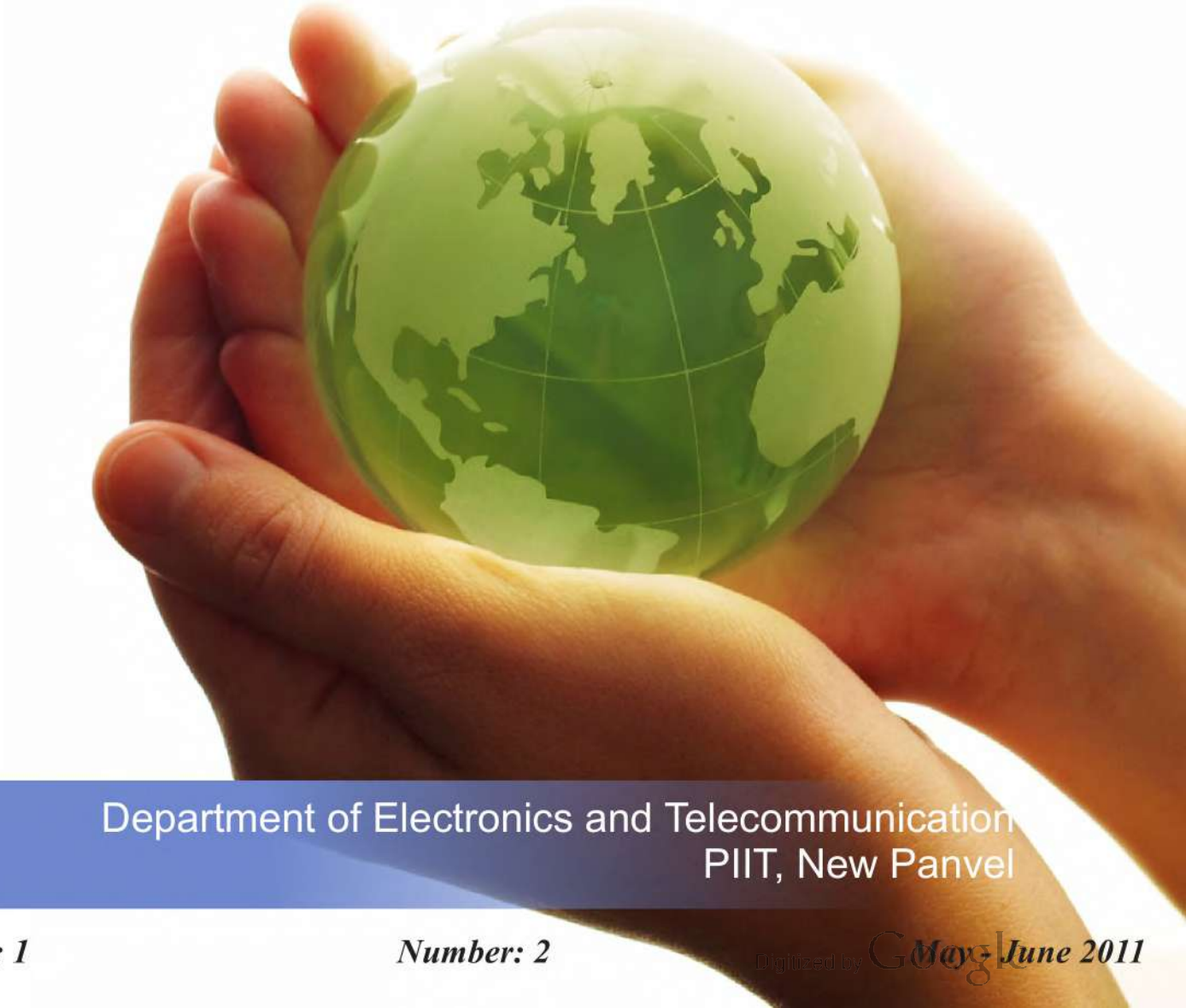
PIIT JOURNAL OF

Electronics and Telecommunication



Department of Electronics and Telecommunication
PIIT, New Panvel

Volume: 1 *Number: 2* *May - June 2011*

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- Mahatma Education Society's HOC International School, Rasayani
- Dr. Pillai Global Academy, Gorai
- Dr. Pillai Global Academy, New Panvel, Sector- 7
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N.G.O. FOR NON-PROFIT WORK

- Erudite Education Mission

Community Talk

We are excited to present the second edition of Intelligent Links. The first edition was a huge success. We received a lot of positive feedback. We decided that this edition will be a themed edition. Today, the world is facing one of its greatest crisis: global warming. So, we decided to dedicate this edition to environmental issues. However, instead of focusing only on the problems, we present ways to solve them. There have been many articles, magazines, websites etc dedicated to environment issues. Instead of just joining them as yet another magazine on environment issues that only preach but do not practice, we decided to go one step ahead and actually do our bit for the environment. A tree plantation drive was organized in which enthusiastic students planted about 25 trees in Palaspe village near Panvel. We hope all of you are inspired by this and will do your bit for the environment in the future.

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Sept – Oct 2010

1st Edition

iNTELLiGENT LiNKS

Department of Electronics and Telecommunication
Pillai's Institute of Information & Technology, Engineering
Media Studies & Research, New Panvel

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Exploring Space

Hubble Space Telescope

The Hubble space telescope (HST) is often called mankind's eyes in space. It is a space telescope launched in 1990 by NASA (National Aeronautical and Space Administration). It is the most famous instrument to be ever launched into space. Named after astronomer Edwin Hubble, it is one of the NASA's four "great observers", the others being Compton Gamma Ray Observatory, the Chandra X-ray Observatory, and the Spitzer Space Telescope. HST has been instrumental in many big astronomical discoveries. It has provided pictures of the universe with unbelievable clarity.

So, why is a space telescope necessary? Normally, ground based telescopes are used as they are much easier to set up and maintain than a space telescope. However, ground based telescopes can't capture images of the distant universe due to the Earth's atmosphere. The Earth's atmosphere acts as a kind of lens and distorts the light entering through it. This phenomenon is evident by the twinkling of stars. Space telescopes overcome this disadvantage as there is no atmosphere in space – only vacuum.

HST was funded in 1970s and after many delays, was launched on April 24, 1990 by the space shuttle Discovery. Due to these delays, mainly caused by the Challenger shuttle disaster, the cost of the telescope rose from $400 million to $2.5 billion! Soon after launch, a fault was detected in the main mirror: the main mirror was not aligned correctly resulting in image distortion. To correct this, a servicing mission was launched which placed another instrument for correcting the fault like a spectacle correcting the faulty eye lens.

At launch, HST carried 5 instruments. The wide field and planetary camera, a high-resolution imaging device primarily intended for optical observations. Goddard High Resolution Spectrograph, designed to operate with ultraviolet rays. Faint Object Camera and the Faint Object Spectrograph both optimized for UV rays. The High Speed Photometer was designed to measure the brightness and polarity of rapidly varying celestial objects. Also, there were a total of 5 servcing missions to maintain the telescopes and adding new instruments such as Space Telescope Imaging Spectrograph (STIS) and the Near Infrared Camera and Multi-Object Spectrometer.

HST is famous for its photograph of Carina Nebula. This photo was released on Hubble's 20th anniversary. Hubble has helped to resolve many long standing problems in astronomy. It helped the astronomers fix the age of the universe and also give hints to the future of the universe. The high-resolution spectra and images provided by the HST have been especially well-suited to establishing the prevalence of black holes in the nuclei of nearby galaxies. IT also famously imaged the collision of comet Shoemaker-Levy 9 with Jupiter.

HST was originally scheduled to go out of service in 2010. A mission was planned to extend its life, but it was aborted due to the risks involved. However, following a public outcry and pressure from astronomers, NASA decided to go ahead with the final servicing mission. It was launched in May, 2009 and completed all the long planned replacements as well as additional repairs, including replacing the main data-handling unit. There are many proposed successors to HST, like the James Webb Space Telescope and Advanced Technology Large-Aperture Space Telescope. But none of them will match Hubble in the excellent resolution over a wide field of view, and the very dark background of space.

FACTS:

The farthest objects Hubble has seen are galaxies well over 12 billion light years away. This distant observation has been named the Hubble Ultra Deep Field, or HUDF.

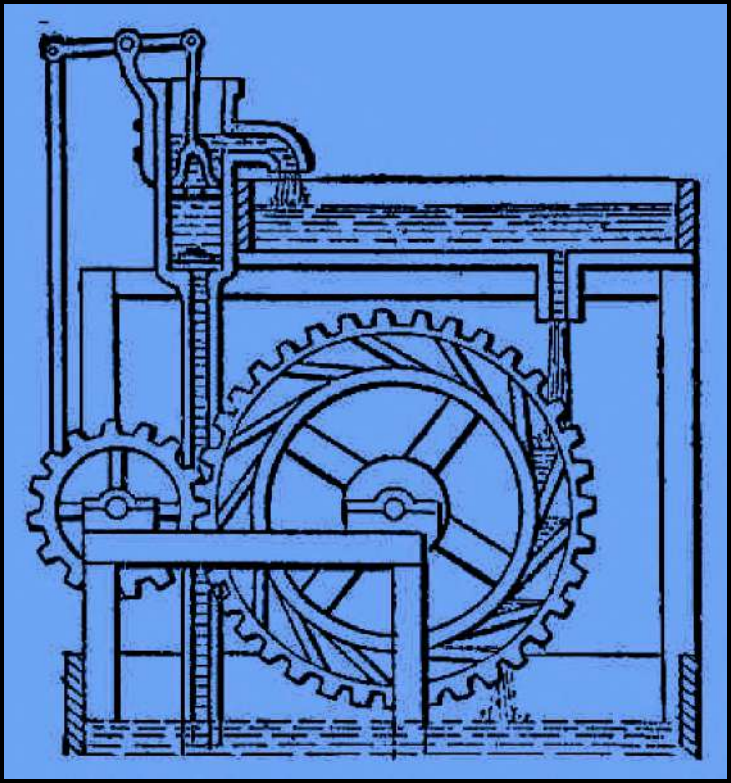
Hubble is 13.2 meters (43.5 ft.) long and its maximum diameter is 4.2 meters (14 ft.) It is about the size of a large tractor-trailer truck.

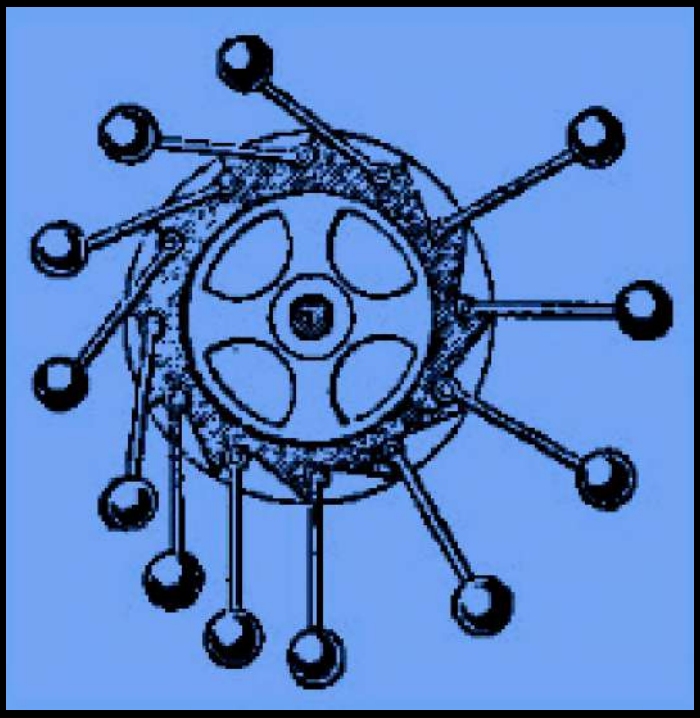
Provided that Hubble passes closely enough overhead, it is relatively dark, and the skies are clear enough, Hubble can be seen with the naked eye.

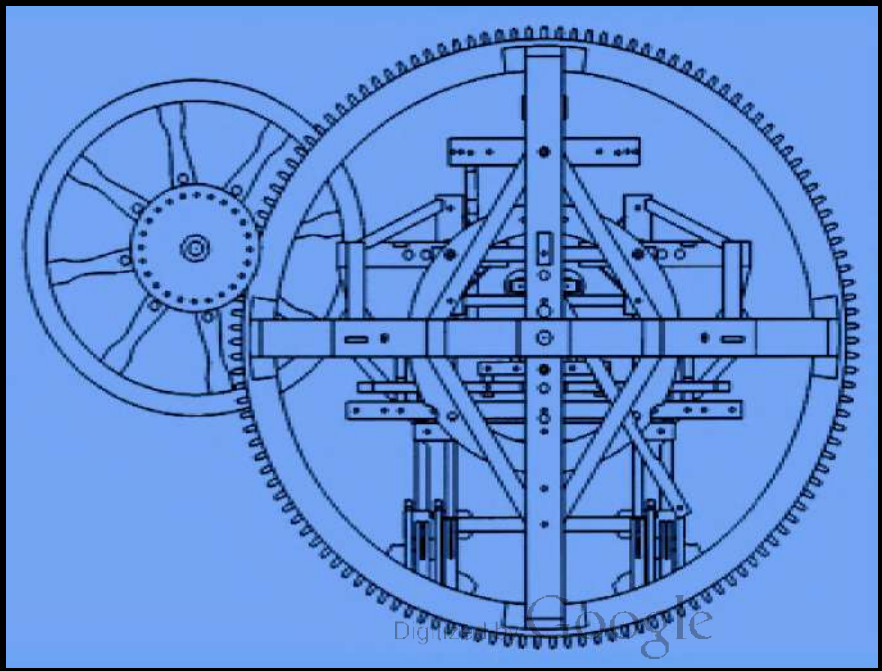
Hubble's speed is approximately 8 km per second (5 miles per second).

