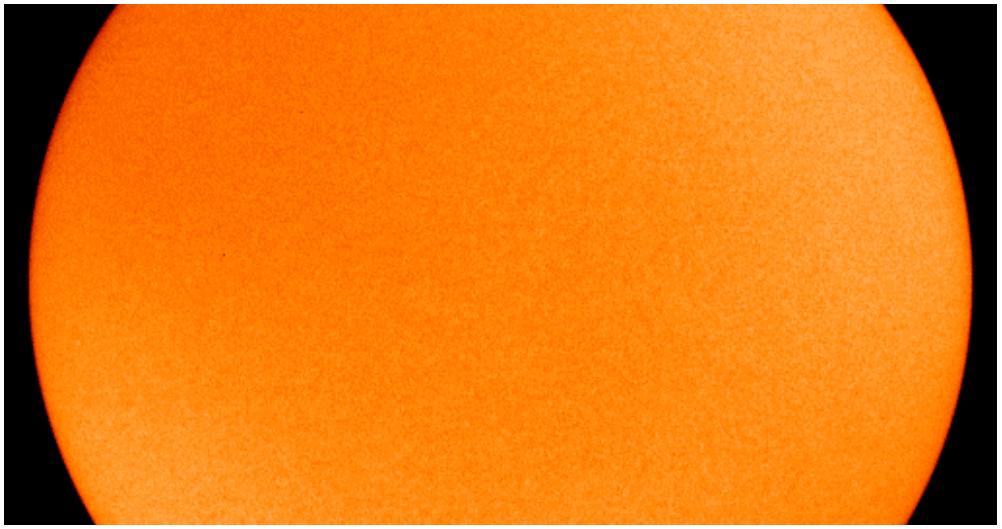
Spotless Sun: Blankest Year of the Space Age

Astronomers who count sunspots have announced that 2008 is now the "blankest year" of the Space Age.

As of Sept. 27, 2008, the sun had been blank, *i.e.*, had no visible sunspots, on 200 days of the year. To find a year with more blank suns, you have to go back to 1954, three years before the launch of Sputnik, when the sun was blank 241 times.

"Sunspot counts are at a 50-year low," says solar physicist David Hathaway of the NASA Marshall Space Flight Center. "We're experiencing a deep minimum of the solar cycle."

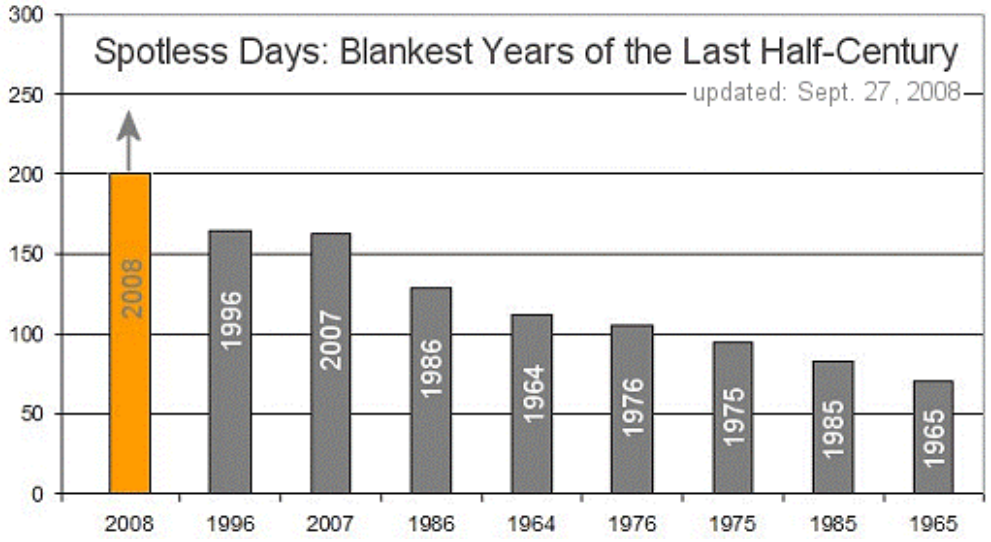
A spotless day looks like this:



The image, taken by the Solar and Heliospheric Observatory (SOHO) on Sept. 27, 2008, shows a solar disk completely unmarked by sunspots. For comparison, a SOHO image taken seven years earlier on Sept. 27, 2001, is peppered with colossal sunspots, all crackling with solar flares: image. The difference is the phase of the 11-year solar cycle. 2001 was a year of solar maximum, with lots of sunspots, solar flares and geomagnetic storms. 2008 is at the cycle's opposite extreme, solar minimum, a quiet time on the sun.

