



STELLA MARIS COLLEGE

Φ Ψ

phy si

DEPARTMENT OF PHYSICS

2012

Published on 27/01/2012

**NEW EXOTIC &
HERBAL FRAGRANCE**



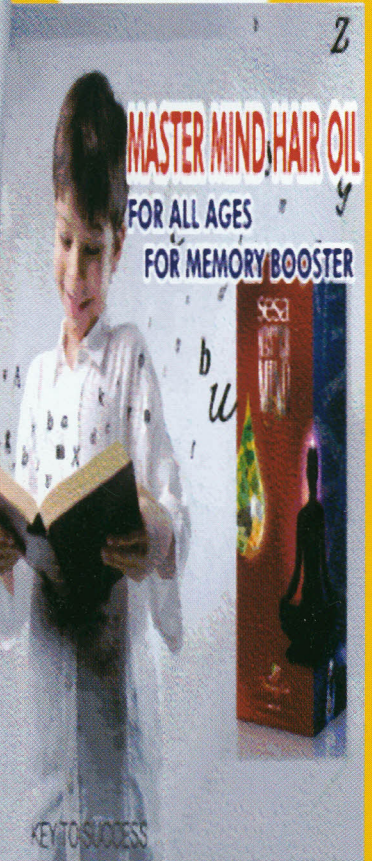
enriched with ROSEMARY, CALENDULA & HENNA
SESA HAIR COLOUR
BLACK, BROWN & BURGUNDY

அறிவின் ஒரு புதிய விளக்கம்

நன்மை பயக்கும் 3 மதிப்புமிக்க
மூலிகைகள் உங்கள் மனதை
குணமடையாக்கும்.
இதனால் உங்கள் ரூபக் சக்தி
மேம்படும்.



*Smooth and
Silky Hair*



நன்மை பயக்கும் சேனா எண்ணெய்
கீழ்போது புதிய நறுமணத்துடன்
புத்தேகமான ஆயுர்வேத எண்ணெய்

18 வகை மூலிகைகள், செறிவுடையுள்ள
எண்ணெய் மற்றும் பால் ஆகியவற்றை
கொதிக்க வைத்து தயாரிக்கப்பட்டது

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WHAT'S IN???



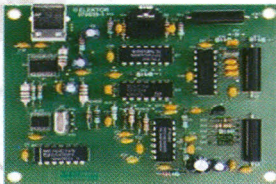
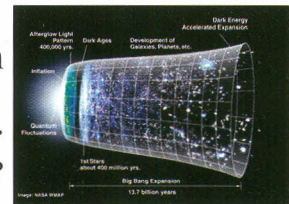
ROBOTICS

The robot – driven cars will be able to understand their surrounding and react to it.

UNIVERSE???

Saul Perlmutter, Adam Reiss, Brian Schmidt.

Gussed who these great fellows are???

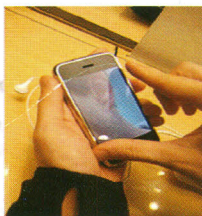
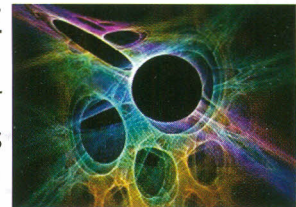


SOFTWARE DEFINED RADIO

has the ability to be transformed through the use of software or redefinable logic

ITS DIFFICULT TO BELIEVE

Black strings - violates the Cosmic Censorship Hypothesis



i PHONE

Apple turns a phone into software that creates a life-like experience and adds a digital lightness and playfulness.

7 STUFF - LAUGH AT PHYSICS

Ferrofluids, Aerogel, Elastic conductors and much more.....



Editor's Epistle

Everyone saw apples fall down, but only Newton questioned why?. Physics is the only field where questions are raised and answers are sought for. If we mull into one's favorite form of nature, there is nothing but physics that encompasses it. Unlike other sciences, Physics can give different form of solutions in different dimensions and perspectives for each conundrum.

