QUASAR9

STARLIKE OBJECTS WITH A COMPACT STRUCTURE AND HIGH REDSHIFT CORRESPONDING TO VELOCITIES APPROACHING THE SPEED OF LIGHT. IMPLIED DISTANCES RUN INTO BILLIONS OF PARSECS. MAKING THEM THE MOST DISTANT AND LUMINOUS OBJECTS IN THE UNIVERSE, MILLIONS OF TIMES BRIGHTER THAN NORMAL GALAXIES

WEDNESDAY, JANUARY 31, 2007

Hubble Alien Worlds

Artists's Concept STScI-PRC2007-07

The powerful vision of NASA's Hubble Space Telescope has allowed astronomers to study for the first time the structure of the atmosphere of a planet orbiting another star. Hubble discovered a dense upper layer of hot hydrogen gas where the super-hot planet's atmosphere is bleeding off into space.

Starlight is heating the planet's atmosphere, causing hot gas to escape into space. Astronomers used Hubble to analyze the starlight that filtered through the planet's atmosphere. Imprinted on the starlight is information about the atmosphere's structure and chemical makeup.

The planet, designated HD 209458b, is unlike any world in our solar system. It orbits so close to its star and gets so hot that its gas is streaming into space, making the planet appear to have a comet-like tail. This new research reveals the layer in the planet's upper atmosphere where the gas becomes so heated it escapes, like steam rising from a boiler.

The Hubble data show how intense ultraviolet radiation from the host star heats the gas in the upper atmosphere, inflating the atmosphere like a balloon. The gas is so hot that it moves very fast and escapes the planet's gravitational pull at a rate of 10,000 tons a second, more than three times the rate of water flowing over Niagara Falls. The planet, however, will not wither away any time soon. Astronomers estimate its lifetime is more than 5 billion years.

The scorched planet is a big puffy version of Jupiter. In fact, it is called a "hot Jupiter," a large gaseous planet orbiting very close to its parent star. Jupiter might even look like HD 209458b if it were close to the Sun.

The planet completes an orbit around its star every 3.5 days. It orbits 4.7 million miles from its host, 20 times closer than the Earth is to the Sun. By comparison, Mercury, the closest planet to our Sun, is 10 times farther away from the Sun than HD 209458b is from its star. Unlike HD 209458b, Mercury is a small ball of iron with a rocky crust.

Although HD 209458b does not have a twin in our solar

ABOUT ME

QUASAR9

11D Space Surfer. Like to travel fast, almost at the speed of light, and dance with the Starlight

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system, it has plenty of relatives beyond our solar system. About 10 to 15 percent of the more than 200 known extrasolar planets are hot Jupiters. A recent Hubble survey netted 16 hot Jupiter candidates in the central region of our Milky Way Galaxy, suggesting that there may be billions of these gas-giant star huggers in our galaxy.

Source hubblesite newscenter releases 31/01/2007

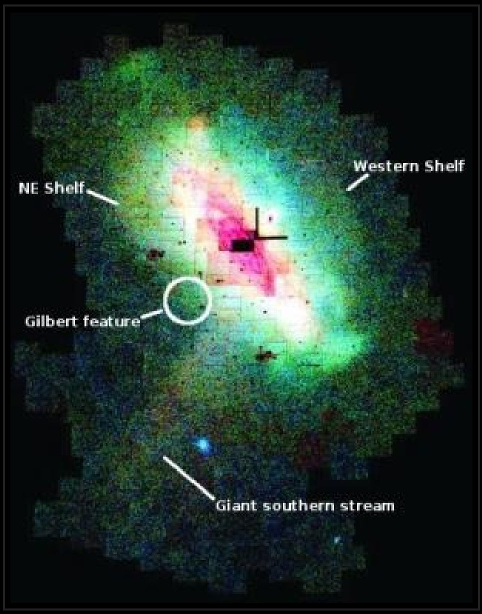
Famous Quotes:
Nothing happens unless first we dream. Carl Sandburg

Labels: exoplanets, Gas Giants, hubble

POSTED BY QUASAR9 AT 10:10 PM

MONDAY, JANUARY 29, 2007

Ancient Galaxy collision



Astronomers surveying the Andromeda galaxy have discovered an association of stars in its outskirts, which they believe to be part of a separate galaxy that merged with Andromeda about 700 million years ago.

The findings suggest that Andromeda's outer swathes of stars are from the same parent galaxy, and may help astronomers determine the Andromeda's total mass.

Large galaxies are believed to be built partly by the merging of smaller galaxies, an event that destroys the smaller galaxy.

The strong gravitational forces of a large galaxy can rip apart a small galaxy, producing loose streams of stars that astronomers call tidal debris. Measuring the amount of the tidal debris that exists in present-day galaxies allows astronomers to examine the role mergers play in galaxy formation.

(Image courtesy of University Of Massachusetts Amherst)
Read more Evidence Of Ancient Galactic Collision Found

Astronomers Discover New Star In Southern Cross by Science Daily

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Labels: Andromeda, Galaxies

POSTED BY QUASAR9 AT 6:58 PM

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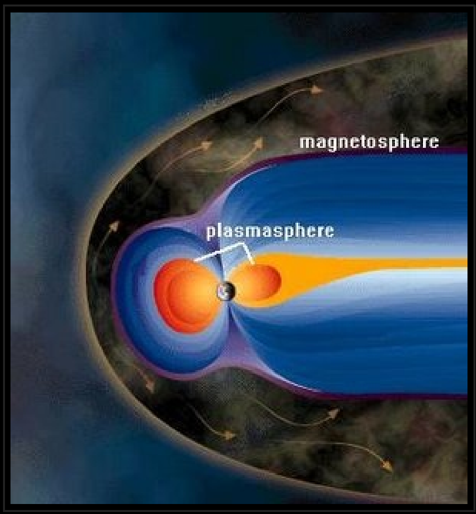
Plasma & Ionosphere



The plasmasphere, or inner magnetosphere is a region of the Earth's magnetosphere consisting of low energy (cool) plasma. It is located above the ionosphere. The outer boundary of the plasmasphere is known as the plasmapause, which is defined by an order of magnitude drop in plasma density.

Traditionally, the plasmasphere has been regarded as a well behaved cold plasma with particle motion dominated entirely by the geomagnetic field and hence corotating with the Earth. In contrast, recent satellite observations have shown that density irregularities such as plumes or biteouts may form. It has also been shown that the plasmasphere does not always co-rotate with the Earth.

The ionosphere is the part of the atmosphere that is ionized by solar radiation. It plays an important part in atmospheric electricity and forms the inner edge of the magnetosphere.

The lowest part of the Earth's atmosphere is called the troposphere and it extends from the surface up to about 10 km (6 miles). The atmosphere above 10 km is called the stratosphere, followed by the mesosphere. It is in the stratosphere that incoming solar radiation creates the ozone layer.

At heights of above 80 km (50 miles), in the thermosphere, the atmosphere is so thin that free electrons can exist for short periods of time before they are captured by a nearby positive ion. The number of these free electrons is sufficient to affect radio propagation. This portion of the atmosphere is ionized and contains a plasma which is referred to as the ionosphere.

In a plasma, the negative free electrons and the positive ions are attracted to each other by the electromagnetic force, but they are too energetic to stay fixed together in an electrically neutral molecule.

Solar radiation at ultraviolet (UV) and shorter X-Ray wavelengths is considered to be ionizing since photons at these frequencies are capable of dislodging an electron from a neutral gas atom or molecule during a collision. At the same time, however, an opposing process called recombination begins to take place in which a free electron is "captured" by a positive ion if it moves close enough to it. As the gas density increases at lower altitudes, the recombination process accelerates since the gas molecules and ions are closer together. The point of balance between these two processes determines the degree of ionization present at any given time.

ARCHIVES

The ionization depends primarily on the Sun and its activity. The amount of ionization in the ionosphere varies greatly with the amount of radiation received from the sun. Thus there is a diurnal (time of day) effect and a seasonal effect. The local winter hemisphere is tipped away from the Sun, thus there is less received solar radiation. The activity of the sun is associated with the sunspot cycle, with more radiation occurring with more sunspots. Radiation received also varies with geographical location (polar, auroral zones, mid-latitudes, and equatorial regions). There are also mechanisms that disturb the ionosphere and decrease the ionization. There are disturbances such as solar flares and the associated release of charged particles into the solar wind which reaches the Earth and interacts with its geomagnetic field.