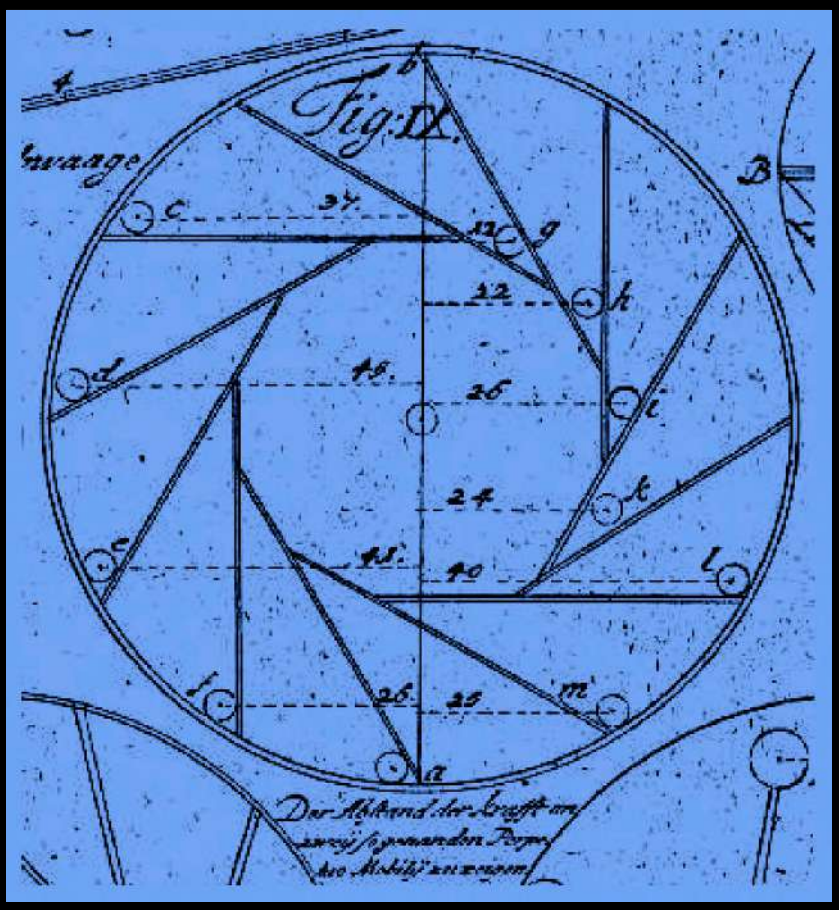
By Balajiganapathi S (TE)

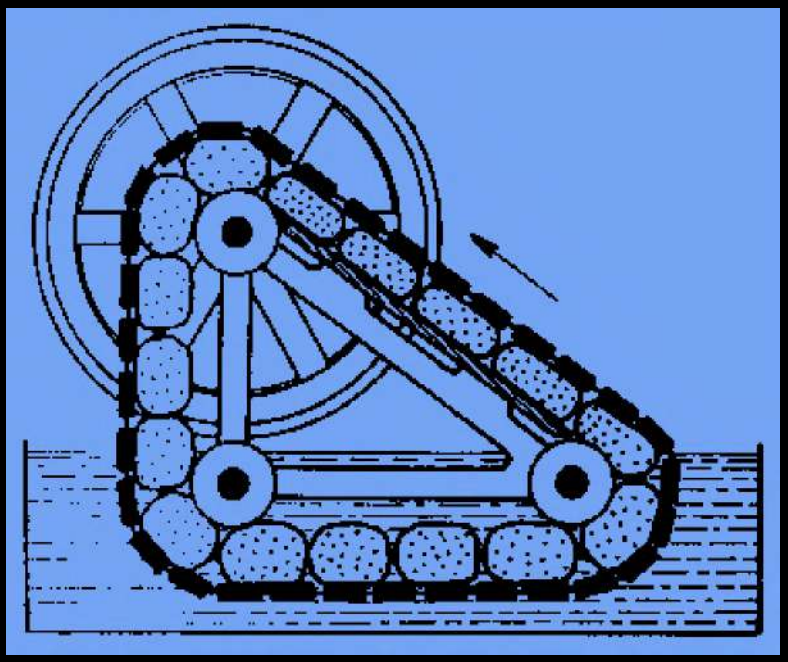
Manatees (marine mammals) possess vocal chords which give them the ability to speak like humans, but don't do so because they have no ears with which to hear the sound.











The rate of warming is increasing. The 20th century's last two decades were the hottest in 400 years and possibly the warmest for several millennia, according to a number of climate studies. And the United Nations' Intergovernmental Panel on Climate Change (IPCC) reports that 11 of the past 12 years are among the dozen warmest since 1850.

Not all who perish in the pursuit of their dreams become legends. Some, whose dreams are shared by the whole of humanity or a large section of it do. Among them, are pioneers and explorers who transcend the horizon-less infinity of space. To their ranks belonged Kalpana Chawla.

Born on July 1, 1961 in Karnal, Punjab, Kalpana graduated from Tagore school in 1976 and went on to complete her BE in Aeronautical Engineering from Punjab Engineering College in 1982. She acquired her MS and PhD in United States and later joined National Aeronautics and Space Administration (NASA) in 1988 and eventually made two trips to outer space from the second of which she never returned.

Though Kalpana is no more, she continues to live in the minds and hearts of her admirers throughout the world. Wanting to be an astronaut would have been an impossible task for an average girl from Punjab, but Kalpana was not the one to give up. She believed "Success is a journey not a destination" and worked pertinaciously towards greater heights.

Ambition without knowledge is like boat on a dry land. Kalpana not only set a goal for herself but strove to make her dream a reality. She was a woman who through sheer grit, determination and hard work reached the top of the world. She was not spared from tasting the bitterness of failure but she took life as it came packed with positives and negatives. The best way out of difficulty is through it and Kalpana cruised through difficult times with admirable ease.

Kaplana's fatal flight aboard Columbia began on January 16, 2003. The 16-day flight was a research mission which comprised 80 experiments. On February 1, 2003 as Columbia was on its way back to earth, it exploded over Texas, USA. The irony is that the tragedy occurred 16 minutes prior to the scheduled landing time, killing all 7 astronauts including Kalpana.

The only difference between successful people and not so successful ones is that the former do not settle for anything less than the best while the later give up at some point. If Kalpana had merely set back to do what an average middle class Indian girl does, she would never have understood what her dream was. Look for the real you and follow that voice alone.

Kalpana today is inspiring all of us to look within and find the light.

- By Akanksha Patil (TE)

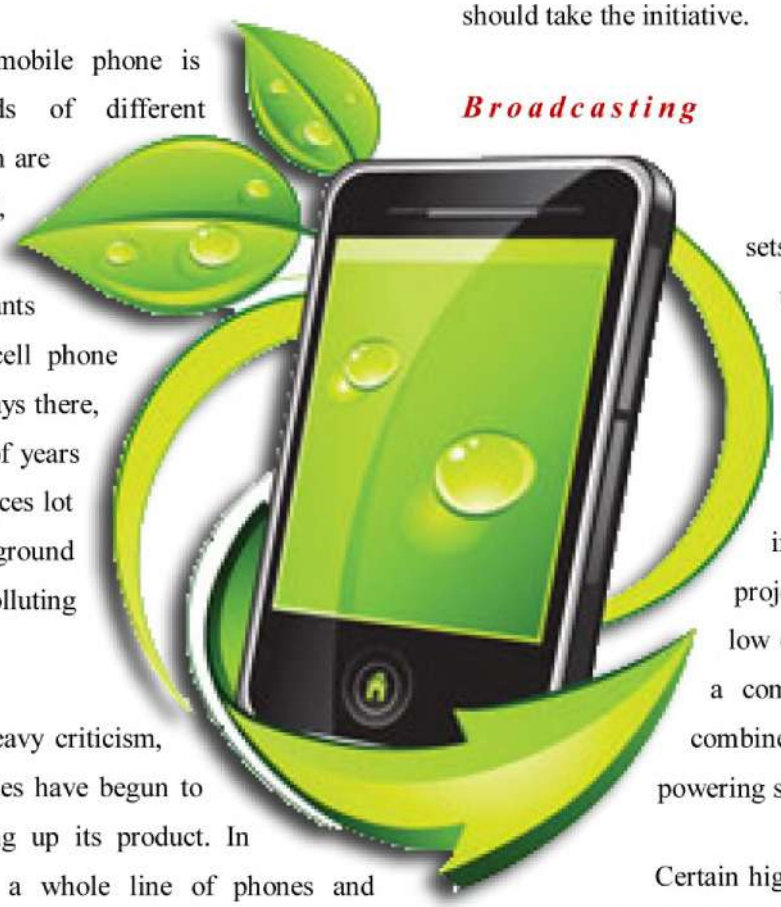
Coral reefs, which are highly sensitive to small changes in water temperature, suffered the worst bleaching—or die-off in response to stress—ever recorded in 1998, with some areas seeing bleach rates of 70 percent. Experts expect these sorts of events to increase in frequency and intensity in the next 50 years as sea temperatures rise.

Green Mobile

The world will have 5.3 billion mobile phone subscribers by the end of this year, as predicted by the International Telecommunication union in its new report. The report said that mobile phone networks are already available to over 90% of the world's population. Well, that makes it even more necessary to study how green mobile phones are. There are various aspects of mobile phone manufacturing and usage which needs to be checked when it is passed through the green test.

Production

To start with, mobile phone is made up of hundreds of different substances, some of which are toxic including PVC, phthalates, zinc, lead, brominated flame retardants and arsenic. When the cell phone ends up in a landfill, it stays there, sometimes for hundreds of years giving those toxic substances lot of time to leach into the ground water supply and thus polluting the environment.



In response to heavy criticism, the mobile phone industries have begun to focus heavily on greening up its product. In 2006, Nokia introduced a whole line of phones and accessories without PVC, and in 2008, the company marketed the first phone with no toxic flame retardant. LG removed the harmful beryllium from its phones and is researching both environmentally friendlier paints and biodegradable plastics for its products. Sony Ericsson has stated that it plans to reduce the carbon footprint of its entire body of products by 15 percent by 2015.

Another important area, were mobile companies should take their attention is, eco-friendly packing of mobile phones. The device & accessories are packed inside a carton box which is made of paper. Because millions of mobile phones are manufactured every year and paper is used as the main material for packing them which is made of wood. This affects the ecological system.

Some of the solutions are using recycled paper in making the packaging box, making the size of carton small compared to previous ones and small high density CD whose capacity is high can be given instead of manuals. It's not an easy way out but with the support of the public, the private companies should take the initiative.

Broadcasting

The base station requires two sets of generators and in some cases up to three months' supply of costly fuel in their tanks. The energy required for the generators can be produced by renewable energy resources. For implementing renewable energy project to power their base station at low end in terms of capital investment, a combination of solar energy power combined with a diesel battery hybrid powering system can be used.

Certain high speed internet service providers, including Red Jelly Fish, Green ISP, Landline Company and Green Mobile, offer consumers a greener way of accessing the internet. These companies operate in an environment conscious way, using solar power and recycled materials in order to provide high quality, responsible service. Many of these companies will also make a charitable donation or plant a tree every time a new member signs up for their service. While these services are still gaining popularity, they are a great way for consumers to make a difference, as well as help promote a greener lifestyle.

You Can....

1) Use of Smartphone can solve disposal of other gadgets like watches, music players, video player and digital cameras.
2) Dispose your phone by giving it to the recycling center after use (Nokia has its own recycling centers).
3) Try donating your phone or reselling it.
4) Support the producers & broadcasters who have initialized green movement, by buying their products & services.
5) Everyone should make it a point to use their phones on an average of 5 years .

Disposing

Each year, over 65,000 tons of waste is calculated and attributed directly to unwanted cell phones. Landfills pay the biggest price, acquiring about 82% of the 2.25 millions tons of waste from mobile phones. Now, if these phones are not disposed off properly then the chemical components used for the production of the mobile phone along with the battery, which is a nickel cadmium battery, is very toxic and will pollute the land. The professional disposal of the mobile phone can be done through recycling. Though the mobile phone itself may no longer be good, much of the metal from the inside is still reusable. For instance, copper from a discarded mobile phone can be recycled.

Recycling procedure

Consider your old mobile phone being tossed into the rubbish and ending up in a landfill site somewhere. Over time, the components in your phone will begin to allow dangerous and harmful chemicals to seep and pollute the air and soil of the surrounding area, making it dangerous for future generations. So, now we know why we should recycle and what benefit this will have but what about the phone itself? Before you recycle or sell your old mobile, you should make sure that all data and pictures etc has been deleted and removed from our old phone.

After this, when your handset reaches a mobile phone recycling centre, the first step that the recyclers (such as Envirofone and Mazuma Mobile) do is to disassemble the basic components of the phone. This usually comprises the following parts: plastic, metals, casing (or housing) and memory. After this first stage the next step is to sort handsets, circuit boards, chargers,accessories and batteries into sorting bins for each of the components. As this is a recycling centre, even the boxes or packaging in which you send the phone will also be recycled! The Nickel in the phone batteries are then processed and can be recycled into stainless steel with applications for home and industrial use.

Recyclers can even extract the Cadmium and then make new batteries from the old ones. The Batteries also contain copper, which can also be recycled. The circuit boards contain many precious metals such as silver,gold and lead and can be used in many different ways whilst preventing future mining operations for acquiring these metals from the earth and destroying habitat and wildlife in the process. The phone casings will also be recycled and used in a variety of ways such as plastic fencing around the home.

Green Applications

YPrintit is a green technology firm. Their latest development is a new free mobile application and social networking platform designed to eliminate the negatives associated with printed paper business cards while maintaining the positive visual impact and established face to face practice of exchanging cards. As an application and networking platform, YPrintit allows you to create unlimited numbers of virtual business cards and share them with others from phone to phone through the use of QR Codes. Changes you make to your card are reflected in what your contacts see instantly. YPrintit applications are available in the iPhones and Android market.

Well, by following the above basic points we can contribute in making mobile phones go GREENER and SAFER.

Johnson Joy (TE-EXTC)

Glaciers and mountain snows are rapidly melting—for example, Montana's Glacier National Park now has only 27 glaciers, versus 150 in 1910. In the Northern Hemisphere, thaws also come a week earlier in spring and freezes begin a week later.

The Bahrain World Trade Center which also called Bahrain WTC or BWTC. It is a 240 m (787 ft) high twin tower complex located in Manama, Bahrain. The construction of towers was started in 2004 and was completed in 2008. BWTC was designed by the multi-national architectural firm Atkins. It is the first skyscraper in the world to have wind turbines into its design. BWTC is 50-floor structure.