Physi, the annual department magazine was released on 27th January, 2012. Physi has been published for the sixth year in string as a part of our departments' endeavor. Physi gives us a manifestation of the abundant physics kingdom. This is an assemblage of stupefying articles written by our beloved fellow students. We had a wonderful time in editing the magazine and the journey we had to tread through the world of physics was incredible!

We would like to thank our principal, Dr.Sr.Jasinthra Quadras, the Head of our Department, Mrs. Suganthi Lark Josephine. A, Ms. Anceila. D, Dr.Ramya C,S and all our faculty members for their unceasing encouragement and support. Our hearty thanks to our sponsors who have made this magazine a great success. We heartily thank our writers of Physi for their significant contributions. We take immense pleasure in releasing Physi. We hope that Physi will be a source of knowledge, inspiration and fun.

Faculty speech

"All truths are easy to understand once they are discovered; the point is to discover them".

- Leonardo da Vinci

With profound joy and gratitude to Almighty, I extend my happiness to all, in the milieu of bringing out the department magazine "Physi".

The valuable chattels have the potential to leap frog and bridge the technological divide that threatens our society. The research and higher studies must persuade and enable one to become renowned scientists and committed citizens of very high caliber to meet the growing and ever changing demands of the industries and global market.

Congratulations to the editorial team and the students who have contributed their might to bring out this magazine, which is an assurance of their creativity. I wish all of you success and prosperity in all your endeavors.

With best wishes,

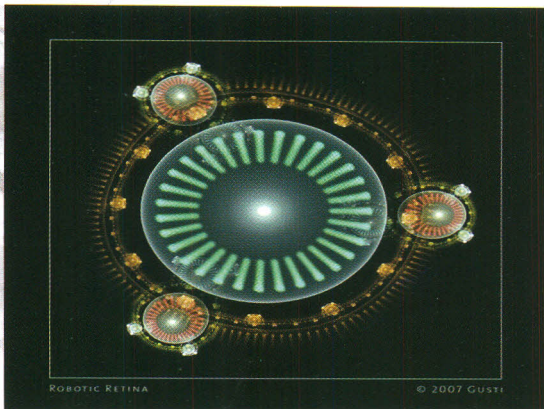
Ms A. Suganthi Lark Josephine

Head, Department of Physics

ROBOTICS

ROBOTIC RETINA

The bionic eye developed by US experts has been successful “in particular restoring the eyesight of blind patients”. It works by converting images from a tiny camera mounted on a pair of glasses into a grid of 16 electrical signals that transmit directly to the nerve endings in the Retina.



An implant wirelessly receives the data and sends the signals through a tiny cable to an electrode array. It is then stimulated to emit electrical impulses, which induce responses in the retina that travel through the optic nerve to the brain, making the blind patient see objects like shadows. They can also be able to tell which directions the objects are moving in front

CIRCA 2030, ROBOT- DRIVEN CARS!

Researchers are working on the next-generation robot- driven cars and for see such cars driving humans around by 2030.



The robot – driven cars will be able to understand their surrounding and react to it. And these intelligent vehicles will be able to operate in a stimulated environment. Radar and global positioning systems fitted in these vehicles feed data into the on- board computer to determine their location and position. This Robot – driven cars would be used in war zones. These vehicles will be of much importance particularly to people who cannot drive owing to physical disabilities.

IT'S ROCKET SCIENCE

Strangely enough my liking for Physics wasn't something that was inborn. It was more of something that developed over the years and that I owe to Stella Maris. I was just another girl who wanted to pursue her MBA after under graduation. In keeping with that I took up a job with an IT solutions company for the experience. Hardly a few months into the job and I detested it. The monotony of a desk job and paper pushing was most definitely not my cup of tea. I missed observing and analyzing scientific data. I quit after a yearlong stint to pursue my Masters in Space Science and Engineering specializing in Spacecraft Technology and Satellite Communications at University College London. The warm rush of contentment when I sat through my first lecture was all that I needed, to know that this was what I wanted to do. A career in Physics is not something that you pursue out of pressure or compulsion. You have to genuinely like it for you to be able to excel at it. I wish all my juniors who are going to pursue any field in Physics all the very best. And the ones who have decided that they have had enough of Physics, all the best to you too and hope you discover something you love doing.