Solar radiation, acting on the different compositions of the atmosphere with height, generates layers of ionization:

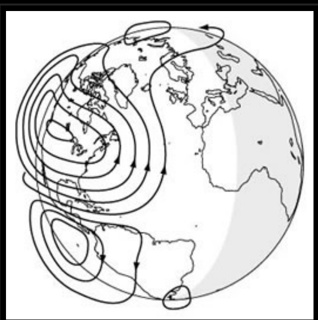
The D layer is the innermost layer, 50 km to 90 km above the surface of the Earth. During the night cosmic rays produce a residual amount of ionization. Recombination is high in this layer, thus the net ionization effect is very low and as a result high-frequency (HF) radio waves aren't reflected by the D layer.

The frequency of collision between electrons and other particles in this region during the day is about 10 million collisions per second. The D layer is mainly responsible for absorption of HF radio waves, particularly at 10 MHz and below, with progressively smaller absorption as the frequency gets higher. The absorption is small at night and greatest about midday. The layer reduces greatly after sunset, but remains due to galactic cosmic rays. A common example of the D layer in action is the disappearance of distant AM broadcast band stations in the daytime.

The E layer is the middle layer, 90 km to 120 km above the surface of the Earth. Ionization is due to soft X-ray (1-10 nm) and far ultraviolet (UV) solar radiation ionization of molecular oxygen (O2). This layer can only reflect radio waves having frequencies less than about 10 MHz. It has a negative effect on frequencies above 10 MHz due to its partial absorption of these waves.

The vertical structure of the E layer is primarily determined by the competing effects of ionization and recombination. At night the E layer begins to disappear because the primary source of ionization is no longer present. This results in an increase in the height where the layer maximizes because recombination is faster in the lower layers. Diurnal changes in the high altitude neutral winds also plays a role. The increase in the height of the E layer maximum increases the range to which radio waves can travel by reflection from the layer.

The statements above assumed that each layer was smooth and uniform. In reality the ionosphere is a lumpy, cloudy layer with irregular patches of ionization.



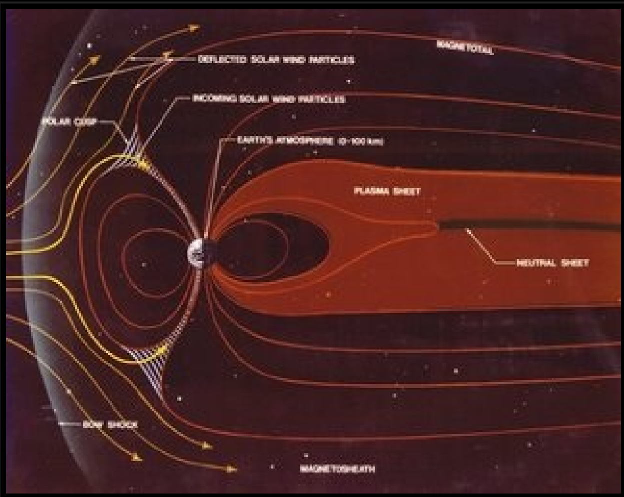
The Equatorial Anomaly is the occurrence of a trough of concentrated ionization in the F2 layer. The Earth's magnetic field lines are horizontal at the magnetic equator. Solar heating and tidal oscillations in the lower ionosphere move plasma up and across the magnetic field lines. This sets up a sheet of electric current in the E region which, with the horizontal magnetic field, forces ionization up into the F layer, concentrating at ± 20 degrees from the magnetic equator. This phenomenon is known as the equatorial fountain.

Protons: polar cap absorption (PCA)
Associated with solar flares is a release of high-energy protons. These particles can hit the earth within 15 minutes to 2 hours of the solar flare. The protons spiral around and down the magnetic field lines of the Earth and penetrate into the atmosphere near the magnetic poles increasing the ionization of the D and E layers. PCA's typically last anywhere from about an hour to several days, with an average of around 24 to 36 hours.

Labels: Ionosphere, Plasma

POSTED BY QUASAR9 AT 6:48 PM

Earth's Magnetosphere



The magnetosphere of Earth is a region in space whose shape is primarily determined by the distortion of Earth's internal magnetic field and by the solar wind plasma and the interplanetary magnetic field (IMF). In the magnetosphere, a mix of free ions and electrons is held mainly by magnetic and electric forces that are much stronger than gravity and collisions.

On the side facing the Sun, the distance to its boundary (which can vary) is about 70,000 km or between 10 - 12 Earth radii (or RE, where 1 RE=6371 km). The boundary of the magnetosphere "magnetopause" is roughly bullet shaped, about 15 RE abreast of Earth and on the night side (in the "magnetotail" or "geotail") approaching a cylinder with a radius 20-25 RE. The tail region stretches well past 200 RE, and the way it ends is not known.

The neutral gas envelope of Earth ("geocorona") continues to about 4-5 RE, with diminishing density and minimal interaction with the plasmas of the magnetosphere. So does the upwards extension of the ionosphere, known as the plasmasphere.

The internal field of the Earth (its "main field") appears to be generated in the Earth's core by a dynamo process, associated with the circulation of liquid metal in the core, driven by internal heat sources. Its major part resembles the field of a bar magnet ("dipole field") inclined by about 10° to the rotation axis of Earth, but more complex parts ("higher harmonics") also exist, as first shown by Gauss. The dipole field has an intensity of about 30,000-60,000 nanotesla (nT) at the Earth's surface, and its intensity diminishes like the inverse of the cube of the distance.

The solar wind is a fast outflow of hot plasma from the sun in all directions. Above the sun's equator it typically attains 400 km/s; above the sun's poles, up to twice as much. The flow is powered by the million-degree temperature of the sun's corona, for which no generally accepted explanation exists as yet. Its composition resembles that of the Sun - about 95% of the ions are protons, about 4% helium nuclei, with 1% of heavier matter - and enough electrons to keep charge neutrality.

A magnetic tail is formed by solar winds blowing electrified gases, plasma, trapped in a planet's magnetosphere away from the sun. The magnetic tail can extend great distances away from its originating planet. Earth's magnetic tail extends beyond the orbit of the Moon, while Jupiter's magnetic tail is believed to extend beyond the orbit of Saturn. The plasma in the tail is revolving, reaching the end of the tail and then folding back in on itself and returning to the planet it originated from.

There are also gaps in the magnetic tail, called troughs, where no stream of material exists. These troughs change in size and location, and can reconnect at later points in the tail. The night-side magnetic tail can sometimes whip violently back, throwing large amounts of superheated plasma and highly charged particles at the originating planet.

Magnetic fields from currents that circulate in the magnetospheric plasma extend the Earth's magnetism much further in space than would be predicted from the Earth's internal field alone. Such currents also determine the field's structure far from Earth, creating the regions described in the introduction above.

Similarly, in everyday applications, electric currents always require a "voltage" to drive them, a sort of electric pressure difference (a pressure known as "electric potential"), similar to the pressure difference that drives water along a pipe. Ohm's law is observed to hold fairly well in metallic conductors used by electric technology (e.g. wires) and it predicts a current proportional to voltage. Double the voltage and the current doubles, remove it and no current can flow.

Not so in the magnetosphere (and in many plasmas) where currents (with one important exception) need no voltage to drive them. Any electric current is the transport of electric charge, but in many cases, such transport is already implied by the structure of the field and the plasma. For instance, electrons and positive ions trapped in the dipole-like field near the Earth tend to circulate around the magnetic axis of the dipole (the line connecting the magnetic poles), without gaining or losing energy (see "Guiding center motion").

Viewed from above the northern magnetic pole, ions circulate clockwise, electrons counterclockwise, producing a net circulating clockwise current, known (from its shape) as the ring current. No voltage is needed--the current arises naturally from the motion of the ions and electrons in the magnetic field.

Any such current will modify the magnetic field. The ring current, for instance, strengthens the field on its outside, helping expand the size of the magnetosphere. At the same time, it weakens the magnetic field in its interior. In a magnetic storm, plasma is added to the ring current, making it temporarily stronger, and the field at Earth is observed to weaken by up to 1-2%.

The deformation of the magnetic field, and the flow of electric currents in it, are intimately linked, making it often hard to label one as cause and the other as effect. Frequently (as in the magnetopause and the magnetotail) it is intuitively more useful to regard the distribution and flow of plasma as the primary effect, producing the observed magnetic structure, with the associated electric currents just one feature of those structures, more of a consistency requirement of the magnetic structure.