Location:-

It is constructed in close proximity to the King Faisal Highway, near popular landmarks such as the towers of Bahrain Financial Harbour, National Bank of Bahrain, Abraj Al Lulu and the scenic Pearl Roundabout. It currently ranks as the second tallest building in Bahrain, after the twin towers of the Bahrain Financial Harbour.

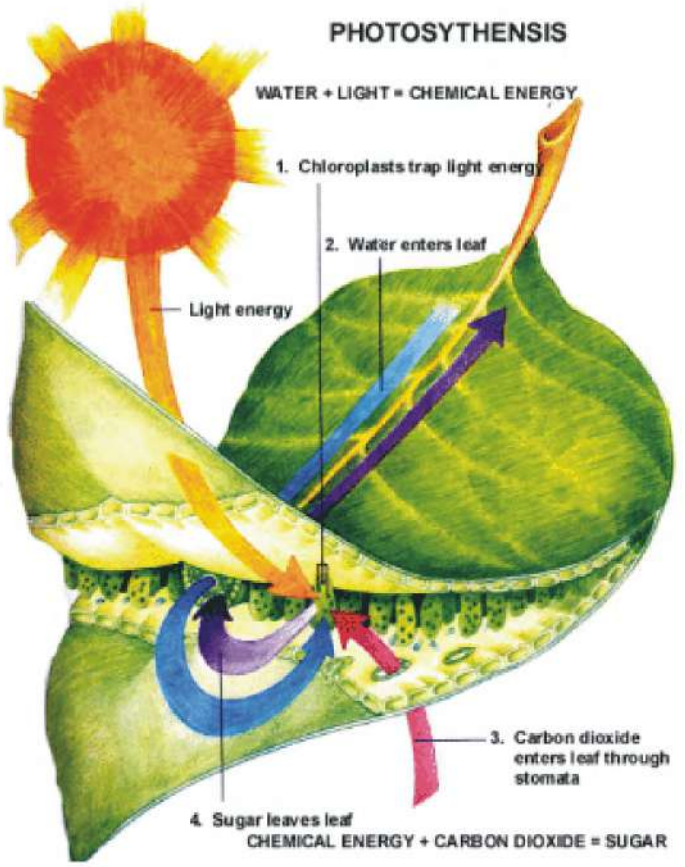
Engineering:-

The two towers are joined via three skybridges. This sky bridge holds a 225KW wind turbine. There are three such wind turbine, totalling to 675kW of wind power production. Each of these turbines measure 29 m (95 ft) in diameter, and is directed in north, which is the direction from which air from the Persian Gulf blows in. The sail-shaped buildings on both side are designed to funnel wind through the gap to provide accelerated wind passing through the turbines. This was confirmed by wind tunnel tests. The wind tunnel test showed that the buildings create an S-shaped flow, ensuring that any wind coming within a 45° angle to either side of the central axis will create a wind stream that remains perpendicular to the turbines. This significantly increases their potential to generate electricity.

The wind turbines provide 11% to 15% of the tower's total power consumption. That is equal to approximately 1.1 to 1.3 GWh a year. This power is equivalent to providing the lighting for about 300 homes throughout a year. The three turbines were brought to service for the first time on the 8th of April, 2008. They are expected to operate half of the time on an average day.

- By Jigar Shah (TE)

Tamil Nadu is the state with the most wind generating capacity: 4906.74 MW at the end of the March 2010. Not far from Aralvaimozhi, the Muppandal wind farm, the largest in the subcontinent, is located near the once impoverished village of Muppandal, supplying the villagers with electricity for work. The village had been selected as the showcase for India's $2 billion clean energy program which provides foreign companies with tax breaks for establishing fields of wind turbines in the area.



Climate issues are creating a growing demand for sustainable energy systems, and the goal is to have a system relying on renewable energy sources that are sustainable and environmentally friendly. Guaranteed supply is another important demand.

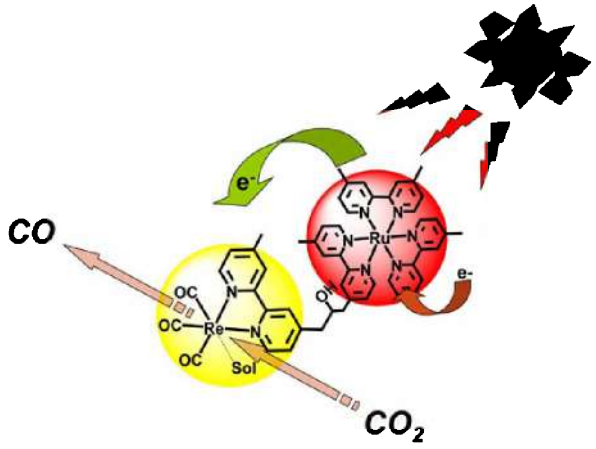
A vast amount of energy reaches the Earth's surface every year, even as far north in Scandinavia. The total energy received by the Earth as sunlight is approximately 340,000 Exajoules (i.e. 10^18 joules) per year. In comparison, annual energy consumption is about 400 Exajoules. The question is how this solar energy can be transformed simply and cost-effectively into useful forms of energy such as heat, electricity and fuel. Solar energy is unfortunately at a minimum during the winter, when the dark and cold mean our energy needs are greatest. It is, therefore, necessary to store the solar energy in a suitable energy carrier.

Hydrogen gas is an efficient energy carrier. It can be used within the entire energy sector as a fuel, for heating and for electricity generation. One of its advantages is that the use of hydrogen gas does not lead to the emission of any carbon dioxide. If hydrogen gas could be produced cost-efficiently in a sustainable manner, the world's energy needs could be met for a long time to come. But the current methods for producing hydrogen are based on fossil fuels. An energy-efficient and emission-free way of producing hydrogen would make it one of several interesting energy carriers for a sustainable energy system.

We burn a lot of known environmentally friendly fuels like coal, oil and other fossil fuels. All these energy resources affect our nature and the environment. The twin problems of global warming, caused by an increase in atmospheric carbon dioxide (CO_2) concentrations, and limited fossil fuel resources have stimulated research in the utilization of CO_2.

The maintenance of life on earth, our food, oxygen, and fossil fuels depends upon the conversion of solar energy into chemical energy by biological photosynthesis carried out by green plants and photosynthetic bacteria. In this process, sunlight and available abundant raw materials (water, carbon dioxide) are converted to oxygen and reduced organic species, which serve as food and fuel.

Artificial photosynthesis is a research field that attempts to replicate the natural process of photosynthesis, converting sunlight, water, and carbon dioxide into carbohydrates and oxygen. Sometimes, splitting of water into hydrogen and oxygen by using solar energy is also referred to as artificial photosynthesis. The actual process that allows half of the overall photosynthetic reaction to take place is photo-oxidation. This half-reaction is essential in separating water molecules because it releases hydrogen and oxygen ions. These ions are needed to reduce carbon dioxide into a fuel. However, the only known way this is possible is through an external catalyst, one that can react quickly as well as constantly absorb the sun's photons.



ARTIFICIAL PHOTOSYNTHESIS

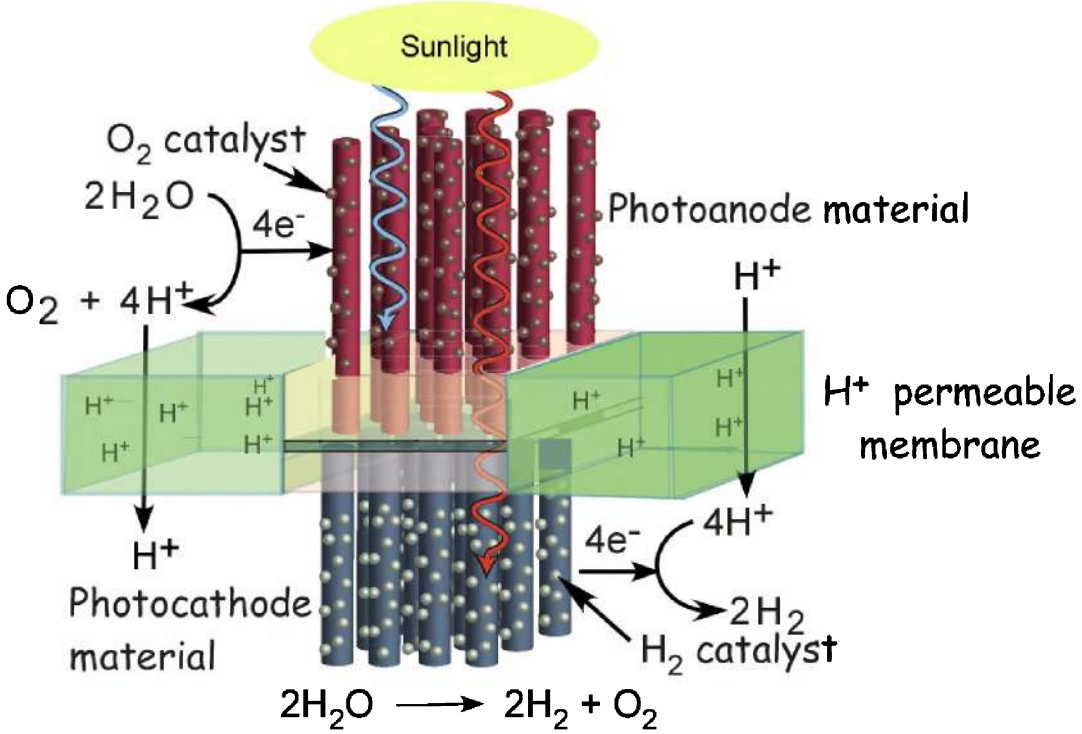
Because of scientific and business interest in artificial photosynthesis and the desire for potential new products that could stem from it, the research field split into two sides. This produced two different results: photoelectrochemical cells and dye-sensitized solar cells. Each cell operates on different principles but tries to obtain the same result: artificial photosynthetic energy that can be harnessed and stored for later use, which would reduce the world's dependency on nonrenewable energy resources.

Photoelectrochemical cells, also referred to as PECs, use the electric current of water to create hydrogen and oxygen in a process called electrolysis. Electricity can then be stored in the hydrogen, which is an "energy carrier," and the energy can be used later, such as in batteries. There are two types of PECs, one that uses semiconductor surfaces to absorb the solar energy and help split water molecules for energy use. The other variety uses dissolved metals to draw in solar energy and start the process of artificial photosynthesis. The most common metal catalysts for this type of reaction are cobalt and rhodium.

The other type of cell being researched, the dye-sensitized solar cell, is sometimes called a Gratzel cell or Graetzel cell. Like PECs, dye-sensitized artificial photosynthesis cells use a semiconductor to collect energy, usually silicon. In dye-sensitized cells, the semiconductor is used to transport the collected energy, and the photoelectrons, or energy particles, are separated and harnessed using special dyes. Gratzel cells are considered to be the most effective form of artificial photosynthesis currently available, as well as the most cost-efficient to manufacture. The disadvantages are mainly due to temperature concerns related to the liquid dyes, because these can freeze at lower temperatures and cease energy production, and expand at higher temperatures and break.

The worlds need for energy is increasing but fossil fuels are not a solution, renewable energy in some form is needed. Artificial photosynthesis and hydrogen can be the solution if the technique is developed. The world has a huge quantity of water and receives huge amount of radiation from the sun, which today is mostly unused. Our ambition is to replace environmentally damaging forms of energy with clean, renewable and readily available energy sources. Artificial photosynthesis for fuel production from sunlight and water has the potential to meet this ambition. There is still a long way to go and major efforts from creative scientists are needed before the goal can be reached.

- Alvin A Thomas (BE)



A compact fluorescent lamp, also known as a cfl or energy saving light, is a type of fluorescent lamp. Many CFLs are designed to replace an incandescent lamp and can fit into most existing light fixtures formerly used for incandescents.
Compared to general service incandescent lamps giving the same amount of visible light, CFLs use less power and have a longer rated life.

Gee's golden langur, or simply the golden langur, is an Old World monkey found in a small region of western Assam, India and in the neighboring foothills of the Black Mountains of Bhutan. It is one of the most endangered primate species of India. Long considered sacred by many Himalayan peoples, the Golden Langur was first brought to the attention of science by the naturalist E. P. Gee in the 1950s.

10 Surprising Ways you're Killing the Earth without Even Knowing It

Regardless of whether or not one believes in concepts such as Global Warming or carbon offsetting, the environment still needs protection for the sake of keeping its inhabitants as safe and healthy as possible. Taking precautions to preserve everyone's right to a nurturing planet ought to be an entirely nonpartisan issue, unencumbered by arguments and petty bickering. Understandin g and evaluating the implications of these 10 surprisingly hazardous everyday actions can minimize negative environmental impad – no matter an individual's political leanings.

Ignoring home inspections

1 A simple check for leaks around doors and windows, rooftops, pipes, and electrical outlets can waste between 5% and 30% of a home's energy Every year, which impacts both costs and the amount of available resources as. Anyone at all concerned about keeping the environment as clean and healthy as possible ought to set aside time for a regular home inspection – even if the planet is not a concern, at least consider doing so for the amount of money it saves residents every year.

Using disposable utensils

2 Disposable utensils, plastic sandwich bags, paper plates, and paper bags are all convenient methods of eating without having to clean or haul anything around once the meal or party is over. Though paper bags are far more biodegradable, some leech harmful chemicals from the treatment process back into the soil and damage the resident worms, bacteria, and other subterranean forms of life.

Using biofuels

3 While a cost-efficient, environmentally-friendly solution will one day present itself to the world, some of the fuels derived from rapeseed and corn, ended up actively causing more damage than their nonrenewable counterparts. A 2007 article in The Times (London) revealed that these biodiesels emitted between 50% (corn) and 70% (rapeseed) more greenhouses gases than oil and natural gas.

Lighting with incandescent bulbs

4 The Energy Star program pushes consumers towards buying fluorescent light bulbs over the traditional incandescent. Energy efficient and economical CFLs (compact fluorescent light bulb) come with an impressively wide variety of styles and shapes to choose from, and in general they save buyers $30 per bulb and lower their energy bills by using 75% fewer resources. They also last up to 10 times longer than incandescent bulbs as well.