- ManishaPranati Caleb

Masters in Space Science & Engineering, UCL

WONDERFUL SMALL SATELLITES

Small satellites are a great boon for those nations which are interested in space research but not in a position to pursue it due to economic reasons.



IMPORTANCE OF SATELLITES IN PRESENT TIME:

Satellites have become very important to man and are providing many types of services, helping in day-to-day work. These can be divided into:

Communication satellites: help in communication.

Weather satellites : provide information for weather forecasting.

Biosatellites : carries living organisms in space for scientific studies.

Astronomical satellites : provide information about astronomical bodies.

Solar power satellites : brings solar energy on the earth.

Remote sensing satellites: provides in-

World's first Microsatellites

MICRO SATELLITE	LAUNCH DATES
SPUNTIK-1	4 th October, 1957
VANGUARD-1	17 th March, 1958
OSCAR-1	12 th December, 1961
TELSTAR-1	10 th July, 1962
SYNCOM-1	14 th February, 1963
EARCYBIRD-F1	6 th April, 1965
PIONEER-6	16 th October, 1965
APOLLO -P&F1	4 th August, 1971
UoSAT-1	6 th October, 1981
DARPA microsats	16 th July, 1991
PoSAT-1	26 th September, 1993

"To myself I am only a child playing on the beach, while vast oceans of truth lie undiscovered before me."

Albert Einstein (1879 - 1955)

MOON FACTS

EARTH'S MOON: The most familiar and also the largest satellite in relation its planet in the solar system. It is the first body in the solar system on which vehicles from Earth landed, and the only one to be explored by humans.

DIAMETER: 3,475.6 km

DISTANCE FROM EARTH: 406,711 km (furthest , 1912) to 356,375km (closest,1984), 384,403 km (average).

MASS: 734,556,000,000 tones; a person weighing 65kg on earth would weight 10.79 kg on the moon.

ROTATION: 27 days 7 hours 43 minutes 11.5 seconds.

SURFACE TEMPERATURE: -163° to 117°C

LARGEST CRATER: Southpole Aitken (far side) 2,100 km diameter, 12km deep (largest in the solar system).

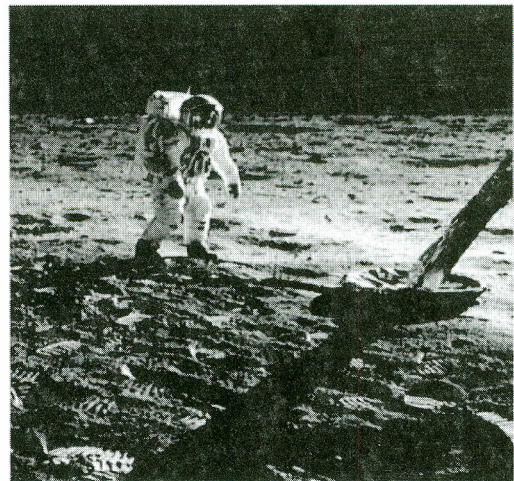
TITANIC MOON

Titanic is the largest of Saturn's 34 moons. It is 5,150 km in diameter – largest than the planet mercury. Dutch astronomer Christian Huygen discovered Titan in 1655. We still have no idea what its surface looks like because Titan has a dense atmosphere containing nitrogen, ethane and other gases which surround its surface- not unlike that of Earth four billion years ago.