As noted, one exception (at least) exists, a case where voltages do drive currents. That happens with Birkeland currents, which flow from distant space into the near-polar ionosphere, continue at least some distance in the ionosphere, and then return to space. (Part of the current then detours and leaves Earth again along field lines on the morning side, flows across midnight as part of the ring current, then comes back to the ionosphere along field lines on the evening side and rejoins the pattern.) The full circuit of those currents, under various conditions, is still under debate.

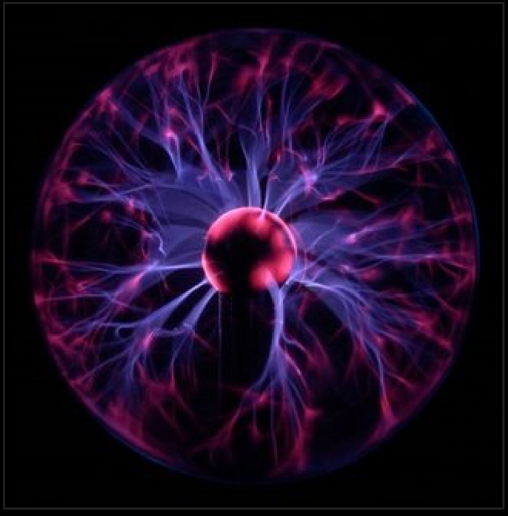
Because the ionosphere is an ohmic conductor of sorts, such flow will heat it up. It will also give rise to secondary Hall currents, and accelerate magnetospheric particles - electrons in the arcs of the polar aurora, and singly-ionized oxygen ions (O+) which contribute to the ring current.

Labels: Earth, Magnetosphere, Solar Wind

POSTED BY QUASAR9 AT 6:18 PM

SATURDAY, JANUARY 27, 2007

Plasma & Spin



Plasma - The Fourth State of Matter
In physics and chemistry, a plasma is typically an ionized gas, and is usually considered to be a distinct state of matter in contrast to solids, liquids, and gases because of its unique properties. "Ionized" means that at least one electron has been dissociated from a proportion of the atoms or molecules. The free electric charges make the plasma electrically conductive so that it responds strongly to electromagnetic fields.

Except near the electrodes, where there are sheaths containing very few electrons, the ionized gas contains ions and electrons in about equal numbers so that the resultant space charge is very small. We shall use the name plasma to describe this region containing balanced charges of ions and electrons.

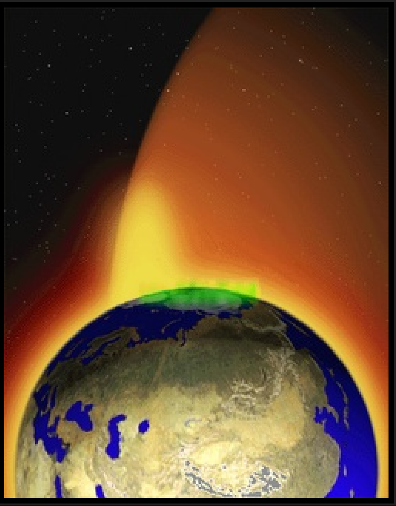
Plasma typically takes the form of neutral gas-like clouds or charged ion beams, but may also include dust and grains (called dusty plasmas). They are typically formed by heating and ionizing a gas, stripping electrons away from atoms, thereby enabling the positive and negative charges to move freely.

Common Plasmas

Plasmas are the most common phase of matter. Some estimates suggest that up to 99% of the entire visible universe is plasma. Since the space between the stars is filled with a plasma, albeit a very sparse one (see interstellar medium and intergalactic space), essentially the entire volume of the universe is plasma (see astrophysical plasmas).

Notable plasma physicist Hannes Alfvén also noted that due to their electric charge, very small grains also behave as ions and form part of plasma (see dusty plasmas).

The Earth's Plasmasphere (inner magnetosphere)



The Earth's "plasma fountain", showing oxygen, helium, and hydrogen ions that gush into space from regions near the Earth's poles. The faint yellow area shown above the north pole represents gas lost from Earth into space; the green area is the aurora borealis-or plasma energy pouring back into the atmosphere.

Plasma properties are strongly dependent on the bulk (or average) parameters. Some of the most important plasma parameters are the degree of ionization, the plasma temperature, the density and the magnetic field in the plasma region.

Definition of a plasma

Although a plasma is loosely described as an electrically neutral medium of positive and negative particles, a more rigorous definition requires three criteria to be satisfied:

The plasma approximation: Charged particles must be close enough together that each particle influences many nearby charged particles, rather than just interacting with the closest particle (these collective effects are a distinguishing feature of a plasma). The plasma approximation is valid when the number of electrons within the sphere of influence (called the Debye sphere whose radius is the Debye (screening) length) of a particular particle is large. The average number of particles in the Debye sphere is given by the plasma parameter, Λ.

Bulk interactions: The Debye screening length (defined above) is short compared to the physical size of the plasma. This criterion means that interactions in the bulk of the plasma are more important than those at its edges, where boundary effects may take place.

Plasma frequency: The electron plasma frequency (measuring plasma oscillations of the electrons) is large compared to the electron-neutral collision frequency (measuring frequency of collisions between electrons and neutral particles). When this condition is valid, plasmas act to shield charges very rapidly (quasineutrality is another defining property of plasmas).

Range of Plasmas Density increases upwards, temperature increases towards the right. The free electrons in a metal may be considered an electron plasma

A candle flame.
Fire can be considered to be a low temperature partial plasma.

Plasma temperature

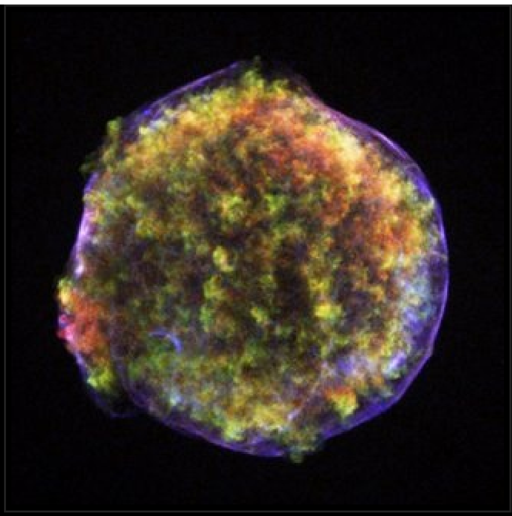
Plasma temperature is commonly measured in kelvins or electronvolts, and is (roughly speaking) a measure of the thermal kinetic energy per particle. In most cases the electrons are close enough to thermal equilibrium that their temperature is relatively well-defined, even when there is a significant deviation from a Maxwellian energy distribution function, for example due to UV radiation, energetic particles, or strong electric fields.

Because of the large difference in mass, the electrons come to thermodynamic equilibrium among themselves much faster than they come into equilibrium with the ions or neutral atoms. For this reason the ion temperature may be very different from (usually lower than) the electron temperature. This is especially common in weakly ionized technological plasmas, where the ions are often near the ambient temperature.

Based on the relative temperatures of the electrons, ions and neutrals, plasmas are classified as thermal or non-thermal. Thermal plasmas have electrons and the heavy particles at the same temperature i.e. they are in thermal equilibrium with each other. Non thermal plasmas on the other hand have the ions and neutrals at a much lower temperature (normally room temperature) whereas electrons are much "hotter".

Temperature controls the degree of plasma ionization. In particular, plasma ionization is determined by the electron temperature relative to the ionization energy (and more weakly by the density) in accordance with the Saha equation.

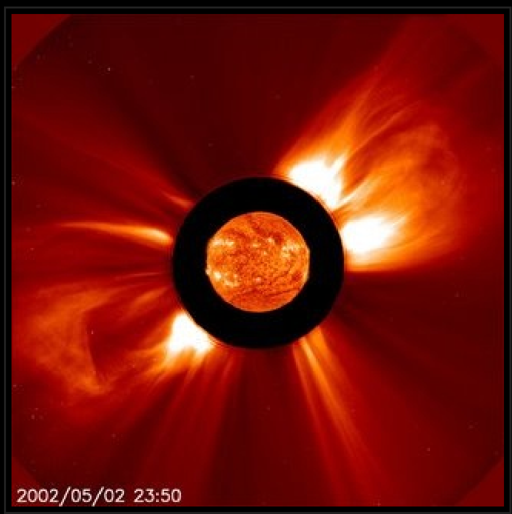
A plasma is sometimes referred to as being hot if it is nearly fully ionized, or cold if only a small fraction (for example 1%) of the gas molecules are ionized (but other definitions of the terms hot plasma and cold plasma are common). Even in a "cold" plasma the electron temperature is still typically several thousand degrees Celsius. Plasmas utilized in plasma technology ("technological plasmas") are usually cold in this sense.