Not buying in bulk

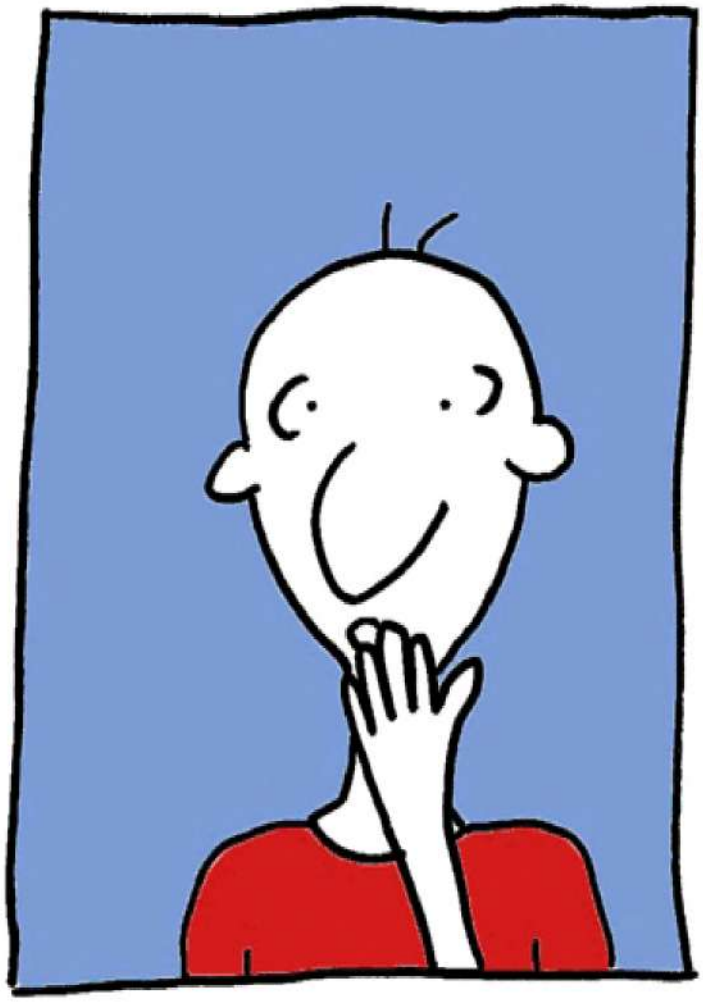
5 Families ought to consider buying in bulk for their essentials such as toilet paper, paper towels, toothpaste, deodorant, shampoo, and other household things. One must think twice about purchasing too many perishables that may expire before use, making this style of shopping inconvenient for fresh fruits, baked goods, meat, and other goods. When buying in bulk, one also needs to resist the temptation to buy a product that will actually get used rather than placing an item in the cart simply because it is affordable. Doing so may create waste, which entirely defeats one of the purposes of bulk shopping to begin with.

Eating farm-raised fish

6 Though more expensive, seafood fans who purchase wild-caught fish rather than those raised on farms are also making the more environmentally conscious choice and making an investment in their overall health.

Not buying local

Obviously, one cannot expect to find everything they need from locally-owned ventures – especially in much smaller communities or those with limited resources, but doing so whenever feasible cuts down on shipping that releases toxins into the atmosphere.



Have you made this mistake?

Washing clothes in hot water

8 No matter the temperature they are exposed to, clothes run through a washing machine's cycle come out clean. The Department of Energy states that 90% of the power needed to keep a unit going is actually put towards heating the water.

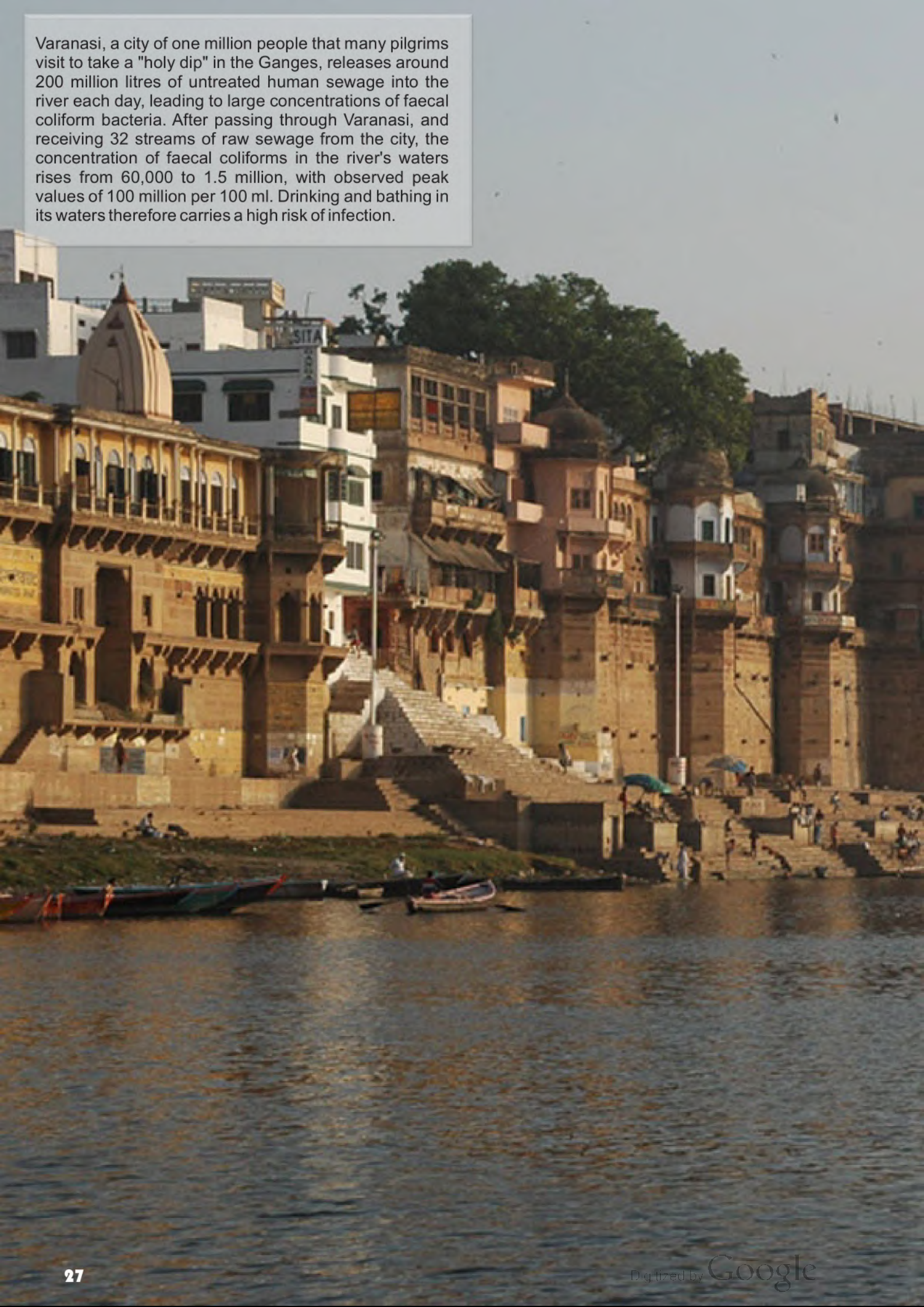
Putting electronics on standby

9 According to research conducted by the California Energy Commission in 2008, between 15% and 19% of a home's energy consumption is taken up by electronics – with 60% involving entertainment-related machines and 31% towards information technology. 22% of the total energy expenditures are taken up by standby and low-power modes switched on when the technology in question is no longer in use.

Washing the car

10 Washing a car at home may seem like a more convenient measure than taking it to a special business, but it also stands as the more environmentally unfriendly option as well. Home car washes use up (and subsequently waste) far more water and other resources than the drive-through services– who generally clean and reuse their runoff for economic and environmental reasons alike.

Compiled by Pratham Kar (FE DIV-C)



Varanasi, a city of one million people that many pilgrims visit to take a "holy dip" in the Ganges, releases around 200 million litres of untreated human sewage into the river each day, leading to large concentrations of faecal coliform bacteria. After passing through Varanasi, and receiving 32 streams of raw sewage from the city, the concentration of faecal coliforms in the river's waters rises from 60,000 to 1.5 million, with observed peak values of 100 million per 100 ml. Drinking and bathing in its waters therefore carries a high risk of infection.

Louis Pasteur

December 27, 1822 – September 28, 1895

Louis Pasteur (December 27, 1822 – September 28, 1895) was a French chemist and microbiologist born in Dole. He grew up in the town of Arbois. He Specialized in Mathematical science before entering the École Normale Supérieure, an elite college. He was a professor of physics at Dijon Lycée in 1848. After this, he became professor of chemistry at the University of Strasbourg. He and his wife had five children, only two of whom survived to adulthood; the other three died of typhoid. These personal tragedies inspired Pasteur to try to find cures for diseases such as typhoid.

He is best known to the general public for inventing a method to stop milk and wine from causing sickness, a process that came to be called pasteurization. Pasteur's work on diseases included work on chicken cholera. In the 1870s, he applied this immunization method to anthrax, which affected cattle, and aroused interest in combating other diseases. Pasteur undertook many risks in order to achieve his goals. In The Story of San Michele, Axel Munthe writes of the rabies vaccine research: "Pasteur himself was absolutely fearless. Anxious to secure a sample of saliva straight from the jaws of a rabid dog, I once saw him with the glass tube held between his lips draw a few drops of the deadly saliva from the mouth of a rabid bull-dog". Because of his study in germs, Pasteur encouraged doctors to sanitize their hands and equipment before surgery.

Thus Pasteur founded the science of microbiology and proved that most infectious diseases are caused by micro organisms. This became known as the "germ theory" of disease. The discovery of the vaccine for rabies led to the founding of the Pasteur institute in Paris in 1888.

His death occurred in 1895, near Paris, from complications of a series of strokes that had started in 1868. He died while listening to the story of St Vincent de Paul, whom he admired and sought to emulate. He was buried in the Cathedral of Notre Dame, but his remains were reinterred in a crypt in the Institute Pasteur, Paris, where he is remembered for his life-saving work.

Dipti Krishnan,
TE ExTc

About 400 billion gallons water is used worldwide each day.

Earth travels through space at 66,700 miles per hour.

From a distance, Earth would be the brightest of the 9 planets. This is because sunlight is reflected by the planet's water.

The moon is one million times drier than the Gobi Desert.

The Persian Gulf is the warmest sea. In the summer its temperature reaches 35.6 degrees centigrade.

Louisiana loses about 30 square miles (78 square kilometers) of land each year to coastal erosion, hurricanes, other natural and human causes and a thing called subsidence, which means sinking.

Sunlight can penetrate clean ocean water to a depth of 240 feet.

Only 3% water of the earth is fresh, rest 97% salted. Of that 3%, over 2% is frozen in ice sheets and glaciers.

The total surface area of the Earth is 197 million square miles.

The world's deadliest recorded earthquake occurred in 1557 in central China, more than 830,000 people were killed.

About 540 volcanoes on land are known. No one knows how many undersea volcanoes have erupted through history.

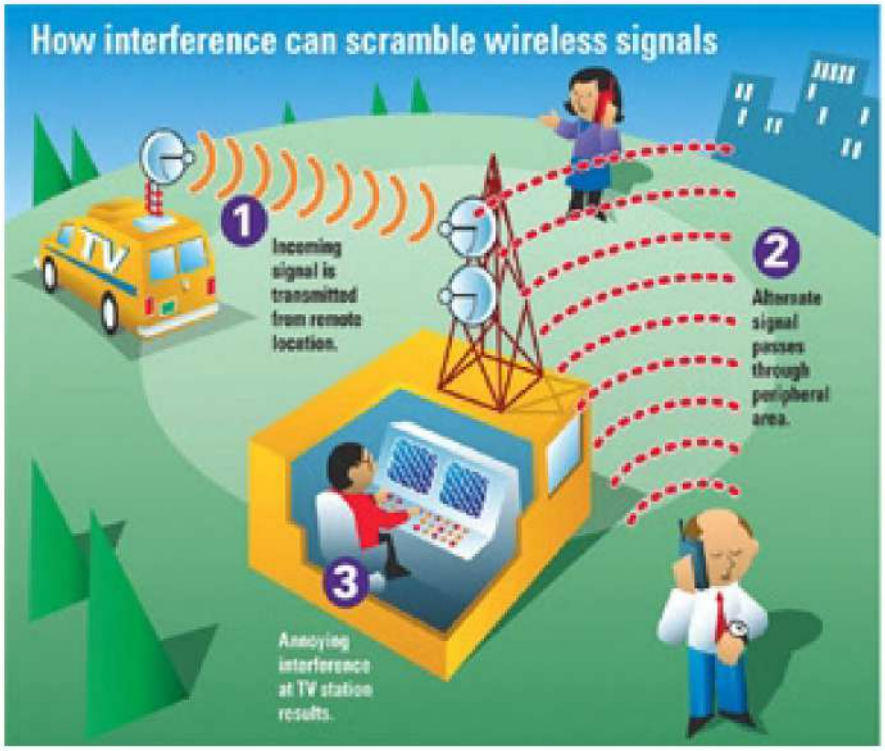
The deepest depth in the ocean is 36,198 feet (6.9 miles or 11 kilometers) at the Mariana Trench, in the Pacific Ocean well south of Japan near the Mariana Islands.

In 1934, a gust of wind reached 371 km/h on Mount Washington in New Hampshire, USA.

Earth's atmosphere is actually about 80 percent nitrogen. Most of the rest is oxygen, with tiny amounts of other stuff thrown in.

Asia Continent is covered by 30% of the total earth land area, but represent 60% of the world's population.

Earth is tipped at 23 and 1/2 degrees in orbit. That axis is what causes our seasons.



Cognitive radio is a paradigm for wireless communication in which either a network or a wireless node changes its transmission or reception parameters to communicate efficiently avoiding interference with licensed or unlicensed users. This alteration of parameters is based on the active monitoring of several factors in the external and internal radio environment, such as radio frequency spectrum, user behavior and network state.

It was thought of as an ideal goal towards which a software-defined radio platform should evolve: a fully reconfigurable wireless black-box that automatically changes its communication variables in response to network and user demands.

Regulatory bodies in various countries (including the Federal Communications Commission in the United States, and Ofcom in the United Kingdom) found that most of the radio frequency spectrum was inefficiently utilized. For example, cellular network bands are overloaded in most parts of the world, but amateur radio and paging frequencies are not. Moreover, fixed spectrum allocation prevents rarely used frequencies (those assigned to specific services) from being used by unlicensed users, even when their transmissions would not interfere at all with the assigned service. This was the reason for allowing unlicensed users to utilize licensed bands whenever it would not cause any interference (by avoiding them whenever legitimate user presence is sensed).