And it is a *very* quiet time. If solar activity continues as low as it has been, 2008 could rack up a whopping 290 spotless days by the end of December, making it a century-level year in terms of spotlessness.

Hathaway cautions that this development may sound more exciting than it actually is: "While the solar minimum of 2008 is shaping up to be the deepest of the Space Age, it is still unremarkable compared to the long and deep solar minima of the late 19th and early 20th centuries." Those earlier minima routinely racked up 200 to 300 spotless days per year.



Above: A histogram showing the blankest years of the last half-century. The vertical axis is a count of spotless days in each year. The bar for 2008, which was updated on Sept. 27th, is still growing. [Larger images: 50 years, 100 years]

Some solar physicists are welcoming the lull.

"This gives us a chance to study the sun without the complications of sunspots," says Dean Pesnell of the Goddard Space Flight Center. "Right now we have the best instrumentation in history looking at the sun. There is a whole fleet of spacecraft devoted to solar physics--SOHO, Hinode, ACE, STEREO and others. We're bound to learn new things during this long solar minimum."

As an example he offers helioseismology: "By monitoring the sun's vibrating surface, helioseismologists can probe the stellar interior in much the same way geologists use earthquakes to probe inside Earth. With sunspots out of the way, we gain a better view of the sun's subsurface winds and inner magnetic dynamo."

"There is also the matter of solar irradiance," adds Pesnell. "Researchers are now seeing the dimmest sun in their records. The change is small, just a fraction of a percent, but significant. Questions about effects on climate are natural if the sun continues to dim."

Pesnell is NASA's project scientist for the Solar Dynamics Observatory (SDO), a new spacecraft equipped to study both solar irradiance and helioseismic waves. Construction of SDO is complete, he says, and it has passed pre-launch vibration and thermal testing. "We are ready to launch! Solar minimum is a great time to go."

Coinciding with the string of blank suns is a 50-year record low in solar wind pressure, a recent discovery of the Ulysses spacecraft. (See the Science@NASA story *Solar Wind Loses Pressure*.) The pressure drop began years before the

current minimum, so it is unclear how the two phenomena are connected, if at all. This is another mystery for SDO and the others.

Who knew the blank sun could be so interesting?

The Recent Disappearance of Sunspots

From Michael Roe

Recently astronomers studying the Sun have observred that its face is almost blank with no sunspots except a very few tiny ones along with very low solar activity altogether. I realised this about a year ago from my own observations. I use very simple equipment, a tiny pair of 10x25 binoculars projecting a solar image of approximately one inch or so, big enough to reveal any medium-sized or larger sunspot .

And the results? No sunspots seen since 11 December 2007 when two small spots were seen. Before that one larger sunspot was seen on 30 April 2007 though I only observed the Sun seven times between these dates from late August onwards. This was when I realised how few sunspots were appearing and then I observed the Sun as often as I could. In fact this year I have observed the Sun 24 times but not before May 2008. Sometimes, such as late July 2008 I used my Celestron 8" telescope and a few times my 10x50 binoculars. The result – not one sunspot!

This is very strange, we are now in 2008, a little past the sunspot minimum and I have seen a few sunspots at other sunspot minimums. This included a huge sunspot in 1976 so something rather unusual is going on!

According to the January 1997 Sky and Telescope magazine that over September and October 1996 no sunspots were seen for 36 days. The 20th century record was in 1913 when there were no sunspots for 92 days, so perhaps this present lack of sunspots may beat that record.

At the moment the Sun appears a perfect flawless disk as the Ancient Greeks believed it to be. As my observations of a blank disc mount up I imagine it was like this for astronomers in 1645 to 1715, a period of almost no sunspots known as the Maunder minimum, observing for years and not seeing a single sunspot.