The remnant of Tycho's Supernova, a huge ball of expanding plasma. The blue outer shell arises from X-ray emission by high-speed electrons.

Although the underlying equations governing plasmas are relatively simple, plasma behaviour is extraordinarily varied and subtle: the emergence of unexpected behaviour from a simple model is a typical feature of a complex system. Such systems lie in some sense on the boundary between ordered and disordered behaviour, and cannot typically be described either by simple, smooth, mathematical functions, or by pure randomness. The spontaneous formation of interesting spatial features on a wide range of length scales is one manifestation of plasma complexity.

Quasineutrality of a plasma requires that plasma currents close on themselves in electric circuits. Such circuits follow Kirchhoff's circuit laws, and possess a resistance and inductance. These circuits must generally be treated as a strongly coupled system, with the behaviour in each plasma region dependent on the entire circuit. It is this strong coupling between system elements, together with nonlinearity, which may lead to complex behaviour.



A solar coronal mass ejection blasts plasma throughout the solar system.

Electrical circuits in plasmas store inductive (magnetic) energy, and should the circuit be disrupted, for example, by a plasma instability, the inductive energy will be released as plasma heating and acceleration. This is a common explanation for the heating which takes place in the solar corona. Electric currents, and in particular, magnetic-field-aligned electric currents (which are sometimes generically referred to as Birkeland currents), are also observed in the Earth's aurora, and in plasma filaments.

Famous Quotes:
Essentially the entire volume of the Universe is Plasma.

Labels: Plasma

POSTED BY QUASAR9 AT 9:59 AM

Plasma & Spin - 2

A schematic representation of the Heliospheric current sheet, the largest structure in the Solar System, resulting from the influence of the Sun's rotating magnetic field on the plasma in the interplanetary medium (Solar Wind). It is sometimes informally refered to as the 'Ballerina Skirt' model.

Ordinarily, the current sheet circles the Sun's equator like a wavy skirt around a ballerina's waist. But during the double north pole event of March 2000, the current sheet was radically altered: The waviness increased. Irregularities appeared. Its topology "morphed" from a ballerina's skirt to a giant seashell.

Cellular structure
Narrow sheets with sharp gradients may separate regions with different properties such as magnetization, density, and temperature, resulting in cell-like regions. Examples include the magnetosphere, heliosphere, and heliospheric current sheet.

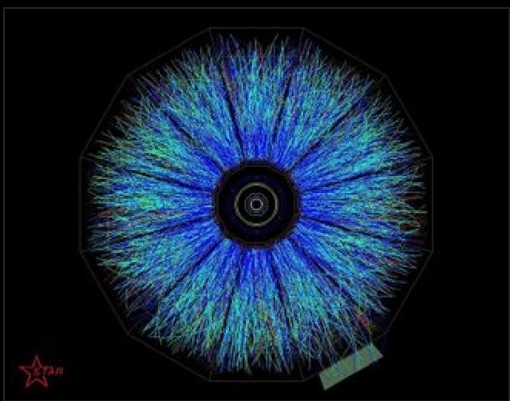
From the cosmological point of view, the most important new space research discovery is probably the cellular structure of space. As has been seen, in every region of space which is accessible to in situ measurements, there are a number of `cell walls', sheets of electric currents, which divide space into compartments with different magnetization, temperature, density, etc

Saturn's rings in which certain effects have been suggested are due to dusty plasmas (false colour image)

Ultracold Plasma
It is possible to create ultracold plasmas, by using lasers to trap and cool neutral atoms to temperatures of 1 mK lower. Another laser then ionizes the atoms by giving each of the outermost electrons just enough energy to escape the electrical attraction of its parent ion.

The key point about ultracold plasmas is that by manipulating the atoms with lasers, the kinetic energy of the liberated electrons can be controlled. Using standard pulsed lasers, the electron energy can be made to correspond to a temperature of as low as 0.1 K, a limit set by the frequency bandwidth of the laser pulse.

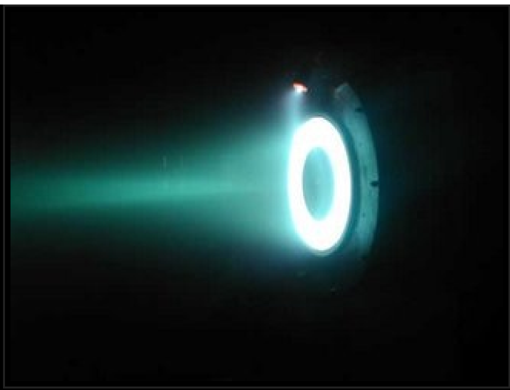
The ions, however, retain the millikelvin temperatures of the neutral atoms. This type of non-equilibrium ultracold plasma evolves rapidly, and many fundamental questions about its behaviour remain unanswered. Experiments conducted so far have revealed surprising dynamics and recombination behaviour that are pushing the limits of our knowledge of plasma physics.



A Quark Gluon Plasma QGP is formed at the collision point of two relativistically accelerated gold ions in the center of the STAR detector at the RHIC.

A quark-gluon plasma (QGP) is a phase of quantum chromodynamics (QCD) which exists at extremely high temperature and density. It is believed to have existed during the first 20 or 30 microseconds after the universe came into existence in the Big Bang.

Experiments at CERN's Super Proton Synchrotron (SPS) first tried to create the QGP in the 1980s and 1990s, and may have been partially successful. Currently, experiments at Brookhaven National Laboratory's Relativistic Heavy Ion Collider (RHIC) are continuing this effort. Three new experiments running on CERN's Large Hadron Collider (LHC), ALICE, ATLAS and CMS, will continue studying properties of QGP.



Hall effect thruster - Plasma Thrusters.
The electric field in a plasma double layer is so effective at accelerating ions, that electric fields are used in ion drives

Double layers involve localised charge separation, which causes a large potential difference across the layer, but does not generate an electric field outside the layer. Double layers separate adjacent plasma regions with different physical characteristics, and are often found in current carrying plasmas. They accelerate both ions and electrons.

More on PLASMA SCIENCES
Credits @ wikipedia - Plasma (physics)

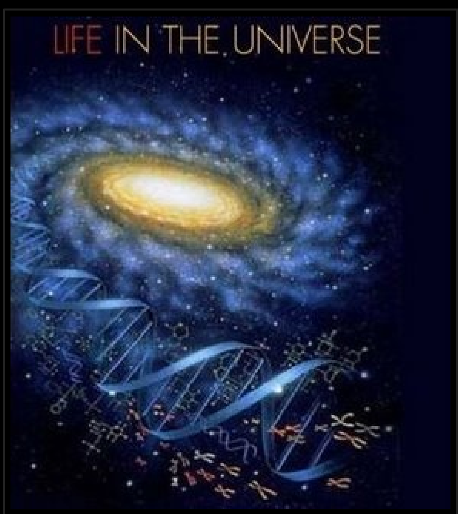
Famous Quotes: **The most important plasma & space research discovery is the cellular structure of space**

Labels: Plasma

POSTED BY QUASAR9 AT 8:59 AM

FRIDAY, JANUARY 26, 2007

Testing String Theory



Scientists have developed a test based on studies of how strongly W bosons scatter in high-energy particle collisions generated within a particle accelerator.

W bosons are special because they carry a property called the weak force, which provides a fundamental way for particles to interact with one another.

String Theory includes three mathematical assumptions — Lorentz invariance (the laws of physics are the same for all uniformly moving observers), analyticity (a smoothness criteria for the scattering of high-energy particles after a collision) and unitarity (all probabilities always add up to one). Our test sets bounds on these assumptions.

If the test does not find what the theory predicts about W boson scattering, it would be evidence that one of string theory's key mathematical assumptions is violated. In other words, string theory in its current form, would be proven impossible. If the bounds are satisfied, we would still not know that string theory is correct.

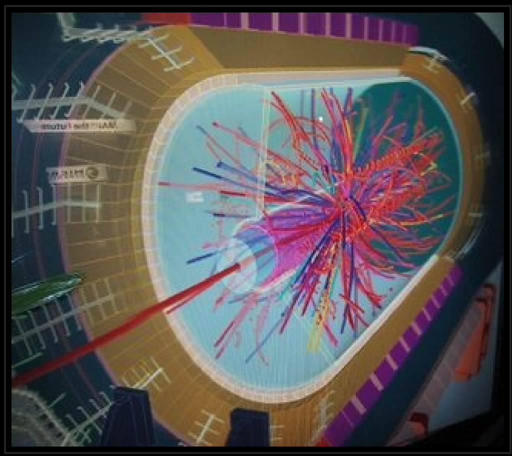


Image Credit: Caltech - hologram

String theory attempts to unify nature's four fundamental forces — gravity, electromagnetism, and the strong and weak forces — by positing that everything at the most basic level consists of strands of energy that vibrate at various rates and in multiple, undiscovered dimensions. These "strings" produce all known forces and particles in the universe, thus reconciling Einstein's theory of general relativity (the large) with quantum mechanics (the small).