NEPTUNE'S MOON:

TRITON, discovered in 1846, is the only known large moon in the solar system with the retrograde orbit. It revolves around its planet (Neptune) in the opposite direction to the planets rotation

LONGEST SPACE WALK

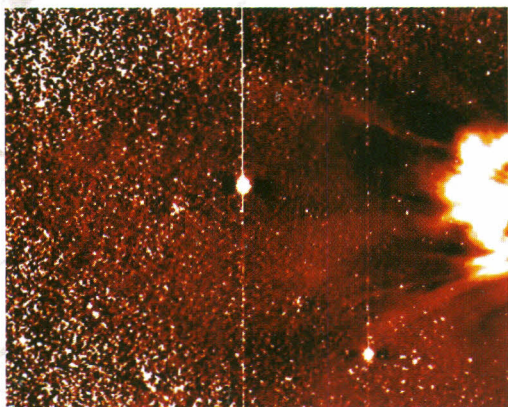


The record for the longest spacewalk was broken from 10-11 March 2001, when mission specialist James Voss and Susan Hellen stepped outside space shuttle. Discovery of STS-102 was to do construction work on the space station. Their EVA (Extra Vehicular Activity) lasted 8 hours 56 minutes

Work on NASA's new lunar lander, code named Altair, begins in 2009. The aim is to put humans on the moon by 2018-46 years after the last bright star) shows how the lander will look.

MYSTERIOUS MERCURY

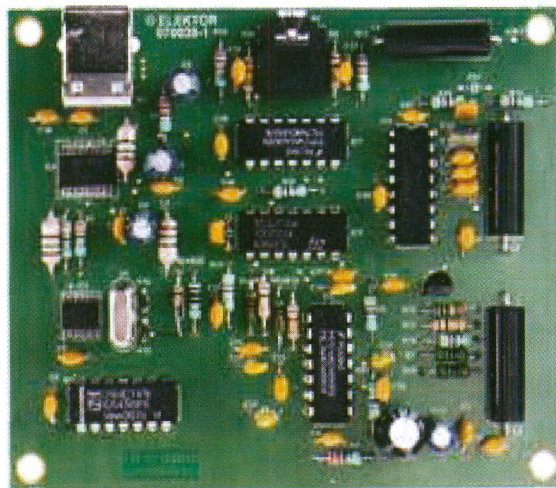
The messenger spacecraft puts forth some mysterious facts about the planet, which tends to shake our basic ideas about nature and history of the planet. Mercury and the earth are the only two planets which have their own magnetic fields generated internally. The only difference being that the mercury's magnetic field possesses unusual characteristics. The magnetic vector is displaced 500km, northward of the geographical equator. Consequently the surface field of the North pole is larger than that of the south pole by 3.5 km. But the astounding fact is that Mercury shows "no evidence" of electron radiation belts (van Allen Belts) surrounding it. And an acceleration phenomenon produces energetic electrons but not energetic protons. This phenomenon is unique to mercury and might be due to the "weak planetary field".



Another strange feature proved is the prevalence of northern high latitude smooth plains which is a result of extensive flood volcanism. Due to the presence of abundant radioactive isotopes on its surface, the overall composition makes the planet easily comparable to meteorites.

Software-Defined Radio

Over the last decade as semiconductor technology has improved both in terms of performance capability and cost, new radio technologies have emerged from military and R&D labs and become mainstream technologies. One of these technologies is software-defined radio. Software radio is difficult to generate. This is largely due to the flexibility that software-defined radios offer, allowing them to take on many different forms that can be changed to suit the need at hand.



SDRs, do have characteristics that make them unique in comparison to other types of radios. An SDR is a radio that has the ability to be transformed through the use of software or redefinable logic. This is done with general-purpose digital signal processors (DSPs) or field programmable gate arrays (FPGAs). In order to take advantage of such digital processing, traditional analog signals must be converted to and from the digital domain. This is accomplished using analog-to-digital (ADC) and digital-to-analog (DAC) converters. To take full advantage of digital processing, SDRs keep the signal in the digital domain for as much of the signal chain as possible, digitizing and reconstructing as close to the antenna as possible, which allows digital techniques to perform functions traditionally done by analog components as well as others not possible in the analog domain. Despite the fact that an ADC or DAC connected directly to an antenna is a desirable end goal, there are issues with selectivity and sensitivity that an analog front end can remedy.