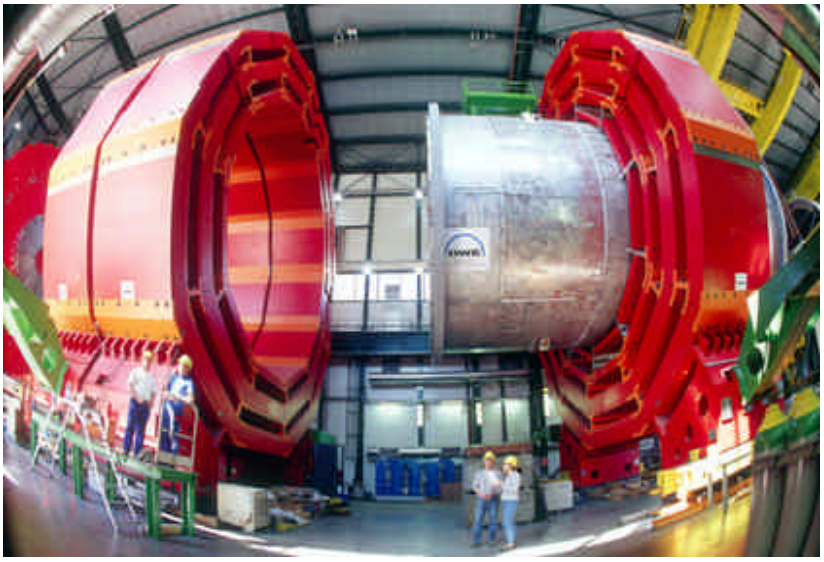
Of course we have only observed the Sun telescopically for about 400 years so we simply don't know what its long term behaviour really is. If Galileo and others had began observing the Sun 40 years later they would have thought the Ancient Greeks were correct about the unblemished Sun and given up on it for who knows how long.

I don't know if this will bring frozen-Thames-type winters as in the 1600s but a spotless Sun is actually emitting less radiation than a Sun full of sunspots so it actually affect the climate of the Earth.

One thing is for sure. There is absolutely nothing we can do about the Sun but we can continue observing it and see just what the Sun is doing in the future. The sunspot drought may last less than a year or perhaps over a century, we just don't know yet.

CERN Shutdown: Predictable?

Posted by Josh Hill.



The world held its collective breathe on the 10th of September, fully unaware that regardless of what happened, the Large Hadron Collider was not going to be creating a black hole… at least, it wasn't then. No actual particle smashing took place on the opening run of the world's largest and most expensive collider.

However, only a week later, the European Organization for Nuclear Research (CERN), had to suspend operations due to equipment failure. The thing is though, that it seems the surprise belonged most to us and the scientists at CERN; physicists around the world had pretty much been expecting something like this.

CERN specialists quickly found that a connector between electromagnets failed and heated up, causing a magnet "quench," or shutdown, that apparently melted a hole in the tube and caused a leak of about a ton of liquid helium.

But this shutdown, though a blow to the LHC team, who have been forced to suspend operations through to spring 2009 as a result, did not come as a surprise to other collider scientists around the world. "It's what happens when you start up a big, superconducting machine," Judy Jackson, spokeswoman for the Fermi National Accelerator Laboratory outside Chicago, told AP. "Our impression is that what happened last Friday at CERN caught them more by surprise than it did us."

One of the biggest hindrances at the moment is the three week wait that scientists have to begin repairs, let alone finish them. The warm-up time – the period of time taken to bring the LHC back up to room temperature from the freezing temperatures it was so painstakingly reduced too – will take time, adding to that repairs or replacement, testing, and then cool-down.

"The thing about the LHC was it has not just caused a quench, but there are systems that are supposed to prevent it from melting and dumping helium," said Michael Harrison, who worked on Fermilab's Tevatron collider and designed and built the United States' other superconducting collider at Brookhaven on Long Island. "So it was obviously something else that went on as well."

But none of this is out of the ordinary, apparently, according to both Harrison and Jackson. Apparently at Fermilab, Jackson and the scientists in charge rephrased Alfred Tennyson's 1854 poem "The Charge of the Light Brigade" to mirror the exploding magnets that hampered development: "Magnets to the left of us, magnets to the right of us, magnets in front of us volley'd and thunder'd."
"They were blowing up all the time," said Jackson.