Proponents say that string theory is elegant and beautiful. Dissenters argue that it does not make predictions that can be tested experimentally, so the theory cannot be proven or falsified. And no particle accelerator yet exists that can attain the high energies needed to detect strings. Because of this technical limitation, tests of string theory have remained elusive until now.

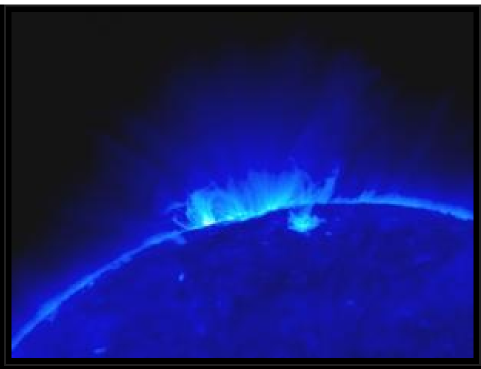
Since we don't have a complete understanding of string theory, it's impossible to rule out all possible models that are based on strings. However, most string theory models are based upon certain mathematical assumptions, and what we've shown is that such string theories have some definite predictions that can be tested.

Famous Quotes: It is true without lying, certain and most true. That which is Below is like that which is Above and that which is Above is like that which is Below to do the miracles of the Only Thing. And as all things have been and arose from One by the mediation of One, so all things have their birth from this One Thing by adaptation - *Sir Isaac Newton*

Labels: Particle Physics, Strings, Theoretical Physics

POSTED BY QUASAR9 AT 6:00 PM |

Sun's Hot Atmosphere



A close up of loops in a magnetic active region.

These loops, observed by STEREO's SECCHI/EUVI telescope, are at a million degrees C. This powerful active region, AR903, observed here on Dec. 4, produced a series of intense flares over the next few days. (Credit: NASA)

Solar Satellite's First Images Show Sun's Super-hot Atmosphere

NASA's twin Solar Terrestrial Relations Observatories (STEREO) first images of the sun give a view into the sun's mounting activity.

"STEREO is the first mission using the moon's gravity to redirect multiple spacecraft, launched aboard a single rocket, to their respective orbits," said Ron Denissen, APL STEREO project manager. On Dec. 15, 2006, mission operations personnel at the laboratory used lunar gravitational swingbys to alter the spacecraft orbits, redirecting the "A" observatory to its orbit "ahead" of Earth. The "B" observatory swung past the moon a second time on Jan. 21, redirecting it to an orbit "behind" Earth.

The two will orbit the sun from this perspective, separating from each other by about 45 degrees per year. Scientists expect the two to be in position to produce 3-D images by April 2007.

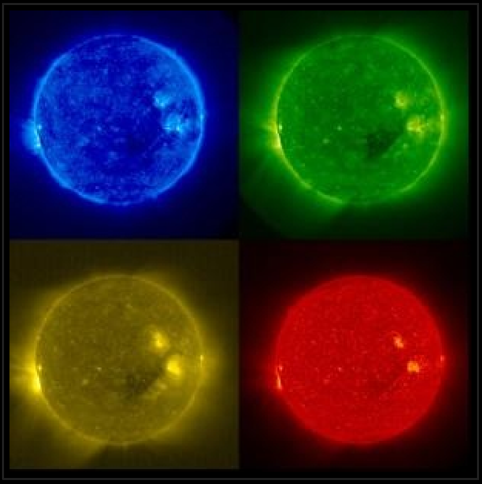
"Our ultimate goal is seeing solar flares and coronal mass ejections in 3-D to better understand their origin, evolution and determine whether or not they're a threat to Earth," said Russell Howard, principal investigator for SECCHI, the imaging instrument suite aboard both observatories. Howard and his staff are a part of the Naval Research Laboratory (NRL) in Washington, DC.

Artist's concept showing a coronal mass ejection (CME) sweeping past STEREO. (Image credit: NASA)

Coronal mass ejections, - giant clouds of plasma shot out into space by the sun and X-ray emitting solar flares are the largest explosions in the solar system and can pack the force of a billion megaton nuclear bombs. They are caused by the buildup and sudden release of magnetic stress in the solar atmosphere above the turbulent active regions we see as sunspots.

When directed at Earth, CMEs can produce spectacular aurora and disrupt satellites, radio communications and power systems. Energetic particles associated with these solar eruptions permeate the entire solar system and may be hazardous to spacecraft and astronauts.

“An integral part of exploration, heliophysics is the system science that unites all of the linked phenomena in the region of the cosmos influenced by a magnetically variable star like our sun,” said Madhulika Guhathakurta, NASA STEREO program scientist at NASA Headquarters, Washington. The STEREO mission represents the most significant upgrade and expansion to this system science as it will not only provide a rich package of upgraded sensors, but it will travel to new vantage points.”



A mosaic of the extreme ultraviolet images from STEREO's SECCHI/Extreme Ultraviolet Imaging Telescope aboard the "A" observatory taken on Dec. 4, 2006.
These false color images show the sun's atmospheres at a range of different temperatures. Clockwise from top left: 1 million degrees C (171 Å), 1.5 million C (195 Å), 60,000-80,000 C (304 Å), and 2.5 million C (286 Å). (Credit: NASA/NRL)

Twin Spacecraft Swing Past Moon, Preparing For 3-D Solar Studies from Science Daily

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The Voyager's and the Heliosphere by Astroprof
Holding the Sun up & Stereo on the Sun by Astroprof
Solar & Lunar Atmospheres from Astroprof's Page

Labels: STEREO, Sun

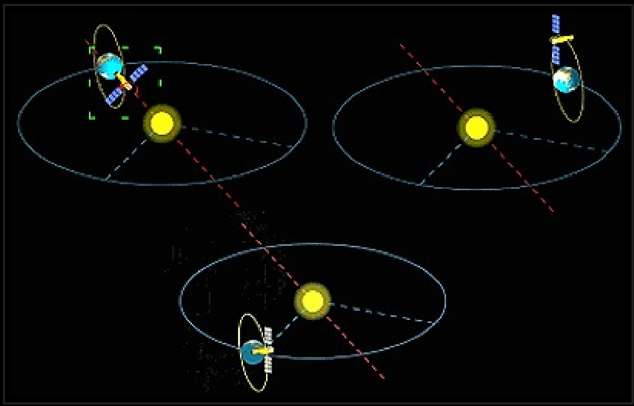
POSTED BY QUASAR9 AT 2:36 PM

THURSDAY, JANUARY 25, 2007

Corot sees first light!

The first light detected by COROT comes from the constellation of the Unicorn near Orion, the great 'hunter' whose imposing silhouette stands out in the winter nights.

On 18 January, the telescope was carefully aligned with the region to be observed, facing away from the centre of our Galaxy. This setting that will be maintained until April, when the Sun's rays will start to interfere with the observations.



COROT will then rotate by 180 degrees and will start observing the opposite region towards the centre of the Milky Way. In the meantime the COROT scientists are preparing for the science phase to start in February, continuing a thorough examination of the data and the information collected so far.

More on COROT sees first light! from ESA International

Developing a new vision for European astronomy

Michael Bode, Professor of Astrophysics at Liverpool John Moores University, has been charged with the vital task of developing the new 'roadmap', which will act as the blue print for the development of astronomy in Europe over the next 20 years. The roadmap will detail the infrastructure needed to deliver European astronomy's science vision - being agreed at a conference in Poitiers now (23-25th January 2007) hosted and organised by ASTRONET, a consortium of eleven European Science Agencies.

ASTRONET has an extensive brief covering all astrophysical objects from the Sun and Solar system to the global structure of the Universe, as well as every observing technique, in space and from the ground, and from radiation at any wavelength to astroparticles and gravitational waves.

Big questions remain in our understanding of the Universe, and ASTRONET has divided these challenges into four scientific areas:

Do we understand the extremes of the Universe?
How do galaxies form and evolve?
How do stars and planets form?
How do we fit in?
Answering these questions will require development of existing infrastructure as well as European wide investment in new facilities.