The first phone call over a cognitive radio network was made on Monday 11 January 2010 in Centre for Wireless Communications at University of Oulu using CWC's cognitive radio network CRAMNET (Cognitive Radio Assisted Mobile Ad Hoc Network) that has been developed solely by CWC researchers.

Depending on the set of parameters taken into account in deciding on transmission and reception changes, and for historical reasons, we can distinguish certain types of cognitive radio. The main two are:

- **Full Cognitive Radio ("**Mitola radio**"):** Here, every possible parameter observable by a wireless node or network is taken into account.
- **Spectrum Sensing Cognitive Radio:** Here, only the radio frequency spectrum is considered.

Also, depending on the parts of the spectrum available for cognitive radio, we can distinguish:

- **Licensed Band Cognitive Radio**: Here, cognitive radio is capable of using bands assigned to licensed users, apart from unlicensed bands, such as U-NII band or ISM band. The IEEE 802.22 working group is developing a standard for wireless regional area network (WRAN) which will operate in unused television channels.
- **Unlicensed Band Cognitive Radio**: Here only unlicensed parts of radio frequency spectrum is utilized.

Although cognitive radio was initially thought of as a software-defined radio extension (Full Cognitive Radio), most of the research work is currently focusing on Spectrum Sensing Cognitive Radio, particularly in the TV bands. The essential problem of Spectrum Sensing Cognitive Radio is in designing high quality spectrum sensing devices and algorithms for exchanging spectrum sensing data between nodes. A simple energy detector cannot guarantee the accurate detection of signal presence, calling for more sophisticated spectrum sensing techniques and requiring information about spectrum sensing to be exchanged between nodes regularly. Increasing the number of cooperating sensing nodes decreases the probability of false detection.

Filling free radio frequency bands adaptively using *Orthogonal Frequency-Division Multiple Access (OFDMA)* is a possible approach. Applications of Spectrum Sensing Cognitive Radio include emergency networks and WLAN higher throughput and transmission distance extensions.

The main functions of Cognitive Radios are:

Spectrum Sensing: Detecting the unused spectrum and sharing it without harmful interference with other users. It is an important requirement of the Cognitive Radio network to sense spectrum holes. Detecting primary users is the most efficient way to detect spectrum holes. Spectrum sensing techniques can be classified into three categories:

- ***Transmitter detection***: Cognitive radios must have the capability to determine if a signal from a primary transmitter is locally present in a certain spectrum. There are several approaches proposed:

  matched filter

  § detection

  § energy detection

  cyclostationary

  § feature detection

- ***Cooperative detection***: Refers to spectrum sensing methods where information from multiple Cognitive radio users is incorporated for primary user detection.
- ***Interference based detection.***

· **Spectrum Management**: Capturing the best available spectrum to meet user communication requirements. Cognitive radios should decide on the best spectrum band to meet the quality of service requirements over all available spectrum bands, therefore spectrum management functions are required for Cognitive radios. These management functions can be classified as:

- ***spectrum analysis***
- ***spectrum decision***

· **Spectrum Mobility**: It is defined as the process when a cognitive radio user exchanges its frequency of operation. Cognitive radio networks target to use the spectrum in a dynamic manner by allowing the radio terminals to operate in the best available frequency band, maintaining seamless communication requirements during the transition to better spectrum.

· **Spectrum Sharing:** It is providing the fair spectrum scheduling method. One of the major challenges in open spectrum usage is the spectrum sharing. It can be regarded to be similar to generic media access control MAC problems in existing systems.

Cognitive network

The Knowledge Plane is "a pervasive system within the network that builds and maintains high level models of what the network is supposed to do, in order to provide services and advice to other elements of the network".

The CN as a network with a cognitive process that can perceive current network conditions, plan, decide, act on those conditions, learn from the consequences of its actions, all while following end-to-end goals. This loop, the cognition loop, senses the environment, plans actions according to input from sensors and network policies, decides which scenario fits best its end-to-end purpose using a reasoning engine, and finally acts on the chosen scenario. The system learns from the past (situations, plans, decisions, actions) and uses this knowledge to improve the decisions in the future.

The knowledge plane needs at least two elements:

- A representation of relevant knowledge about the scope (device, homogeneous network, heterogeneous network, etc.).
- A cognition loop which uses Artificial Intelligence techniques inside its states (learning techniques, decision making techniques, etc.).

Cognitive networks can dynamically adapt their operational parameters in response to user needs or changing environmental conditions. They can learn from these adaptations and exploit knowledge to make future decisions.

Cognitive networks are the future, and they are needed simply because they enable users to focus on things other than configuring and managing networks. Cognitive network design can be applied to any type of network, being fixed or wireless. Cognitive networks promise better protection against security attacks and network intruders and such networks will benefit the service operator as well as the consumer.

FUTURE ASPECTS:

- Intelligent systems.
- Higher computational capability.
- More flexibility.
- Harvesting more and more radio spectrum (reusing them temporally and spatially).
- Digital dividend.
- More standards to come.

OPEN ISSUES:

- Regulatory
- Test Procedures
- Protocols
- Interoperability
- Coexistence and cooperation
- Medium Access Control
- Security

- by Shweta Shettigar (TE)

Bio fuel

In India, biofuel is extracted using Jatropha seeds which have a high percentage of oil (40%) in them. Jatropha is a historical, environment friendly and economical plant. Political parties have even morally supported these plants. Jatropha oil in India is mainly used as a biodiesel fuel which acts as a substitute for diesel in rural areas and forest communities. This oil has the advantage that it can be used directly after being extracted (without refining) in diesel generators and engines. Jatropha provides economical benefits at the local level, since it can grow in dry marginal non-agricultural lands. This allows villagers and farmers to leverage non-farm land for expansion of income. Thus Jatropha oil production gives economic benefits to India on a national level. Also, it helps in reducing the nation's fossil fuel import budget for diesel production. It helps in betterment of India's capital expenditure for production and industrial inputs. Since Jatropha oil is carbon-less or carbon neutral, large-scale production will reduce the country's carbon footprint. Negative impact on production of grain and other vital agricultural goods about Jatropha plant is unheard till today.

If one wants to start a biodiesel plant then one should have his/her own Jatropha plantation. Since there is an oil crisis all over the world, Jatropha plantation is a unique source of oil. From 200 hectares of plantation one can yield 1000 liters of oil per day. Since India is a densely populated country, 200 hectares of land mass is not easily available for plantation. Farmers have to sell their seeds to a nearby biodiesel plant. Currently, in India, Jatropha oil is used as Biokerosene, and for manufacturing of soap. In India there are 5 large plants, with a capacity of 3,00,000 liter per day, 4 medium size plants with the capacity of 30,000 liters per day, and a number of small plants, with a capacity of 1000 to 3000 liters per day. Due to lack of seeds most of the plant are running at low capacity or have been closed. Jatropha seeds are available only once a year. Therefore for operation throughout the year, these seeds have to be stored.

The Indian Biofuel policy was announced on 23rd December 2009. India estimates about 6, 00,000 tons per year of Biodiesel. For many reasons, Biodiesel has not yet been started in India. Indian government polices and non-availability of vegetable oil is the main reason.

Non-availability of oil:

- Country has to import up to 40% of the edible oil for its requirement. Therefore prices of edible oil are higher than that of petroleum diesel. Therefore, they cannot survive successfully and hence use of non-edible oil is suggested for biodiesel manufacture.
- In India consumption of edible oil is very high but its availability is very small.
- Vegetable oil in Indian culture is used for lighting lamps in temple and homes, when prices of these oils hike up, people are tempted to use cheaper non-edible oil.
- Edible oils all over the world are used for manufacturing of biodiesel. These include Rape seeds in Europe, Palm in South East Asia and Soy in Americas. After the extraction of oil from Rape and Soy seeds these are used as food to cattle. As they are in excess they are disposed at lower price.
- These non-edible oil seeds are collected manually, and for large Biodiesel plant it is quiet impossible, because in a day a person can collect up to 80 kg of seeds, which can yield 20 to 23 liters of oil. This collection is challenging and time consuming.
- Jatorpha seeds are costly as most of them are used for plantation purpose; the manufacturing cost of biodiesel is 3 times the petroleum pump price.
- Load shedding in India has rapidly increased the use of lamp oil in all over India specifically in rural area. Soon there will be shortage of these oils for lighting purpose.
- All over India there are billions of other trees (Karanj, Mahua, and Neem) which bear oil seeds. These seeds are not yet used for oil extraction and most of them lie on ground and ultimately used as Biofertilizers.
- Biodiesel is being purchased by many oil companies and they offer a price of Rupee 34.00 per liter of Biodiesel.
- States like Chhattisgarh and Uttar Pradesh grow Jatropha seeds on large scale. These Jatorpha seeds play a crucial part in India's plan to attain energy sustainability.
- The government is trying to implement an ethanol-blenel program and it is even considering initiative in the form of mandates for Biodiesel. If these strategies are implemented, then the rising population and their growing demand for energy from trans-port sector will assure a significant market for Biofuel in India.
- Presently, fuel yielding plants cover less than 5,000 sq kilometers. India meets 20% of India's diesel demand with fuel derived from these plants.

By Ruzuvesh Nair (TE)

You are not just burning off calories...

You'll save one pound of CO_2 for every mile you don't drive.

Tree Plantation Drive 2011

Artificial

The main cause of Global Warming is due to emition of green house gasses (GHG) in atmosphere. This GHG in atmosphere absorbs and emits radiation within the thermal infrared range. Due to which the temperature is increasing very rapidly. The primary greenhouse gases in the Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Since the beginning of the Industrial revolution, the burning of fossil fuels has contributed to the increase in carbon dioxide in the atmosphere from 280ppm to 390ppm.

The main gas resulting in Global Warming is emission of carbon dioxide gas. This carbon dioxide emitted in atmosphere can be absorbed by Artificial Trees. Professor Klaus Lackner of Columbia University has been working on the concept since 1998. This technology is similar to that used at coal plants to capture carbon from flue stacks, but can be used anywhere. Professor Lackner notes that half of carbon emissions come from small sources, including cars and airplanes, and is usually nearly impossible to collect. But since the carbon dioxide in the air is actually very concentrated, the device required to collect it can be fairly small. This work of Capture CO2 is done by Artificial Trees. Each synthetic tree would cost about $30,000 to build, with most of the cost due to the technology used to release the carbon dioxide from the sorbent. In addition, since the device requires energy to operate, it also generates some carbon itself if plugged into the power grid. Professor Lackner calculated that, for every 1000 kg of carbon dioxide the synthetic tree collects, it emits 200 kg, so that 800 kg are considered true collection. The Professor found out that one Artificial Trees can absorb 1000kg per year.

There are two ways by which CO2 can be absorbed. One is to use sodium hydroxide solution (caustic soda).Sodium hydroxide is an alkali, and carbon dioxide is an acid gas, and the two react to form sodium carbonate (washing soda).A second process is to use calcium oxide. It combines with carbon dioxide to form calcium carbonate. The reaction needs some heat to drive it.

Trees

The Professor and his colleague Allen Wright used an ion exchange resin – a polymer impregnated with sodium hydroxide. The plastic is set up in vertical sheets, the air blows through it, and the gas gets absorbed in the resin.The sodium hydroxide in the resin has the sodium ions at one end firmly attached to the polymer, and the hydroxide ions in a looser state, so that they are easily displaced by carbon dioxide. It binds to the sodium to produce sodium bicarbonate – the familiar bicarbonate of soda.The dry resin has this affinity for CO_2, so freely absorbs it. But when wet, the attraction for CO_2 diminishes. So when the resin has absorbed as much of the atmospheric gas as it can, moisture is added, and it releases the gas which can then be collected.

This collected liquefied CO_2 can then be stored underground, down in the deep ocean where it theoretically would stay as liquid carbon dioxide under cold temperature and high pressure, re-used in the pressurisation of oil fields, combined with hydrogen to make synthetic hydro-carbons, fed to oil-making algae or in any of the other chemical and manufacturing processes that require carbon dioxide – like putting it in those fizzy drinks everyone likes.

This Artificial Trees can play an important role to reduce green house gas Carbon dioxide and can help to reduce the effect of it on Global Warming.

By Vaibhav Mehta (TE)

10 Most Polluted Cities In The World

1. Maputo – Mozambique

Maputo is the capital and the largest city of Mozambique located on the bank of Indian Ocean. It is suffering from lack of sanitation processes–specifically the lack of a solid waste removal system as well as sewage treatment, that has created difficulties for people over there. Huge garbage dumps and piles of garbage seem scattered in the streets, and the sewage in the river can be seen.

2. Moscow- Russia

Despite claims that Moscow is the most important and capital city of Russia and where people pay an average $3,000 a month for a three bedroom apartment does not even have clean running water, Moscow also has a huge level of air pollution which is resulting in daily strain on lung health. Cholera is on the rise in some of the parts of Moscow due to filthy areas, where there is no adequate arrangement to dispose of garbage.

3. Brunei – Darussalam

Brunei Darussalam is a small but enriched country with natural gas and petroleum resources located in South Asia surrounded by Malaysia.
Pollution now seems to be a growing concern in Brunei Darussalam. It seems there is a lack of information and research studies in the area. The air quality generally appears to be comparatively clean but this does not mean that Brunei Darussalam is free from air pollution. However, some studies have revealed a very high TSP level. Wind-blown dusts are the most apparent sources.

4. Baghdad – Iraq

Baghdad is the most troubled and vulnerable city of the world due to ongoing war on terror. Frequent bomb blasts and destruction has supplemented the pollution in the city. Poor water quality is threatening to aggravate the transmission of water-borne diseases in the city. Cholera has struck several provinces of the country, including Baghdad from August 2007 to December 2007. A recent study carried out by the United Nations Environment Program shows that air pollution, resulting from burning oil and aggravated by war, is causing grave concern.