The alternative to digitizing at the antenna is the use of a completely flexible analog front end (AFE) capable of translating a wide range of frequencies and bands to that which the data converters themselves can adequately process. SDRs are ideal candidates to be used for multicarrier, single-carrier, single-band, multiband, and multi-mode transceivers.

The key point is that SDRs have the ability to go beyond simple single-channel, single-mode transceiver technology with the ability to change modes arbitrarily because the channel bandwidth, rate, and modulation are all flexibly determined through software. These characteristics may be changed by direct input, floppy disk, over-the-air download, or through the use of careful signal analysis to determine analytically how the information is coded through a process termed *cognitive radio*. Regardless of the means by which the radio is reconfigured, a fully implemented SDR will have the ability to navigate a wide range of frequencies with programmable channel bandwidth and modulation characteristics. These are some of the possible dynamic characteristics of an SDR:

1. Channel bandwidth
2. Data rate
3. Modulation type
4. Conversion gain

“Am a man should look for what is, and not for what he thinks should be.”

-- Nikola Tesla
(1856 – 1943)

Super-resolution microscope coming to a lab near you

Confocal microscope images showing how STED improves resolution

Germany's Max Planck Society and the microscope maker Leica Microsystems have joined forces to commercialize a new technique to allow optical microscopes to look at even smaller objects than was previously possible. This latest method is based on stimulated emission depletion (STED) microscopy, which is a technique for beating the diffraction limit that was first demonstrated more than a decade ago by Max Planck researcher Stefan Hell.

Optical microscopy is the preferred tool of biologists because it can be used to study living cells, and for this purpose they invented STED microscope. The method involves fluorescence microscopy, whereby a molecule of interest is tagged with a dye that gives off light at a specific colour when illuminated with a spot of light. The sample is viewed through a confocal microscope, to ensure that light is only gathered from a very small part of the sample. The sample is moved under the aperture and many images are taken to build up a full picture.

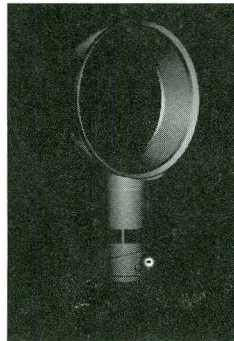
A STED module can be used with a conventional scanning confocal microscope to achieve a lateral resolution of about 50–70 nm – and a commercial version is available from the microscope manufacturer Leica. Normally, STED images are taken in a continuous wave (CW) mode. However, the researchers have discovered that it takes several nanoseconds. This means that any images taken during this initial period are blurry because of the signal still coming from non-depleted areas in the outer much

lesparts – and such images do not benefit from the full STED effect.

Another benefit of the technique is that sharper images can be acquired using a light (which can reduce the damage of living cells due to irradiation) – and therefore less image-acquisition time.

Bladeless Fan

In October 2009, James Dyson's consumer electronics company introduced a new device to the market called the Dyson Air Multiplier. The Air Multiplier is a fan with an unusual characteristic: it doesn't have any visible blades. It appears to be a circular tube mounted on a pedestal. The shallow tube is only a few inches deep.



The air flows through a channel in the pedestal up to the tube, which is hollow. The interior of the tube acts like a ramp.

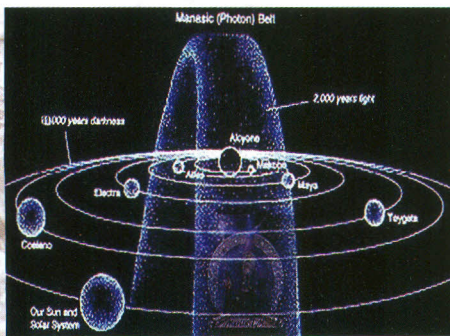
Air flows along the ramp, which curves around and ends in slits in the back of the fan. Then, the air flows along the surface of the inside of the tube and out toward the front of the fan. As air flows through the slits in the tube and out through the front of the fan, air behind the fan is drawn through the tube as well. This is called **inducement**. The flowing air pushed by the motor induces the air behind the fan to follow. Air surrounding the edges of the fan will also begin to flow in the direction of the breeze. This process is called **entrainment**.