Different Constellations, Different Times by Astroprof

Labels: Corot, ESA

POSTED BY QUASAR9 AT 8:00 AM

TUESDAY, JANUARY 23, 2007

Cataclysmic Variable

Artist's impression of SDSS 1035+0551. Credit: Stuart Littlefair/Science.

The hot white dwarf is the same size as the Earth, yet weighs the same as our Sun. The brown dwarf is about the same size as Jupiter, but much more massive. The gravity of the white dwarf pulls gas from the brown dwarf; this gas spirals down onto the surface of the white dwarf, like water down a plughole, forming an "accretion disc" of hot gas around the white dwarf.

Where the falling gas from the brown dwarf hits the accretion disc, it creates a hot spot. The position of this hot spot depends on the masses of the two stars. The authors precisely timed when the white dwarf and hot spot were eclipsed by the brown dwarf. This allowed them to measure the location of the hot spot, and infer the masses of the two stars.

A long-standing and unverified prediction of binary star evolution theory is the existence of a population of white dwarfs accreting from substellar donor stars. Such systems ought to be common, but the difficulty of finding them, combined with the challenge of detecting the donor against the light from accretion, means that no donor star to date has a measured mass below the hydrogen burning limit.

A binary star system in which a white dwarf accretes material from a companion is called a cataclysmic variable (CV). Every kilogram of material that falls onto the white dwarf gains the energy equivalent of a few kilotons of TNT. Much of this energy is released as ultraviolet or x-ray radiation. Many CVs have been identified from this highly variable, short-wavelength light produced by rapid mass transfer onto the white dwarf.

However, most CVs should have evolved through this violent phase to become a "dead CV" with a low-mass companion that can support only weak mass transfer. Extensive efforts to confirm this long-standing prediction have failed to identify any CVs that have clearly survived the rapid mass transfer phase of their evolution. Now, a team of astronomers report in Science (see reference below) the unambiguous detection of a dead CV from a direct mass measurement of the low-mass companion in the CV SDSS 103533.03+055158.4 (SDSS 1035 for short).

A typical CV is smaller than the Sun, so there is a good chance that the orientation of the binary is such that the companion eclipses the white dwarf once every orbit as seen from Earth. This will lead to an apparent dimming of the CV every orbit during the few minutes that the companion blocks the light from the white dwarf. SDSS 1035 is an eclipsing CV, so there is a wealth of information to be gleaned from the changes in brightness during the eclipse. These show, for example, that the mass transferred from the low-mass companion forms a disc around the white dwarf with a bright spot on its outer edge due to the inflowing material.

The orbital period of SDSS 1035 is only 82 min, so small features such as the white dwarf are eclipsed in less than a minute. To accurately measure these rapid changes in brightness in such a faint star, Littlefair et al. used the William Herschel Telescope and ULTRACAM, an instrument they designed that uses CCDs to measure the brightness of CVs and other rapidly varying stars.

The data quality is impressive and leads to a mass for the companion accurate to about 4%. This is good enough to show convincingly that they are observing a genuine dead CV because the companion is well below the limit of 0.072 solar masses which a star cannot sustain nuclear reactions in its core. Objects that are born with masses below this limit are known as brown dwarfs.

Source ING Isaac Newton Group of Telescopes
ULTRACAM Obtains the First Observational Evidence of a Dead Cataclysmic Variable
More information:
A Ghostly Star Revealed in Silhouette Science, 314, 1550. Pierre F. L. Maxted.
Cataclysmic Cannibals in the Sky Science Press Release, 7 December 2006

Binary Stars & Terrestial Worlds by Centauri Dreams
Colliding White Dwarfs could create a supergiant by Universe Today

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Labels: Binary Stars, ING

POSTED BY QUASAR9 AT 6:19 PM

SUNDAY, JANUARY 21, 2007

Blue Horse & Sombrero

APoD **Horse Head Shaped Reflection Nebula IC 4592**
Credit & Copyright: Jim Misti & Steve Mazlin, (acquisition), Robert Gendler (processing)

Do you see the horse's head?
What you are seeing is not the famous Horsehead nebula toward Orion but rather a fainter nebula that only takes on a familiar form with deeper imaging. The main part of the above imaged molecular cloud complex is a reflection nebula cataloged as IC 4592. Reflection nebulas are actually made up of very fine dust that normally appears dark but can look quite blue when reflecting the light of energetic nearby stars. In this case, the source of much of the reflected light is a star at the eye of the horse. That star is part of Nu Scorpii, one of the brighter star systems toward the constellation of Scorpius. A

second reflection nebula dubbed IC 4601 is visible surrounding two stars on the far right.

APoD **The Sombrero Galaxy in Infrared**
Credit: R. Kennicutt (Steward Obs.) et al., SSC, JPL, Caltech, NASA

This floating ring is the size of a galaxy.
In fact, it is part of the photogenic Sombrero Galaxy, one of the largest galaxies in the nearby Virgo Cluster of Galaxies. The dark band of dust that obscures the mid-section of the Sombrero Galaxy in optical light actually glows brightly in infrared light. The above image shows the infrared glow, recently recorded by the orbiting Spitzer Space Telescope, superposed in false-color on an existing image taken by NASA's Hubble Space Telescope in optical light. The Sombrero Galaxy, also known as M104, spans about 50,000 light years across and lies 28 million light years away. M104 can be seen with a small telescope in the direction of the constellation Virgo.

Famous Quotes: Fortune favours the bold. Virgil

Labels: Blue Horse, Galaxies, Nebula, Sombrero

POSTED BY QUASAR9 AT 10:30 AM

FRIDAY, JANUARY 19, 2007

Swift wins Award

Swift team awarded top high energy astronomy prize
This year's prestigious Bruno Rossi Prize has been awarded to National Aeronautics and Space Administration (NASA) scientist Neil Gehrels and the team working on NASA's Swift Gamma-Ray Burst Explorer mission, including UK scientists from the University of Leicester and University College London's Mullard Space Science Laboratory, for major advances in the scientific understanding of gamma-ray bursts.

The prize is given each year by the High Energy Astrophysics Division (HEAD) of the American Astronomical Society (AAS), the largest professional organization of astronomers in the United States.

Besides observing GRBs, Swift has several secondary scientific goals, including observing supernovae (powerful stellar

explosions which can be used to map out the shape and fate of the Universe) and making the first high-energy survey of the entire sky since the 1980s.
The HEAD-AAS awards the Rossi Prize in recognition of significant contributions as well as recent and original work in high-energy astrophysics.

Past awards have been given for work, both theoretical and observational, in the fields of neutrinos, cosmic rays, gamma rays and X-rays. The prize is in honor of Professor Bruno Rossi, an authority on cosmic-ray physics and a pioneer in the field of X-ray astronomy.
For more information on Swift, visit:
Swift site
NASA site
The main mission objectives of Swift are to:
(1) determine the origin of gamma-ray bursts; (2) classify gamma-ray bursts and search for new types; (3) determine how the blast-wave evolves and interacts with the surroundings; (3) use gamma-ray bursts to study the early Universe; (4) perform the first sensitive hard X-ray survey of the sky.

Nano-detector Looks Promising For Remote Cosmic Realms
A miniscule but super-sensitive sensor can help solve the mysteries of outer space. Cosmic radiation, which contains the terahertz frequencies that the sensors detect, offers astronomers important new information about the birth of star systems and planets.

The detector, called a 'hot electron bolometer', is based on the well-known phenomenon that electrical resistance increases when something is heated up. The use of a superconductor renders the detector extremely sensitive and allows it to be used for radiation that until now could not be so well detected.

The detector works for terahertz frequencies, which astronomers and atmospheric scientists are extremely interested in. The detector's core is comprised of a small piece of superconducting niobiumnitride. Clean superconducting contacts that are kept at a constant temperature of --268 °C (five degrees above absolute zero) are attached to both ends of the superconducting niobiumnitride.

A miniscule gold antenna catches the terahertz-radiation and sends it via the contacts to the small piece of niobiumnitride, which functions as an extremely sensitive thermometer. "By reading this thermometer, we can very accurately measure the terahertz radiation. In Delft, we have set a world record with this detector in the frequency area above 1.5 terahertz," Hajenius says proudly.

The results have convinced astronomers to use these detectors for the new observatory in Antarctica (HEAT), and a new space mission (ESPRIT) has also been proposed.