5. Mumbai – India

Mumbai is one of the most populated cities of the world, so you can see piles of garbage in various streets of the city. It is also considered to be one of the busiest and crowded cities of the world. There are places in the city where you would perhaps not want to go due to stink that comes from filthy garbage scattered over there. The pollution in these areas is massive and is spoiling the beauty of the city on daily

6. New Delhi – India

Delhi is considered to be the fourth most polluted city in the world. Today pollution is one of the serious problems faced by the public and concerned authorities. Growing industrialization and migration is creating a unique challenge for the government to overcome. The alarming growth in the number of vehicles in Delhi is a major threat as everyday over 1000 vehicles are increasing on the roads in Delhi. The city is usually full of fog due to heavy traffic, and industries throw 3,000 ton of pollutants into the air every day. Thermal power plants contribute 13 per cent of air pollution.

7. Mexico City – Mexico

Mexico City the capital of Mexico, has gone from among the world's cleanest to among the dirtiest in the span of a generation. The average visibility of some 100 km in 1940s is down to about 1.5 km. Snow-capped volcanoes that were once parts of the landscape are now visible only rarely and levels of almost any pollutant like nitrogen dioxide (NO_2) is regularly breaking international standards by two to three times. Levels of ozone, a pollutant that protects us from solar radiation in the upper atmosphere but is dangerous to breathe, is twice as high here as the maximum allowed limit.

8. Dhaka - Bangladesh

Dhaka is the capital city of Bangladesh located in southern Asia, between Burma and India. The capital is battling with the constant threats of water pollution. Surface water is often thick with disease and pollutants from the use of commercial pesticides.

9. Karachi – Pakistan

Karachi is the metropolitan city and business hub of Pakistan: On one side the image of Karachi is being projected as major and industrial city of Pakistan, but on the other hand pollution-related diseases in Karachi are on the rise due to intolerable levels of air and noise pollution in the city. Some 35 percent of people in one way or another are affected by these ailments including cardiac, lung, ENT, skin, eye and psychological diseases.

10. Lagos – Nigeria

Lagos is the commercial capital and largest city in Nigeria. The hovering smoke over the city blurs the skyline of the central business area of Nigeria's commercial capital. The city of 12 million residents and one of the biggest cities in Africa is facing a huge air pollution problem.

I woke up one morning and in a paper I read,
Man is living on a planet which was supposed to be dead.

Oh how advanced have we become: we fit a million transistors on a single thumb, Many mothers in Hiroshima still give birth to babies who are blind, deaf and dumb, A new planet in the solar system has just been discovered, Many of those who drowned in the floods have not yet been recovered.

A car that travels at 500kph has just been produced. Unfortunately global co2 emissions are yet to be reduced.

70 billion dollars spent on the Large Hardon Collider, 925 million hungry people of the world still wait for a provider.

To find the God particle they spent all this money, And just like God it still eludes… now that funny!

In the furnaces new steel smelts, But at the same time arctic ice caps melt.

Global sea levels continue to rise, The coastal villages pay the price.

USA creates a super computer called Jaguar Cray, Not even God answers when starving Eutopians pray.

2.5 Quadrillion calculations per second the computer can do,
But even all the worlds computing power cannot create one morsel of food for me and you

Technology is like a double edged knife,
The beholder decides to give or take a life.

Around 140,000 species every year face extinction, We hold the knife; but in which direction.

As engineers we learn technology is our friend,
But we must realize what remains till the end.

The technology that we create should give us the convenience we deserve, It's the environment we should preserve.

Man can live without every technological achievement, He can't live without the environment.

Every second new ideas we generate.
Every day new inventions we create.

Man has made many inventions of every kind, But he is still to discover peace of mind.

The melting ice caps
The rising sea levels
The climatic anomalies
All these point to one phenomenon called global warming.
If we dont change right here, right now the world wont be there one morning,
This is not to scare you.
This is just a global warning.

SACHIN DINESH NAIK (TE)

DESIGN OF A LOW COST MICROSTRIP PATCH ANTENNA FOR GPS APPLICATIONS

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Keywords: Microstrip Antenna (MSA), Global Positioning System (GPS), Circular Polarization.

Abstract

A compact MSA for GPS application at 1575 MHz, having 8 slits is presented. The said MSA is designed and simulated in IE3D and measurements are made using Agilent Vector Network Analyser E5062A.

1 Introduction

Positioning and finding user locations, with GPS requires some understanding of the GPS signal structure and how the measurements can be done. GPS receiver transmits the microwave radio signal composed of two carrier frequencies modulated by two digital codes and navigation message. GPS satellite transmits two low power radio signals, designed as L1 and L2. Civilian GPS uses the L1 frequency of 1575.42 MHz in the UHF band where the signals travel by line of sight[1][2][5]. Microstrip antenna is a resonator type antenna, usually designed for single mode operation that radiates mainly in linear polarization. For circular polarized (CP) radiation, a patch must support orthogonal fields in equal amplitude but in phase quadrature[2-5]. This requirement can be accomplishment by a single patch with proper excitation or by an array of patch with appropriate arrangement and phasing. The conventional antennas for GPS applications are very compact and expensive. Typically patch antennas have gain between 5 to 6 dB and exhibits a 3dB beamwidth between 70^0 and 90^0.

2 Design Procedure

First step of design is to select the proper feeding technique depending on the application. Various types of feeding techniques can be employed, including direct contact method such as probe or microstrip line feed and non-contacting feed of proximity and slot couplings. Matching can be achieved by appropriately choosing the feed locations and the dimensions or by using impedance transformers.
Second important step is design of a power divider network. The output ports are connected to the antenna feeds. The output port line impedances should be matched with the antenna feeds. Impedance transformers can be used if necessary.
In the design it is preferable to minimize the coupling between the two feeds for the better axial ratio performance. If the coupling between the two feeds remains strong, a splitter with a good isolation such as quadrature hybrid or the Wilkinson divider is required for good CP quality[2,5].

3. Design and Geometry

Fig. 1 shows the geometry of the proposed antenna. For the patch design, a FR-4 substrate (ε_r = 4.48, tanδ = 1.48 E-2, thickness = 1.6mm) is selected. Overall size of the MSA is reduced by cutting 8 slits on the patch. In order to get circular polarization, double feed is used, which allows to excite two orthogonal TM01 mode on the square patch by feeding the two inputs 90^0 out of phase. It must be noticed that to get circular polarization slits length and width should be identical and symmetric w.r.t. orthogonal axes; a slight asymmetry can produce large degradation of the polarization purity because the two principle axes modes can goes to resonate frequencies[1].

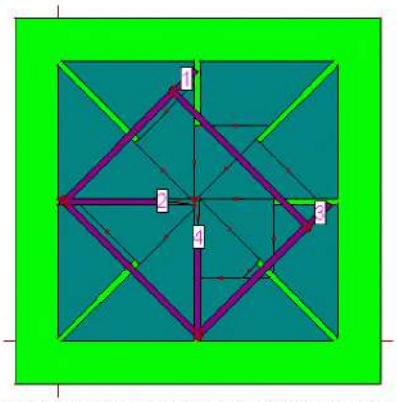

Fig. 1: Microstrip Antenna for GPS Application

A 90^0 hybrid junction on 1.6mm thick FR – 4 substrate was designed to provide 90^0 out of phase double feeding point as shown in Fig. 1. Port 1 is the antenna input (receiver) and port 2 and 4 are the two quadratic outputs to be connected to corresponding patch feeding points. To avoid the spurious reflections, the port 3 is terminated on a matched load (50 ohm). Fig. 2 shows the current distribution on the radiating

patch at 1542 MHz. The symmetrical current distribution is observed.

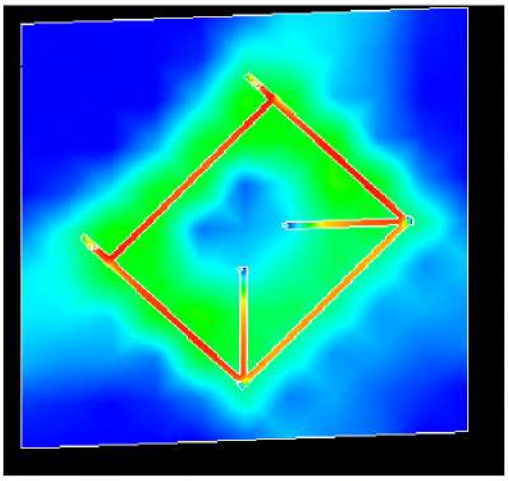

Fig. 2 : Current Distribution

4. Substrate Characteristics

FR-4 dielectric substrate with Permittivity = 4.48 and Loss Tangent = 1.48E-2 is used for the fabrication of MSA. A square patch of 46mm side was printed on 60x60mm circuit board. Hybrid junction feeding circuit was realized on 60x60mm FR-4 substrate (1.6mm thickness) with microstrip technology. Patch board and hybrid circuit boards are stuck together with epoxy glue in such a way a common ground plane separates the two layers. The feeding points of the patch were connected through via holes to the corresponding hybrid circuit outputs. All the dimensions are shown in Table 1 to 5.

Sr. No.	Layer	Length	Width	Thickness
1	Ground Plane	150 mm	150 mm	1.6 mm
2	Layer 1- Upper Patch	46 mm	46 mm	3.2 mm

Table 1: Patch and Substrate Dimensions

	Slit 1	Slit 2	Slit 3	Slit 4
X - Coordinate	23.00	5.25	40.75	23.00
Y - Coordinate	40.75	23.00	23.00	5.25
Length	1	10.5	10.5	1
Width	10.5	1	1	10.5

Table 2: Patch Side Slits Dimensions
(All dimensions are in mm)

	Slit 1	Slit 2	Slit 3	Slit 4
X - Coordinate	39.5	6.5	6.5	39.5
Y - Coordinate	39.5	39.5	6.5	6.5
Length	18.5	18.5	18.5	18.5
Width	1	1	1	1
Theta	45	135	225	315

Table 3: Patch Corner Slits Dimensions
(All dimensions are in mm)

	Probe 1	Probe 2	Probe 3	Probe 4
X - Coordinate	21	17	43	23
Y - Coordinate	43	23	21	17
No. of Segments	8	8	8	8
Radius	0.5	0.5	0.5	0.5
Thickness	1.2	3.2	1.2	3.2

Table 4: Probe Feed Dimensions

	Side 1	Side 2	Side 3	Side 4	Strip1	Strip2
X - Coordinate	12	34	12	30	8.8	23
Y - Coordinate	12	12	34	30	23	9
Length	32.5	30	30	32.5	17	1
Width	1	1	1	1	1	17
Theta	315	225	45	315	-	-

Table 5 : Hybrid Junction Dimensions: Z = 1.2mm
(All dimensions are in mm)

5. Results and Discussions

The VSWR on smith chart, simulated and measured VSWR plot, Return loss plot and Radiation pattern are shown in Fig 3, Fig. 4 Fig. 5 and Fig. 6 respectively. The experimental MSA has 10dB return loss bandwidth from 1.44 GHz to 2.30 GHz allowing a return loss bandwidth of 47 % which covers the civilian GPS band. Although the measured bandwidth shows a small shift compared with what was predicted theoretically, the agreement between measured and simulated results is reasonable for most of the practical purposes.

6. Conclusion

In this paper, we have presented a low cost MSA with 8 slits for GPS application. It is observed that the VSWR bandwidth is 40 % and return loss bandwidth is 47 %. The 90^0 hybrid junction on backside of ground plane produces the circular polarization. The use of the quadrature feeding permits a better purity of circular polarization and a wider impedance bandwidth allowing reducing the environmental dependence with respect to ceramic antennas. The dimensions and location of the feed are optimized by using the IE3D software. The results are verified on Agilent Vector Network Analyser E5062A.

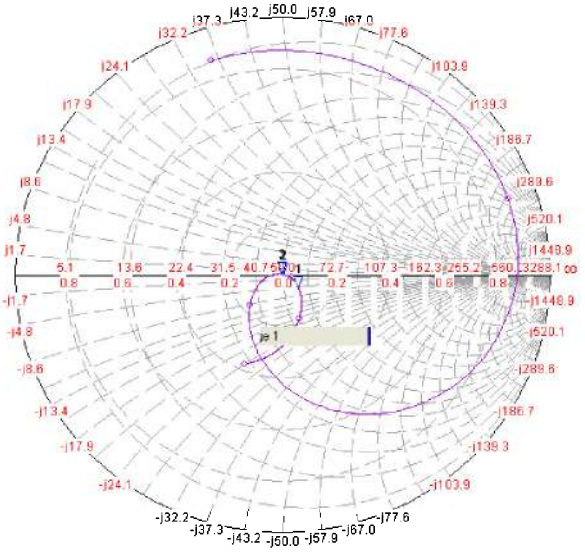

Fig. 3 : VSWR pattern on smith chart

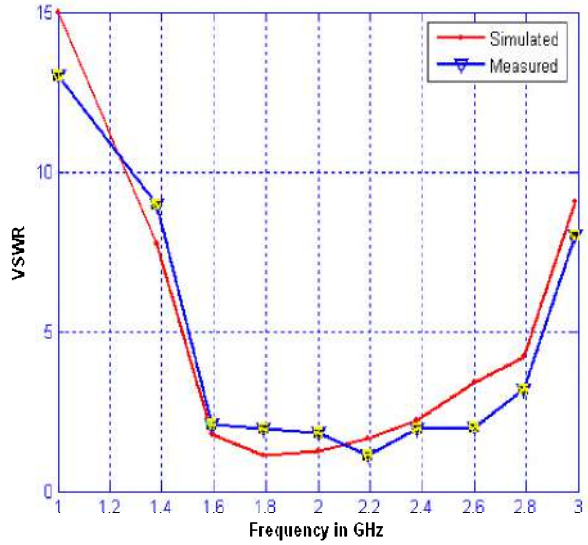

Fig. 4 : VSWR response (Simulated Vs Measured)

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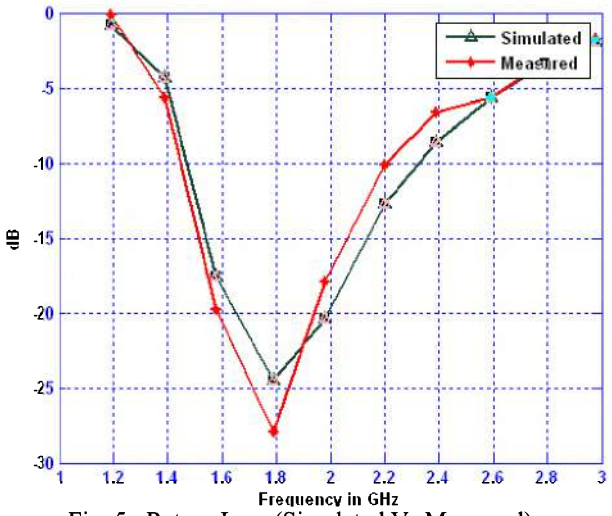