Upon its launch, Dyson made available two sizes of the Air Multiplier. The larger model has a fan with a 12-inch diameter (about 30.5 centimeters). The smaller model has a 10-inch diameter (25.4 centimeters).

The Photon Belt

Just as the earth rotates around the sun, the sun and all her satellites rotate around the galactic centre at a speed of one degree every seventy five years. So it takes 25,920 years to orbit the galactic centre once and this is called the Grand Cycle.

During the first half of the Grand Cycle, the solar system is close enough to the centre of the galactic centre to be bathed in light, but during the second part of the cycle we circle through the darkness of the galactic night for about thirteen thousand years. This is a continuous process since the beginning of time.



The rotational period of 13,000 years has repeating cycles of dark and light and corresponding periods of different states of consciousness. The last time the earth passed through the Photon Belt was when Lemuria and Atlantis were at the height of spiritual development before Lemuria sank into the Pacific Ocean.

At the time of the fall of Atlantis, approximately thirteen thousand years ago we entered the dark half of the Grand Cycle also known as the time of the Great flood. We have come to the end of the 13,000 year dark period now and we began a new 13,000 light period a short time ago. We are at the point of entry into the Galactic Centre where we will remain for two thousand years within the galaxy before we begin the next grand Cycle. As part of a cyclic plan the earth and the solar system will pass through the Photon belt in 2012 and will remain within the galactic centre for 2,000 years.

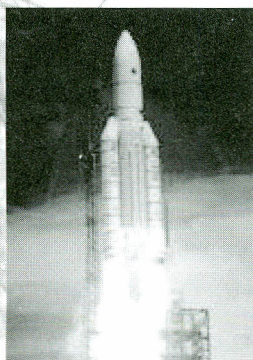
As we move into the galactic Centre our Solar System is gradually coming under the influence of the Photon Belt light. The Photon Belt is a massive region within the galactic centre containing a high concentration of photons.

When our Earth first entered the Photon Belt these frequencies started as short bursts of radiation. Photons are bombarding the earth more frequently now. The Photon belt energy will be our main source of energy as it was in Lemuria and Atlantis. We can breathe in Photon energy into our physical, etheric, emotional mental and spiritual bodies.

APPLICATIONS OF NEUTRON RADIOGRAPHY IN SPACE

Radio metallurgy laboratory (RML) is supporting various organizations such as Indian Space Research organization (ISRO), Indian Air force and Defense Research Development Organization (DRDO) in qualifying critical components by Neutron Radiography (NR).

The space programme has become largely self-reliant with capability to design and build its own satellites and its launch them using indigenously designed and developed launch vehicles.



In a space launch, hundreds of pyro devices are used in the launch vehicle as well as in the satellites. Pyro devices are pyro-chemical based mechanical devices, which contain a small amount of explosive mixture inside a thick metal casing, and are extensively used in all the stages starting from ignition of the strap-on motors up to positioning of the satellite in the required orbit. Pyro devices are also used to shear very thick parking satellites in desired orbits. Pyro devices are also required for de-orbiting a spacecraft to bring it back to Earth. Hence, reliability of pyro devices is critical to the success of any space mission.

fasteners to serve burnt out stages and for jettisoning the heat shields from the launch vehicle after it has cleared the dense atmosphere. In satellites, pyro devices are used to deploy solar panels, antennae and for parking satellites in desired orbits. Pyro devices are also required for de-orbiting a spacecraft to bring it back to Earth. Hence, reliability of pyro devices is critical to the success of any space mission.