The 'maiden flight' of Hajenius' detector is planned for next year, but it will not take place in a satellite used for studying cosmic clouds, but rather in a balloon that will study the earth's atmosphere. The TELIS instrument, which SRON is currently working on, will be equipped with a Delft University of Technology detector and will measure the molecules in the atmosphere above Brazil that influence the formation of the hole in the ozone layer.

Image courtesy of Delft University of Technology

No Extra Dimensions, Yet by Plato
Collider at Fermilab & Cosmic Ray detector at SLAC by Plato
Jovian magnetosphere & Solar Wind interactions by Centauri Dreams

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Famous Quotes: A wise man will make more opportunities than he finds. Francis Bacon

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Labels: Nano detectors, NASA, Swift

POSTED BY QUASAR9 AT 3:44 PM

WEDNESDAY, JANUARY 17, 2007

First Light

The Hubble Ultra Deep Field of galaxies (Credit: NASA, ESA, S. Beckwith (STScI) and the HUDF Team)

The James Webb Space Telescope (JWST), the orbiting infrared observatory designed to succeed the Hubble Space Telescope, is set to enable fundamental breakthroughs in our understanding of the formation and evolution of galaxies, stars and planetary systems.

The project is led by NASA, with major contributions from the European and Canadian Space Agencies. The telescope is scheduled for launch in 2013 for a mission of 5-10 years.

Colliding galaxies, NGC 4676, known as The Mice (Credit: NASA, H. Ford (JHU), G. Illingworth (UCSC/LO), M.Clampin (STScI), G. Hartig (STScI), the ACS Science Team, and ESA)

Webb’s instruments will be designed to work primarily in the infrared range of the electromagnetic spectrum, with some capability in the visible range.

The longer wavelengths enable JWST to look much closer to the beginning of time and to hunt for the unobserved formation of the first galaxies, as well as look inside dust clouds where stars and planetary systems are forming today.

Webb’s scientific goals are split into four distinct themes: The End of the Dark Ages - First Light and Reionization; The Assembly of Galaxies; The Birth of Stars and Protoplanetary

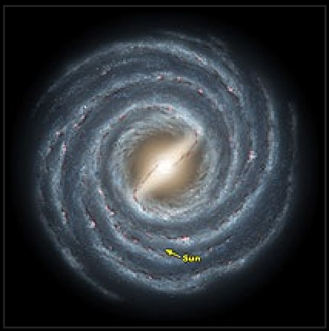
Systems; and Planetary Systems and the Origins of Life.

Labels: hubble, JWST

POSTED BY QUASAR9 AT 8:40 PM

TUESDAY, JANUARY 16, 2007

Milky Way family grows



Like a Goddess, the Milky Way is truly something to be awed by. We live in a disk of stars so vast, that if our Sun was the size of the dot of an "i" on this page, the Milky Way would stretch from Los Angeles to New York City. Hundreds of billions of stars, our Sun among them, orbit around the dense center of our galaxy, passing in and out of giant dust clouds, the debris of the lives of the stars.

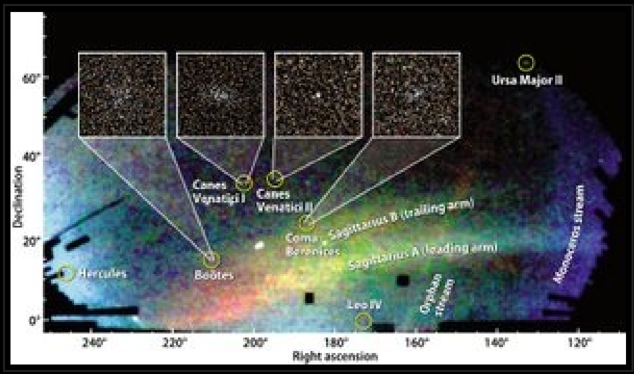
Residing in the outskirts of the Milky Way, our Sun takes 226 million years to make one orbit around the dense center of the galaxy. Even so, our motion is far from leisurely. The Sun, along with all our planets, is moving at well over 400,000 miles per hour around a bulging central swarm of millions of stars concealing a supermassive black hole in their midst. And we are part of all this. Some of the stars we see in the sky, although we don't know which ones, formed out of the same birth cloud the Sun did. Other stars, long dead, seeded our solar system with the rich chemicals needed to form life.

Not only does the Sun belong to a vast extended family, but the Milky Way does as well. Take a fairly basic question: what is the closest galaxy to our own? A lot of people might say the Andromeda Galaxy, which is, in fact, the closest large spiral to us, about two million light-years away. Andromeda is so close, in fact, that it is gravitationally bound to the Milky Way, and is one of the only galaxies in the sky that is moving toward us. Other, somewhat more astronomically savvy people might name the Magellanic Clouds as the closest galaxies. The Large and Small Magellanic Clouds are two small, blobby galaxies that actually orbit the Milky Way, and are about 180,000 and 210,000 light-years away, respectively.

And up until the last few years, everyone seemed pretty pleased with this answer; after all, these were the closest galaxies we could see in the sky. But we were wrong to trust our eyes. As it turns out, there are at least two other galaxies that are much, much closer. Part of the reason we missed them, in fact, is that they are so close; they are actually colliding with the disk of the Milky Way. In a very real way, they snuck up from behind us, hiding behind the stars, dust, and gas that fill the volume of the Milky Way's disk.

So how could we have missed two entire galaxies that are colliding with us? The answer has a lot to do with how we know we live in a spiral galaxy in the first place. I mean, you can't look up into the sky and see the spiral structure of our galaxy, so how do we know it's there? Most people are familiar with the dim, blurry band of light that crosses the sky, which ancient people from several cultures likened to a path of milk. This "Milky Way" is actually the combined light of billions of stars in the plane of our galaxy, and people from at least the eighteenth century have realized that our galaxy has a flattened shape.

The Milky Way: a Growing Galactic Family
by Michelle Thaller @ Spitzer Science Centre



Seven or Eight Dwarf Galaxies Discovered Orbiting the Milky Way
The discovery was announced 9 January 2007, during a press conference at the American Astronomical Society's meeting in Seattle, Washington. The galaxies were discovered as part of the Sloan Digital Sky Survey (SDSS-II), the most ambitious survey of the sky ever undertaken.

These dwarf galaxies have been captured by the gravity of the Milky Way and most eventually will merge with our own galaxy.

Dwarf galaxies contain, at most, a few million stars. The new dwarfs have some unusual properties. Several of the newly discovered systems appear to be on the verge of disruption, probably by the tidal gravity of the Milky Way - and the 'Ursa Major II' dwarf already seems to be in several pieces. "They look as though they're being ground up"

Current theories of galaxy assembly suggest that many - perhaps all - of the stars in the halo and thick disk of the Milky Way originated in smaller dwarf galaxies, which were dissolved when they merged into the Milky Way itself.

The new dwarfs are really just the crumbs from the galactic feast. "Most of the merging happened early on - billions of years ago - and what we're seeing here are the leftovers."

Famous Quotes: **Justice is truth in action. Benjamin Disraeli**

Labels: Galaxies, Milky Way, SDSS-II

POSTED BY QUASAR9 AT 8:03 PM |

SUNDAY, JANUARY 14, 2007

Cosmic Collisions

Scientists plan to pin down the date of a galactic collision billions of years in our future by first reaching back to the Big Bang, a feat that will be made possible by the extreme precision of NASA's planned SIM PlanetQuest mission.

By recreating some of the earliest moments of our portion of the universe, a team led by the University of Maryland's Ed Shaya will establish for the first time the masses and orbits of galaxies ranging from one million to 15 million light years from Earth. The study will reveal when the Andromeda galaxy will collide with our galaxy, the Milky Way, and will also strip away some of the mystery surrounding dark matter, the unknown substance whose gravity is thought to hold galaxies together.

The portion of each galaxy's motion that moves it closer to or further away from Earth, which is called its "radial motion," has already been well-established using the Doppler-shift technique. That's the observation of how light shifts toward the blue end of the spectrum for approaching galaxies, and toward the red for receding galaxies. But proper motion has been elusive because of the exceedingly slow rate at which galaxies millions of light-years away appear to move across the sky, even if they're actually traveling at very high speeds.

Proper motion, combined with the values established for radial motion and distance, will enable Shaya and his colleagues to calculate the three-dimensional velocity and direction of motion for each galaxy in the study. Then, after the observation phase of the study is completed, they will run a series of computer models to calculate masses and orbits for each galaxy.

The successful model will also produce an orbital path taking each galaxy from the Big Bang to its present location. Running the model forward into the future will enable Shaya to determine, among other things, when the Milky Way is destined to collide with the Andromeda galaxy.