So though the rest of us may simply have to wait a little bit longer for the LHC to eat our universe in a strangelet or a black hole, collider physicists around the world will simply just be hoping the LHC eventually gets to crash something together.

Astromind Quiz 2008

To be held in Sheffield Saturday 18th October 2008 – 2pm to late at the Mayfield Environmental Education Centre, David Lane, Fulwood, Sheffield, S10 4PH. Details in last month's Transit or on www.sheffieldastro.org.uk or telephone .e-mail Darren Swindells 0114 269 2291 darren@sheffieldastro.org.uk

Trans-cosmic flow broadens our horizon

From Phil Plait – The Bad Astronomer

In one of the weirder astronomy press releases I've seen in a while, it appears that material literally outside the visible Universe is tugging on material that we *can* see.

Hubble image of the Bullet Cluster, which appears to be getting yanked by material from The Other Side. Click to embiggen.

What does this mean? First off, let's take a sec and talk about *the visible Universe*. If you go outside and look around, you don't see the whole Earth. You only see a small fraction of its surface, because the Earth is a curved ball. The solid planet itself blocks your view.

The farthest you can see is out to the horizon, where the curving Earth dips everything else below your view (well, except for tall objects like buildings and ships at sea, but we can ignore them for this analogy).

The Universe is the same way. The fabric of space is expanding, with the cosmos getting bigger every day. This has an odd effect: objects farther away appear to be moving more rapidly away from us. Eventually, an object can be so far away that the space between us is effectively expanding faster than the speed of light! This does't violate any physical laws, because nothing material is *actually* moving at transluminal speeds; it's just that there is more space itself between us and that object all the time.

This effect naturally provides us with a cosmic horizon. Any object "moving away" from us faster than light can't be seen by us; the photons it emits can't keep up with the expansion of space. They lose energy and fall away from view (like a slow walker on a fast treadmill… or better yet, an ant walking along a rubber band that is being stretched). So, to us, an object far enough away is invisible, beyond the Universal horizon.

Weird, huh? Yeah, as usual, things get even weirder.

Now imagine a third object, say a cluster of galaxies, that lies between us and the one that is beyond our horizon. To the cluster, the object may still be visible, because it's closer, and therefore not receding as rapidly. It's like an island just over the horizon to you as you look seaward from the beach; to you the island is invisible, but to someone a few kilometers out to sea in a yacht the island is still visible.

That cluster can still be affected by the more distant object, pulled by its gravity, for example. To us, farther away, we don't see that distant object, but to the cluster it's sitting right there and still, literally, a force with which to be reckoned.

If you want to go away for a moment and take some Tylenol, I understand. I feel a bit headachy myself just writing this.

The thing is, astronomers now think they've detected this force! Clusters of galaxies are filled with extremely hot gas, or plasma, heated by things like the galaxies' motion in the cluster. As light from objects farther away passes through this gas, it gets affected by it, and we can measure that change. This is called the Sunyaev-Zel'dovich effect, and it's too weak to measure well in individual clusters, but by looking at literally hundreds of clusters, the effect adds up and can be seen. *[Edited to add: the photons that are being affected are not from the matter beyond the horizon, but from the cosmic microwave background, the relic radiation from a very early time in the Universe, but still in our visible Universe. Sorry I wasn't clear about that in the original post.]*

The total force is fairly big, in fact. Clusters seen in the direction of the constellations Centaurus and Vela appear to have an additional 3 million kilometers per hour added to their usual velocity! That means that some very large clump of matter — probably a cluster of galaxy clusters, called a

supercluster — lies in that direction, over the horizon to us but very much visible to clusters we *can* see.
Imagine! It's a sobering reminder that the Universe itself is literally bigger than we can see, with the majority of it forever beyond our ken.