Fig. 5 : Return Loss (Simulated Vs Measured)

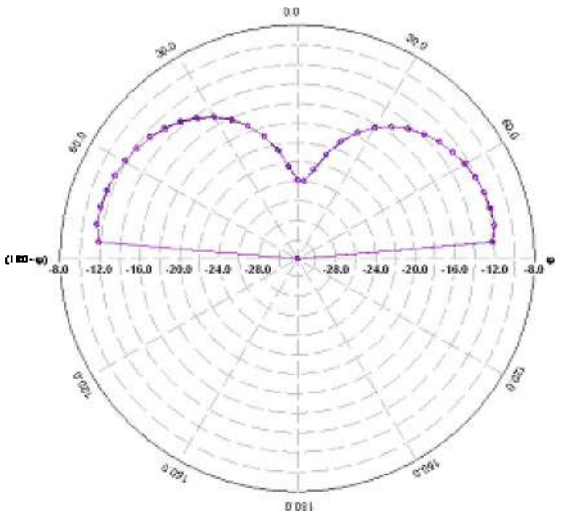

Fig. 6 : Simulated E-plane Radiation pattern at

Microwave Applications

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***Abstract*—First off, let's remind everyone that microwave electronics are by and large an *analog science*, as opposed to most other electrical engineering, which has mostly gone *digital*. We think of analog as real life, and digital as the "reality TV" of electronics. No one really listens to digital music or sees digital television, your senses are analog. Digital communications must be carried on an analog radio signal. Analog engineering will never go away.If we had to summarize what sets a microwave engineer apart from a "normal" electrical engineer, we'd say that knowledge of just a few simple concepts is required to fit in with microwave geeks. These are S-parameters, the Smith chart, decibels, transmission lines (including waveguide, which really isn't a transmission line but performs the same function) and skin depth. Notice that we didn't mention antennas, because we consider that almost a separate subject from microwave engineering!**

Keywords—**Millimetre waves, Heating in Microwave oven, Dielectric heating , HPM, Safe radiation source , Remote sensing**

I.INTRODUCTION

Microwaves are electromagnetic waves with wavelengths ranging from as long as one meter to as short as one millimeter, or equivalently, with frequencies between 300 MHz (0.3 GHz) and 300 GHz.[1] This broad definition includes both UHF and EHF (millimeter waves), and various sources use different boundaries. In all cases, microwave includes the entire SHF band (3 to 30 GHz, or 10 to 1 cm) at minimum, with RF engineering often putting the lower boundary at 1 GHz (30 cm), and the upper around 100 GHz (3mm). The technology used for microwave communication was developed in the early 1940's by Western Union. The first microwave message was sent in 1945 from towers located in New York and Philadelphia. Following this successful attempt, microwave communication became the most commonly used data transmission method for telecommunications service providers.With the development of satellite and cellular technologies, microwave has become widely used in the telecommunications industry. Fiber-optic communication is special application of microwaves and is now the dominant data transmission method .Also , microwave communication equipment is still in use at many remote sites where fiber-optic cabling cannot be economically installed.

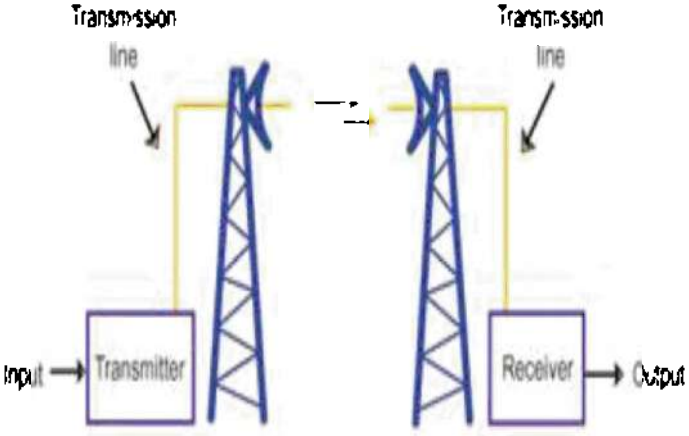

Fig. 1 A basic Microwave system

Microwave Communication Can Be Analog or Digital
Microwave communication takes place both analog and digital formats. While digital is the most advanced form of microwave communication, both analog and digital methods pose certain benefits for users.

THE "BIG THREE" APPLICATIONS OF MICROWAVES IN EVERYDAY LIFE ARE-

- Heating
- Remote sensing and countermeasures
- Communications

1) Heating applications

A microwave oven works by passing non-ionizing microwave radiation, usually at a frequency of 2.45 gigahertz (GHz)—a wavelength of 122 millimetres (4.80 in)—through the food. Microwave radiation is between common radio and infrared frequencies. Water, fat, and other substances in the food absorb energy from the microwaves in a process called dielectric heating. Many molecules (such as those of water) are electric dipoles, meaning that they have a positive charge at one end and a negative charge at the other, and therefore rotate as they try to align themselves with the alternating electric field of the microwaves. This molecular movement represents heat which is then dispersed as the rotating molecules hit other molecules and put them into motion.

A microwave oven converts only part of its electrical input into microwave energy. A typical consumer microwave oven consumes 1100 W of electricity in producing 700 W of microwave power, an efficiency of 64%. The other 400 W are dissipated as heat, mostly in the magnetron tube. Additional power is used to operate the lamps, AC power transformer, magnetron cooling fan, food turntable motor and the control circuits. Such wasted heat, along with heat from the product being microwaved, is exhausted as warm air through cooling vents. The frequencies used in microwave ovens were chosen based on two constraints. The first is that they should be in one of the industrial, scientific, and medical (ISM) frequency bands set aside for non-communication purposes. Three additional ISM bands exist in the microwave frequencies, but are not used for microwave cooking. Two of them are centered on 5.8 GHz and 24.125 GHz, but are not used for microwave cooking because of the very high cost of power generation at these frequencies. The third, centered on 433.92 MHz, is a narrow band that would require expensive equipment to generate sufficient power without creating interference outside the band, and is only available in some countries. For household purposes, 2.45 GHz has the advantage over 915 MHz in that 915 MHz is only an ISM band in the ITU Region while 2.45 GHz is available worldwide.

Most microwave ovens allow users to choose between several power levels. In most ovens, however, there is no change in the intensity of the microwave radiation; instead, the magnetron is turned on and off in duty cycles of several seconds at a time. This can actually be heard (a change in the humming sound from the oven), or observed when microwaving airy foods which may inflate during heating phases and deflate when the magnetron is turned off. For such an oven, the magnetron is driven by a linear transformer which can only feasibly be switched completely on or off. Newer models have inverter power supplies which use pulse width modulation to provide effectively-continuous heating at reduced power so that foods are heated more evenly at a given power level and can be heated more quickly without being damaged by uneven heating.

2) Remote sensing and countermeasures applications

The most well-known remote sensing systems are **radars** (radio direction and ranging), which use a transmitter to illuminate an object, and a receiver to detect its position or velocity (or both).

Another class of remote sensing is radiometry. Radiometric systems need no transmitter, they merely collect naturally-occurring electromagnetic energy and process its to form images. Terahertz radiometric receivers will soon be employed as security systems in airports, provided that the ACLU will permit us all to be seen in the nude by quarter-inch-brow security guards. Another excellent example of remote sensing is the new "T-ray" imaging being done at terahertz frequencies, by companies such as Teraview.

Radio astronomy uses uses huge dishes to capture incredibly weak RF signals from space to reconstruct the origins of the universe starting with the big bang.

Let's lump in global-positioning systems into remote sensing, because a GPS unit "senses" where it is.

Countermeasures to remote sensing include all types of jamming equipment, usually associated with military applications. Interested in electronic countermeasures? Consider becoming an Old Crow!

We will also lump RFID in as a use of microwaves to perform sensing.

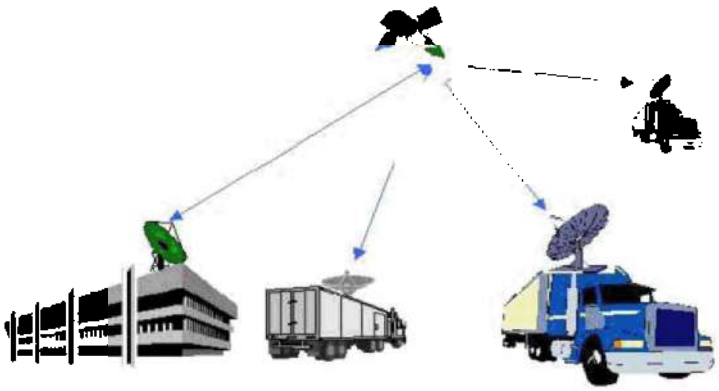

Fig. 2 Various Microwave Transmission

3) Communications applications

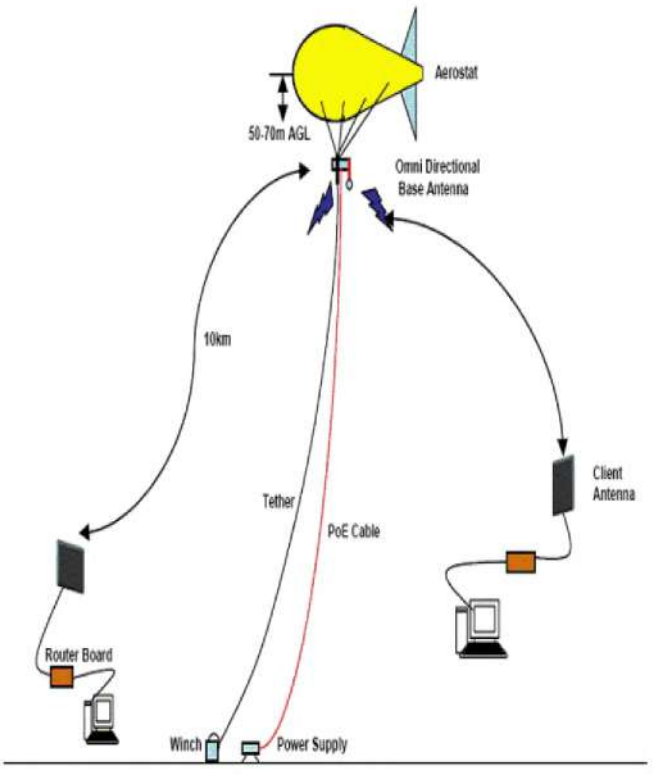

Fig. 3 Various Microwave Links in communication

Communications systems include satellite, radio, television, wireless phone and data transmission applications, and all combinations of

these. We'll get into these later... or sooner, if someone sends us some material!

4) Medical applications

The Varian boys out of Stamford pretty much made Medical Linear Accelerators the mainstay of cancer treatment with their research in the 1940's, eclipsing the use of active Cobalt 60 radiation sources with a much more controllable and "power-off" safe radiation source. From the early 1970's to today the Medical LINAC has been the work horse of the medical cancer treatment industry.

Just yesterday (euphemistically speaking) we had Thyratrons, triggering Klystrons, modulating outputs of electron guns, with outputs running down waveguides, through bunching and steering coils, pulling 270 degree turns with bending magnets to precisely "nail" a target to output a selection of as many as 6 different electron energies and maybe 4 photon energies from anywhere in a 360 degree rotation. Yes, with a waveguide rotational coupling.

Today (literally) Computed Tomography (radiological CT) and Linear Accelerator technology has been married together into a single system with a common source to deliver the most precisely controlled radiation dose that has ever been delivered.

Microwave made it happen.

5) The fifth application

Fig. 4 High Power Microwaves in Military

Directed energy weapons will eventually make up a new category of microwave applications. This includes the Pentagon's new pain ray, as well as high-power microwave (HPM) systems that can be used to defeat weapons such as missiles and even disable ground vehicles (with the exception of diesel engines which have no ignition system).

6) The sixth application

RF lighting is a relatively new topic for microwave engineering. The sulfur lamp uses a 2.45 GHz magnetron to excite sulphur to give up an eye-pleasing spectrum of light. Military versus commercial applications

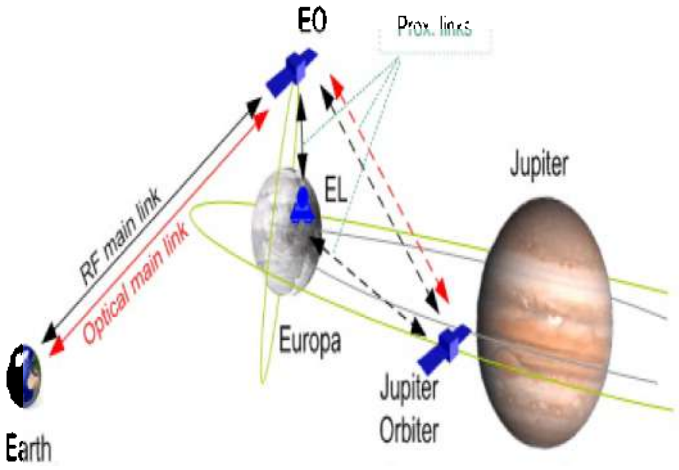

Fig. 5 Involvement of Microwaves in extensive communication

II. MICROWAVE ADVANTAGES AND DISADVANTAGES

Advantages:

- No cables needed
- Multiple channels available
- Wide bandwidth

Disadvantages:

- Line-of-sight will be disrupted if any obstacle, such as new buildings, are in the way
- Signal absorption by the atmosphere. Microwaves suffer from attenuation due to atmospheric conditions.
- Towers are expensive to build

Microwave communication is the transmission of signals via radio using a series of microwave towers. Microwave communication is known as a form of "line of sight" communication, because there must be nothing obstructing the transmission of data between these towers for signals to be properly sent and received.

III .CONCLUSION

A microwave is an electromagnetic wave with a very short wavelength, between .039 inches (1 millimeter) and 1 foot (30 centimeters). Within the electromagnetic spectrum, microwaves can be found between radio waves and shorter infrared waves. Their short wavelengths make microwaves ideal for use in radio and television broadcasting. They can transmit along a vast range of frequencies without causing signal interference or overlap.