Read more SIM PlanetQuest to predict date of cosmic collision

Arp 82 is an interacting pair of galaxies with a strong bridge and a long tail. NGC 2535 is the big galaxy and NGC 2536 is its smaller companion. The disk of the main galaxy looks like an eye, with a bright “pupil” in the center and oval-shaped “eyelids.” Dramatic “beads on a string” features are visible as chains of evenly spaced star-formation complexes along the eyelids. These are presumably the result of large-scale gaseous shocks from a grazing encounter.

The pair first burst with new star formation about 2 billion years ago after swinging by each other. A second close passage more recently resulted in yet another batch of star formation.

The new observations are from NASA's Galaxy Evolution Explorer, NASA's Spitzer Space Telescope and the Southeastern Association for Research in Astronomy Observatory at Kitt Peak, Ariz.

PHOTO CREDIT: NASA/JPL-Caltech/M. Hancock, B.J. Smith,
C. Struck, M.L. Giroux, P.N. Appleton, V. Charmandaris and W.T. Reach.
Graphics and additional information about
the Galaxy Evolution Explorer @ www.nasa.gov/galex/ .
More information about Spitzer @ www.spitzer.caltech.edu/spitzer .

Famous Quotes: The price of anything is the amount of life you exchange for it. Henry David Thoreau

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Labels: Galaxies, NASA

POSTED BY QUASAR9 AT 11:54 AM |

SATURDAY, JANUARY 13, 2007

Space Dust

Eagle Nebula "Pillars of Creation" Credit: nasa spitzer

Famous Space Pillars Feel The Heat Of Star's Explosion

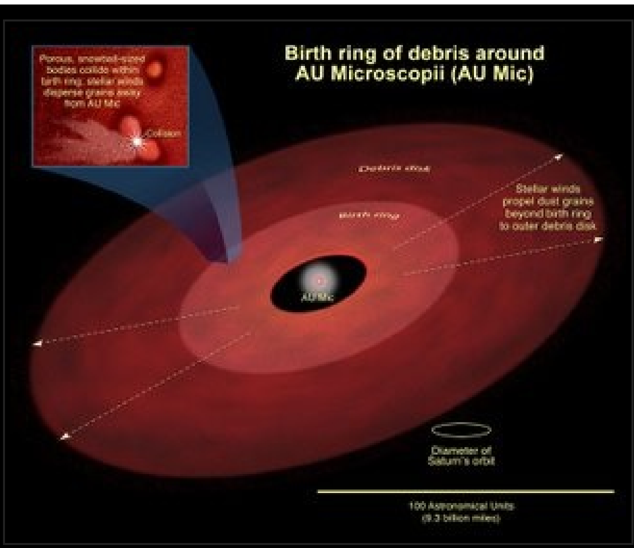
A new, striking image from Spitzer shows the intact dust towers next to a giant cloud of hot dust thought to have been scorched by the blast of a star that exploded, or went supernova.

Astronomers speculate that the supernova's shock wave could have already reached the dusty towers, causing them to topple about 6,000 years ago. However, because light from this region takes 7,000 years to reach Earth, we won't be able to capture photos of the destruction for another 1,000 years or so.

Spitzer's view of the region shows the entire Eagle nebula, a vast and stormy community of stars set amid clouds and steep pillars made of gas and dust, including the three well-known "Pillars of Creation."

Astronomers have long predicted that a supernova blast wave would mean the end for the popular pillars. The region is littered with 20 or so stars ripe for exploding, so it was only a matter of time, they reasoned, before one would blow up. The new Spitzer observations suggest one of these stellar time bombs has in fact already detonated, an event humans most likely witnessed 1,000 to 2,000 years ago as an unusually bright star in the sky.

Whenever the mighty pillars do crumble, gas and dust will be blown away, exposing newborn stars that were forming inside. A new generation of stars might also spring up from the dusty wreckage.



AU Microscopii - Credit: hubblesite

Dust Around Nearby Star Has Fluffiness Of New-fallen 'Powder' Snow
Astronomers peering into the dust surrounding a nearby red dwarf star have found that the dust grains have a fluffiness comparable to that of powder snow, the ne plus ultra of skiers and snowboarders.

This is the first definitive measurement of the porosity of dust outside our solar system, and is akin to looking back 4 billion years into the early days of our planetary system.

Objects in our solar system also are porous - comet grains that have lost their ice are like birds' nests, while some asteroids have been shown to be half-empty rubble piles - but none are as full of nothingness as the dust in AU Mic, which is more than 90 percent vacuum.

Most things we see have been compactified or compressed so that the vacuum has been squeezed out and filled in.

A theory of planet formation is that gas and dust coalesce into rocks and planets within the first 10 million or so years. While planet-size bodies continue to sweep up some of the remaining dust and debris, the debris also collides and creates small dust grains small enough for the stellar wind to blow it out of the inner system, leaving a hole dominated by larger objects, like the planets, dwarf planets and asteroids of our solar system.

He who has great power should use it lightly.
Lucius Annaeus Seneca

Labels: Eagle, NASA, Nebula, Spitzer

POSTED BY QUASAR9 AT 12:03 AM |

WEDNESDAY, JANUARY 10, 2007

ESA - Earth to Mars

Consultations were hosted by the European Space Agency (ESA) and the British National Space Centre (BNSC) in Edinburgh 8/9th January 2007.

Representatives from the UK and other European political, industrial and scientific sectors, together with members of the general public, the various stakeholder groups in Europe with colleagues from across the world, debated the future long-term exploration of the solar system and beyond.

The UK has a vibrant space science and industrial community that already makes a significant contribution to our knowledge economy. Its experience in developing innovative space technology will continue to ensure the UK plays a leading role in both European and global space exploration in the future.

MoonLITE *Credit: SSTL*
MoonLITE equipped with missile-shaped penetrators carrying seismometers to investigate the lunar interior and a telecommunications capability to demonstrate high data rate telecoms at the Moon.

Moonraker *Credit: SSTL*
MoonRaker, a small propulsive Lander to provide in-situ geological dating.
These mission options exemplify the UK's expertise in small satellites, robotics and miniaturised instruments and MoonLITE's telecoms capability could provide a vital contribution to NASA's ambition of establishing a Moon base by 2020.

The UK is already the second largest European contributor to ESA's Aurora programme of planetary exploration and is currently involved in developing an ambitious Mars Rover project that will fly onboard Europe's ExoMars mission to the Red Planet slated for launch in 2013.

ESA's Aurora Mission

From the dawn of humankind the need to explore has driven expansion across our planet. Today this expansion continues towards other planets in the solar system by means of robotic spacecraft - virtual explorers. But will human expansion continue? In the public consciousness this is only a matter of time. By 2025 an international human mission to Mars may be a reality. It may use the Moon as a way station and to prepare for the great leap. The feasibility of such a mission is being assessed, however, the necessary technology and capability still need to be developed.

Over the next 20 years robotic missions will prepare for human missions, by collecting as much scientific and engineering data as possible, without human scientists in situ. These robotic missions will contribute and demonstrate the technologies needed to put humans on Mars and return them safely to our planet.

Some of the key technologies for a human mission are also very important to the search for life in situ on the red planet and on other solar systems, planets and moons. Soft and precision landing, drilling and sample return, will not just be demonstrated for the sake of technology. These missions will carry sophisticated exobiology payloads and provide answers to some key questions on the origin of life in the solar system and possible causes for its extinction.

A challenging and complex return mission to collect a sample on Mars might also involve our first attempt at interplanetary exploitation. Instead of lugging propellant for the return trip all the way from Earth, the lander systems could include technology that would generate rocket fuel from Martian resources.

Ultimately, though, Mars exploration plans should result in an even greater adventure - a human mission. Astronauts are vastly more capable than even the smartest robot, but they are also vastly more difficult and expensive to transport. Unlike robots, they eat and breath; and if their environment is too uncomfortable, they can become tetchy and depressed. For a human Mars expedition to be possible, new technologies will have to be developed and tested: not only soft-landing methods and in-situ fuel processing, but life-support engineering for a long haul far from home and perhaps entirely new rocket systems, possibly based on new types of propulsion, which will reduce the time spent coasting through space.

By 2025 A human Mars mission, perhaps with the Moon as a first target or even as a way station to the Red Planet, would represent the culmination of the programme's efforts. And just incidentally, it would also guarantee that there was life on Mars: human life.

Read more European workshop on space exploration from ESA
Europe forges long-term strategy for Space Exploration by PPARC

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