And if your quota of weird isn't yet sated, then ponder this: the expansion is accelerating. That means that objects we can see today, so distant they linger on our current horizon, will eventually fall away from view as the accelerating expansion beats out the velocity of the light they emit. They will literally move beyond the horizon and become invisible. In a sense, it's as if the visible Universe is shrinking, the horizon getting closer to us every day. The physical Universe is getting bigger, but almost paradoxically what we see of it gets *smaller*. Someday, billions of years from now, only the closest of objects will remain visible.

Everything else will have sailed below the horizon. So we better take a look around while we still can.

Two Shuttles on the Pad — The Last Time

Written by Nancy Atkinson

It’s a rare event anyway, but this is the last time ever. Two shuttles are now sitting on NASA's two launchpads at Kennedy Space Center. Space shuttle Endeavour completed a 4.2-mile journey to Launch Pad 39B Friday morning, Sept. 19, at 6:59 a.m. EDT, and this is the first time a shuttle has stood by as a rescue vehicle. Atlantis, over at Pad 39A is preparing for its mission to the Hubble Space Telescope, currently scheduled for Oct. 10 (although there might be an problem with that date –see below).

Since Atlantis won't be going to the International Space Station which would be a "safe haven" in the event of an emergency, Endeavour will stand by in the unlikely event a rescue mission is necessary. After Endeavour is cleared from its duty as a rescue vehicle, it will move to Launch Pad 39A for the upcoming STS-126 mission to the International Space Station.

That flight is targeted for launch Nov. 12. This Saturday, there will be a good photo op as the Rotating Service Structures for Endeavour will be rolled back, making both the shuttles more visible. Robert Pearlman at CollectSPACE.com has a full list of the 17 times in history two shuttles sat on the launchpads, and some great pictures, too.

A small glitch occurred this week in preparing for the Hubble servicing mission. Trouble with a cleaning system connected to a canister housing fresh batteries and a new camera bound for the Hubble Space Telescope somehow blew insulation into protective bagging around the cargo carrier.. Work to inspect and clean the canister will delay its delivery to the shuttle Atlantis at launch pad 39A by at least 24 hours. While a corresponding launch delay is possible, NASA is sticking with its current Oct. 10 launch target until managers get a better sense of how much lost time can be made up.

And for those you that have questions as to why Endeavor will be moved to 39A, its because that pad is being prepared for being able to launch the Ares rockets for the upcoming Constellation program. It will work in a pinch to launch the shuttle, but NASA officials would much rather launch it from 39A to avoid any problems.

And even if the shuttle program is extended in order to shorten the gap between the time the shuttle flights end and Constellation begins, shuttles will probably not launch from 39B again.

The Telescope: 400 Years and Counting

By Michio Kaku

Quick -- name the invention that has done most to redefine our place in the universe.

Hint: This invention was also the most seditious, blasphemous instrument of all time, shaking the very foundations of society.

The answer, if you haven't already guessed it, is the telescope. It's hard to believe that this instrument, often sold as a cheesy toy in gift shops, is perhaps the single most important scientific instrument of all time.

Now that the telescope is celebrating its 400th anniversary, it's a good time to take stock of this marvelous invention.

For 99.9 percent of human history, most people held a Neolithic viewpoint of our world. It was a natural viewpoint: All our senses scream out to us that Earth is the center of the universe, and everything revolves around us. It's also a comforting point of view, since it means that we stand at the very center of God's creation.

Once in a while, scientists challenged this viewpoint -- the Greeks even calculated the size of the Earth around 200 B.C. -- but for the most part, it stuck around, largely because it dovetailed with powerful religious interests.

The invention of the telescope dealt a deathblow to that Earth-centric cosmology.

In antiquity, it was known to glassblowers that, while making stained glass, spherical blobs of glass could magnify images. But it took centuries for anyone to make the inventive leap of assembling two lenses into a telescope.

Most reliable accounts place the invention of the telescope in 1608 in the Netherlands, by Hans Lippershey, Zacharias Janssen and Jacob Metius. But it was the refinement of the telescope the following year by Galileo that triggered one of the greatest scientific revolutions of all time.

Before Galileo, debates were won not by making careful observations, but by arguing from the Bible and religious texts. According to church dogma, Earth was full of sin because of our expulsion from the Garden of Eden, but the celestial heavens were pure, perfect and divine.