Pyro devices can be in different sizes ranging from a tiny detonator to a heavy bolt cutter or a lengthy explosive transfer assembly. Whatever may be the device, it has to be carefully integrated within the frame and kept in close contact with the dysprosium converter screen for facilitating image formation in the transfer technique. The number of frames chosen for radiographic investigation depends on the type of component, its dimension and the explosive charge content. A stepper motor driver Cassette Drive Mechanism (CDM) enables loading and indexing of multiple components and multiple exposures in single reactor startup. 10 cassettes can be loaded in to the CDM at a time and up to 10 exposures can be carried out without reload-

TO LIVE LONG, GO FOR IT....

The industrial and hence the economic development of a country is directly related to the ready availability of sufficient energy for powering industries. The fossil fuel energy sources like coal and petroleum are being depleted at an alarming rate and so it is imperative that renewable sources of energy be exploited.

Renewable energy technologies have the potential to provide future energy supplies and have the advantage that they are environment-friendly. Renewable energy is the energy generated from natural resources such as water, sunlight, wind, rain, tidal waves, geothermal sources and biomass sources.

These sources are continually and naturally replenished over a period of time.

Solar energy, a clean renewable resource with zero emission, has got tremendous potential of being harnessed using a variety of devices. Sunlight can be converted directly into electricity using photovoltaic's (PV), or indirectly with concentrating solar power (CSP), which normally focuses the sun's energy to boil water which is then used to provide power.

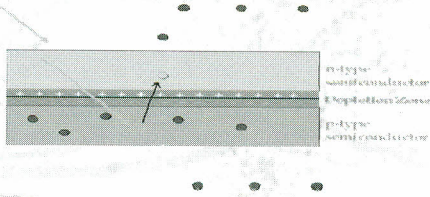
In Solar photovoltaic technology, the light from the sun is being converted into electrical energy.

In case of power plants, more than one panel is clubbed together to have a greater output. The energy produced from the photovoltaic cells is of Direct Current. An inverter can be used to convert DC into AC for AC electrical appliances.



In Solar Thermal technology, sun's heat is tapped and is converted into heat energy. The solar water heaters are either made of flat plate collectors or evacuated

Solar Photovoltaics
Physics of Photovoltaic Generation



tube collectors, which absorb and pass on the heat to the water. The basic principle of solar water heaters is thermo siphon.

Wind energy has been used for centuries to power windmills to mill wheat or pump water. This source of energy is also non-polluting and is freely available in many areas. Wind turbines, which produce electricity from wind, are becoming more efficient.

Hydroelectric power - Flowing rivers have kinetic energy and water stored in dams has potential energy. This energy can be used for generating electricity by converting the available energy into mechanical energy that can be used for turning turbines .

Biomass energy is the utilization of energy stored in organic matter. Examples of biomass include wood, leaves, animal waste, crops, bones, and scales. The abundant plant life on our planet is a natural store house of solar energy and chemical resources. Whether cultivated by man, or growing wild, plant matter represents a massive quantity of a renewable resource that we call biomass. Put another way, biomass is stored solar energy that can be converted to electricity or fuel.

Tidal and Ocean Energy - Tides are caused by the gravitational pull of the Moon, and to a lesser extent the Sun, on the oceans around the world. The difference between high tide and low tide can be many metres, and the energy of the tidal movement can be used to generate electricity. The rise and fall of the tide is constant, and does not depend on the weather. The production of electricity in this way is relatively cheap.

Unlike fossil fuels, the renewable energy can be replenished. This makes it more and more popular compared to conventional energy resources.

BECAUSE MARS IS SMALLER THAN EARTH, IT COOLED FASTER; AND IT PROBABLY WOULD HAVE BEEN HOSPITABLE FOR LIFE EARLIER. THAT RAISES THE INTRIGUING POSSIBILITY THAT PIECE OF MARS CONTAINING MICROBES WERE BLASTED INTO SPACE BY ASTEROID IMPACTS AND LATER LANDED ON EARTH, SEEDING LIFE HERE. IN OTHER WORDS, WE COULD ALL BE DESCENDANTS OF MARTIANS