Galileo was a shrewd man. He did not become a shrill propagandist angrily haranguing the masses about their naïve beliefs. Instead, he gained notoriety among the rich and powerful, such as the Medici family, by hosting the world's first star-gazing parties, in Piazza San Marco in Venice and elsewhere.

Seeing is believing. For the first time, people were witnessing the true splendor of the universe as never before, with their own eyes.

Instead of seeing the perfect disks of celestial objects, they saw that the moon was pockmarked with horrible craters, that Saturn had strange "ears," that Jupiter had moons of its own, and that even the sun, the centerpiece in anyone's cosmology, had ugly spots.

But Galileo went too far, perhaps unnecessarily tweaking the noses of powerful prelates in his books, and had to pay dearly for his sins, ultimately dying in disgrace under house arrest, a lonely, broken man. But in one letter, Galileo took solace in the expression, "the purpose of the church is not to determine how the heavens go, but to determine how to go to heaven."

But the genie had left the bottle, and there was no way to put it back. The very year that Galileo died in ignominy, a child was born who would go on to finally complete the Galilean revolution. Isaac Newton would give us a startling new picture of our universe which would survive for another 250 years, until Einstein. Newton would even invent a new type of telescope, the reflecting telescope, which is the basis of modern telescope technology.

The telescope still exerts a magic pull on us. During a recent Yankees game, with millions watching the World Series, a cameraman had some idle time on his hands, so he turned his TV camera to Saturn. Because a TV camera today has much better optics than Galileo's original telescopes, suddenly millions of people were seeing Saturn in its true glory for the first time.

Immediately, the phone went off the hook. People were demanding to know whether this was the real Saturn, or just a Hollywood special effect. The public reaction was such an unexpected surprise that the stunt was repeated on the second day.

Also, when NASA bureaucrats declared that the Hubble Space Telescope would be allowed to die a natural death, to burn up in the atmosphere as a piece of useless space junk, there was a deafening roar of protest. NASA, which is usually used to hearing applause, not derision, was taken aback. As a consequence, the decision was reversed and this workhorse of astronomy got a reprieve from Death Row.

The best is yet to come. Already, a new generation of monster telescopes is about to go online, with colossal, adjustable mirrors that compensate for the Earth's atmospheric disturbance. Also, new generations of space telescopes will reveal the true splendor of the universe not just in optical frequencies, but even with gravity waves.

Then, we will have not just crude pictures of Saturn with its "ears;" we will have baby pictures of the infant universe as it emerges from the Big Bang.

The telescope may then answer the greatest question of all time: Why was there a Genesis?

Oct. 2, 1608: Up Close and Personal With Hans Lippershey

By Tony Long

1608: Hans Lippershey, a German-born Dutch spectacle-maker, demonstrates the first refracting telescope, the forerunner of the modern optical telescope.
The modern refracting telescope uses two lenses, a convex objective lens (nearer the "object" being observed) and a convex eyepiece (or ocular) lens.

Together, they bend light and focus parallel light rays at a single point. That has the effect of magnifying distant objects for the viewer.
Others have laid claim to inventing the first telescope, but Lippershey's demonstration in front of the States General (parliament) of the Netherlands, is the earliest documented evidence, so priority generally goes to him.

Lippershey seized upon the idea after one of his assistants found that by lining up a long-focus lens and a short-focus lens in front of the eye, distant objects appeared closer. He mounted the lenses in a tube at the optimum distance of separation, liked what he saw and applied for a patent.

The Dutch government, appreciating the refracting telescope's military value, became a customer. Galileo also got wind of the new device, built his own version, and turned it to the sky. The word "telescope" was reportedly coined in 1611 by a guest at a banquet honoring Galileo.

Galileo's design featured a convex objective lens and a concave ocular lens, which represented an improvement over Lippershey's original design. But it was the German astronomer Johannes Kepler who first used convex lenses for both the objective and ocular. That configuration is still used in modern devices like binoculars and telephoto lenses.
(Source: Various)

Hans Lippershey holds one lens in front of another to magnify a distant object. By mounting two lenses in a wooden tube, Lippershey created the first telescope.

WETI versus SETI

(my favourite post of the year – Editor)

The WETI Mission Statement

WETI is the new SETI

To find our place in the universe has been an underlying theme of scientific exploration for more than 5000 years or thereabouts. A critical part of this endeavour is to determine whether life and intelligence are rare commodities or rather the ubiquitous and unavoidable result of cosmic evolution. In more popular terms:

Are we a freak of Nature or is the Galaxy teeming with smart, bug-eyed creatures with lots of tentacles? There are only two ways to obtain an unambiguous answer to the question:

We can either actively search our galactic environment and find intelligent beings, or such beings could conduct a search and find us. The first approach is already being used in a wide variety of large-scale and well-funded projects.

The second approach, on the other hand, has hitherto been left to amateurs, and has never been attempted in a rigorously controlled scientific setup. Naturally, this is goal of the newly founded WETI Institute.

The mission of the WETI Institute is to understand and explain the origin, nature and prevalence of intelligent life in the universe. The WETI Institute has chosen an entirely novel approach to achieve that goal. Instead of actively searching for extraterrestrial intelligence, the idea is to simply WAIT - until the others find us.

Waiting is a notoriously under-appreciated method in our efforts to search for extraterrestrial intelligence. It is cheaper and less stressful than any other type of research. It is also environmentally friendly and does not cause global warming, terrorism or nuclear conflicts. The WETI Institute has assembled an assorted group of professionals to explore the benefits of waiting for our understanding of life in the Universe. Combining the expertise from a wide range of disciplines - astrophysics, biology, neurology, psychology, philosophy - our objective is to set a new gold standard for scientifically meaningful waiting.

Mankind has always felt the urge of actively doing something of extraordinary relevance. By doing so, we have caused a great deal of grief and disaster. The WETI Institute proposes to abandon our reckless anthropocentric ambition, and to strive for a more humble approach of letting the universe explore us instead.

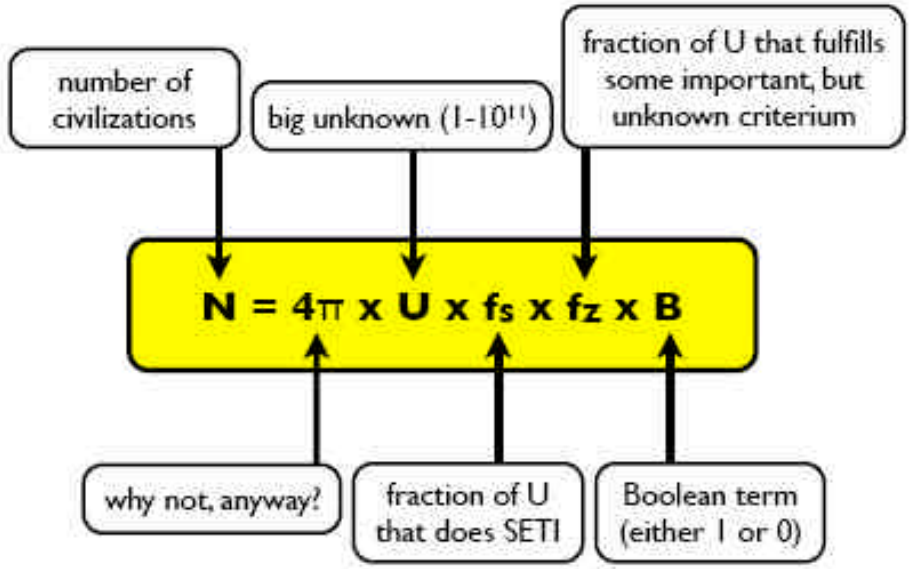
The Brake equation, and other ideas about absolute truth

The Drake equation, first given by Frank Drake 1960, is widely used as a tool to quantify the odds of finding intelligent life in our Galaxy. Much less famous, but significantly more sophisticated is the Brake equation, developed in the 1970s by the Danish cyberneticist Michael F. Brake (1903-1984), who also invented the popular deceleration apparatus.

By introducing the factor fs, the Brake equation puts limits on research efficiency: For all fs>1/N, WETI is more efficient than SETI.

The Brake equation is also much more transparent regarding the inherent uncertainties in the task at hand.

Finally, by adding the term B, the equation ingeniously allows for its own non-existence ▪



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