We often divide microwave technology based on commercial or military/aerospace applications. The mix of people in microwaves is roughly half in commercial applications, and half in military/aerospace. Everyone knows that people who work in military/aerospace microwaves generally are more manly than their commercial brothers.

Commercial applications of microwave technology include the front-end of much of the wireless stuff you use everyday, such as cell phones, pagers, wireless LANs, satellite television, XM Radio, and that cool GPS playtoy you received on Father's Day. Unfortunately the boom years of commercial microwave technology seem to be behind us, as the telecom infrastructure was overbuilt, while competition drove the price of wireless phone services into unprofitable territory. Who knows, videophone and Bluetooth tricks may eventually bring some real money back to this industry. Doesn't everyone want to be able to buy a pack of gum from a vending machine by clicking a few buttons on their cell phone? Military, aerospace applications probably account for more research dollars than commercial stuff. It's arguably a lot more fun to work in this arena, where cost is often NOT as big a consideration as performance. Perhaps the coolest microwave development programs are sponsored by DARPA, the Defense Advanced Research Projects Agency.

Microwave technology was developed during World War II (1939–45) in connection with secret military radar research. Today, microwaves are used primarily in microwave ovens and communications. A microwave communications circuit can transmit any type of information as efficiently as possible . It is impossible today to have communication in today's world without high frequency waves—THE MICROWAVES!!!

Fig. 6 Microwave tower for GSM Application

NANOFABRICATED SOLAR SHEETS

THE NEXT STEP TO EFFICIENT ENERGY UTILISATION

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Abstract

With conventional energy sources fast depleting from the surface of the earth, an alternative energy source which is abundant and readily available, has lesser or no carbon emission, has lower cost of production & easy to maintain is the need of the hour. Solar energy has been one of the most popular alternative energy sources. However efficient utilization of this energy has always been a problem. Though solar energy is abundantly available it is not a concentrated source of energy i.e. it is highly dissipated form of energy. This energy was tapped using conventional Solar panels which were fabricated using Silicon. But the manufacture of silicon based solar panels is expensive; moreover batteries are needed to store this energy. These solar panels are very bulky & occupy lot of floor space and their efficiency is only about 10 to 12% thus the energy production costs upto 23 dollars per watt. This makes it a non realistic source of energy. Thus a new approach to manufacture solar panels using nanotechnology has been introduced in this paper. These Solar sheets are fabricated using solar absorbing ink layers deposited on thin metal or glass sheets. It considerably reduces the size of solar panels and makes it more flexible. The technique was introduced by Nanosolar Incorporaton and can be considered as a breakthrough for efficient utilization of solar energy. It considerably reduces the cost as the solar absorbing ink does not contain silicon, the thin solar sheet can be manufactured at lower cost and the process of manufacturing is much faster producing several feet of sheets per minute. The energy production cost is about 30 cents per watt which is comparable with the energy production cost from conventional fossil fuels. This technology opens arena to independent energy portals to charge gadgets, solar sheets embedded in vehicles as energy sources, solar sheets can be used as stick on tapes on window panes, to generate electricity for house hold purposes, so on and so forth, thus taking us closer to the reality of free electricity. A brief description of the technology, methodologies adopted for its manufacturing, realistic approach & the manifold advantages have been discussed in this paper.

I. INTRODUCTION

In a time where Energy crisis is becoming a global concern with conventional energy source not able to cope up with the increasing demand, the development of alternative energy

sources has become a prime necessity. Though the sum total of energy is always constant, crisis exists due to the cost of converting energy from one form to electricity. Also energy sources which are eco friendly and does put excessive pressure on the existing natural resources is the need of the hour. Keeping this in mind an efficient method of utilizing solar energy by implementing Nano Solar sheets using CIGS photovoltaic cells has been put forward in this paper.

II. DRAWBACKS OF EXISTING SYSTEMS

Disadvantages of conventional solar panels

2.1 **Cost** Cost for solar panels may vary from location to location but estimated cost to run computer with other small electric appliances can cost up to 700 $ to 1000 $. Whereas to lighten up the entire house can cost 15000$ to 25000$ depending on the demand.

2.2 **Availability** Location of solar panels has been a problem. Wet climates will corrode exposed parts. Cloudy areas may not get enough sun exposure. Moreover, there are some places on the earth where optimum solar radiation is not available for trapping energy, e.g. in polar regions.

2.3 **Tracking system** Solar panels require to be directly inclined to face the sun to produce electricity constantly, if panels are not facing sun it will vary in producing watts.

2.4 **Use of batteries for storing energy** Due to unavailability of solar energy during night time, batteries need to be used to store energy during day time. This makes the panel system more bulky.

2.5 **Efficiency** Use of Silicon in solar panels is not much efficient as compared to the chemical used in solar sheets.

2.6 **Maintenance** An experienced photovoltaic energy technician is required for maintenance of solar panels.

III. STRUCTURE OF CIGS SOLAR SHEETS

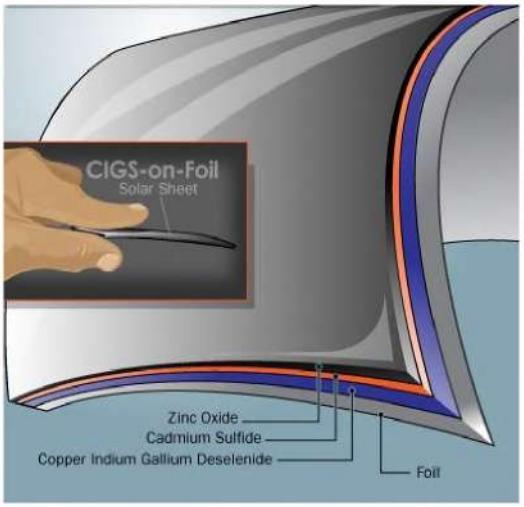


Fig. 6.1. Basic Structure of CIGS thin fim sheets (source: www.howstuffworks.com)

The above figure shows the basic structure of a CIGS thin film sheet. A layer of zinc oxide (ZnO) plays the role of the other electrode in the CIGS cell. Sandwiched in between are two more layers - the semiconductor material and cadmium sulfide (CdS). These two layers act as the n-type and p-type materials, which are necessary to create

a current of electrons.There are two basic configurations of the CIGS solar cell. The CIGS-on-glass cell requires a layer of molybdenum to create an effective electrode. This extra layer isn't necessary in the CIGS-on-foil cell because the metal foil acts as the electrode.When light hits the cell it is absorbed in the CIGS and thus creates free electrons and holes. These electrons diffuse in the CIGS grains until they reach the electric field within the junction region. At this point they are driven into the Cadmium Sulfide / Zinc Oxide (ZnO), which leads to a build up of voltage between the ZnO electrode and the Molybdenum (Mo) base.

IV . FABRICATION PROCESSES:

4.1 Preparation of precursor ink

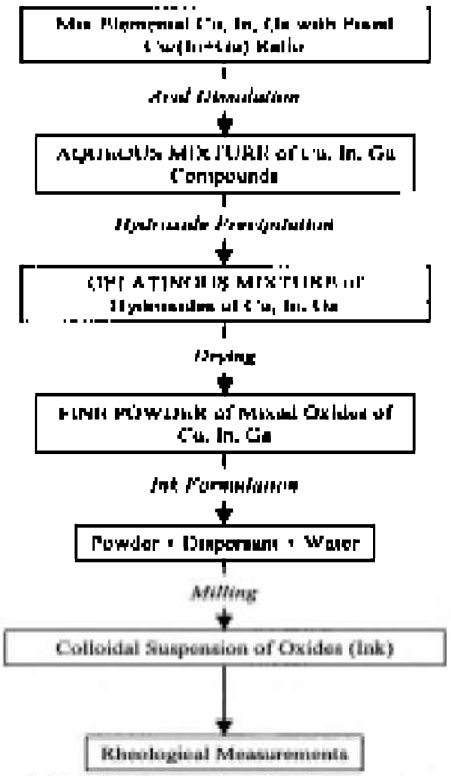


Fig. 4.1. Ink manufacturing process

1. Initially, Cu, In and Ga are mixed in the desired Cu/(In+Ga) ratio. With increase in Cu/(In+Ga) ratio, the carrier concentrations of the films gradually increases but electrical resistivity gradually decreases. Chips of elemental Cu, In and Ga are weighed in exact amount to obtain the desired Cu/ (In+Ga) ratio.
2. These metal chips are dissolved by acid digestion to obtain a homogeneously mixed aqueous solution of compounds of Cu, In and Ga. In acid digestion, acid is added to the metal sample and heated until the solid metal has been completely dissolved. This sample is then diluted down with an acid/water mixture. Metals will not dissolve in water or organic solvents, therefore acid is used for dissolving the metal.
3. Gelatinous mixed hydroxides are precipitated by adding sodium hydroxide (NaOH) solution.
4. After washing the hydroxide precipitate, it is dried to obtain fine powder of mixed hydroxides.
5. A dispersant is added to the powdered precipitate to form the ink precursor.
6. Milling technique is used to form colloidal suspension of oxides.
7. The resultant ink formed undergoes rheological measurements. Rheology refers to the study of various techniques to measure parameters like particle size, viscosity etc. required for production of standard ink.

4.2 Fabrication process

The figure below shows the process of fabricating CIGS solar cell using precursor inks.

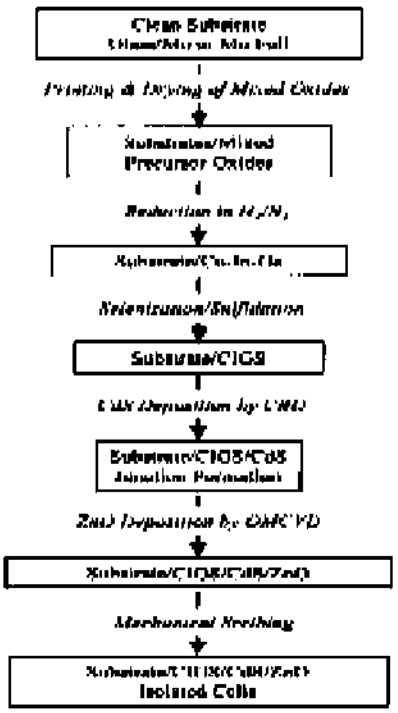


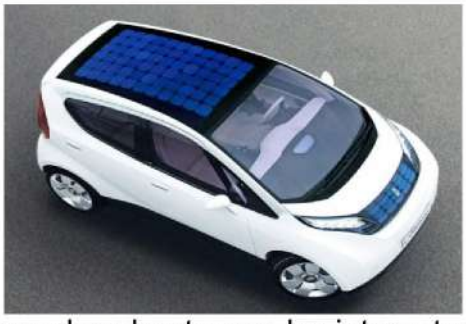
Fig. 4.2. Main fabrication process

The process is described as follows:

1. A thin film of oxide ink is coated is coated onto metallized glass for rigid substrates and on metallic foils for flexible substrates.
2. Wet coating techniques are used to deposit the oxide precursor film properties.
3. The precursor film is converted into a CIGS absorber film of uniform composition via two gas solid reactions. First, mixed oxides are reduced using a gas mixture of H_2 and N_2 gases at temperatures between 500-550°C to obtain a thin film of Cu-In-Ga alloy. Controlled synthesis of starting oxide powders and their proper reduction conditions result in reasonably smooth alloy films. Second, the alloy is selenized using dilute gas mixture of H_2Se and N_2 gases at temperatures between 420 and 450°C to form a CIGS absorber film of desired electronic
4. The solar cell fabrication is completed by depositing a layer of Cadmium sulphide (CdS) on the CIGS absorber film using chemical bath deposition followed by the deposition of a Zinc oxide (ZnO) layer by a lowpressure organometallic chemical vapor deposition technique.

V. APPLICATIONS

5.1 Hybrid Solar Vehicles



Nanosolar sheets can be integrated with the fiber present over the body of the vehicle. Thus the energy generated can be stored in batteries and used to run vehicles. This will significantly reduce the dependence on petrol and diesel which are the major fuels for automobiles. Already aeroplanes using solar systems are prevalent. Toyota introduced its latest hybrid concept car Priuswhich works on solar energy. Thus with the availability of Nanosolar sheets we can definitely have realistic models of vehicles working on Solar energy.

5.2 Solar driven Gadgets

Nano solar shets can be embedded on the body surface of gadgets like ipods, mp3 players, mobiles, GPS systems, laptops etc and can be used to drive them. It can also be used to charge their batteries or as a secondary source of power supply.

5.3 Improved and efficient Solar panels

Nanosolar sheets which can be printed like sheets of paper can be used like stick on tapes on building thus there would be no need for large frames to hold solar panels. Also this thin pigmented ink can be deposited on the glass of window panes or the glass cover of the building. Such a system using Nanosolar sheets on the glass covers of the building has already been implemented in Maryland

5.4 Solar Sheet embedded fabrics

Nanosolar sheets can be embedded on coats and bags which can be used as independent energy portals.

VI. CONCLUSION

Thus with the help of this paper an attempt has been made to give a new dimension into the world of Photovoltaics. It discusses about CIGS nanofabricated solar sheets which are highly reduced in size, more efficient in cost as well as energy generation. This technology & its scope will act as the first step to realize one of the biggest dreams of science of producing free energy.

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answers of previous cross word (sept - oct 2010 edition)

Across

1. Standard test signal; seen once a year - Impluse
5. harmful program; also a famous movie character - virus
7. information transfer - coummnication
10. integrated electronics acronym - intel
12. event that created the universe - bigbang
15. father of modern genetics - mendel
17. basic electronic instrument - multimeter
19. instrumentality that combines interrelated interacting artifacts designed to work as a coherent entity - system
20. name of a galaxy - andromeda
21. picture elements acronym - pixel

Down

2. NASA's bsot; Also applied before injection - spirit
3. group of wires used to transfer data - bus
4. Golden number for aspiring engineers - forty
6. natural processor - brain
8. always completed at eleventh hour - assigntment
9. an entrance exam; also building blocks of digital electronics - gate
11. unofficial reference book - techmax
13. widely used ranged device to device data transfer technology - bluetooth
14. Portable mobile station - cell phone
16. Not continuous - discret
18. Indonesian Island; also a programming language? - java

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Mrs. Swati Sinha

The dream begins with a teacher who believes in you, who tugs and pushes and leads you to the next plateau, sometimes poking you with a sharp stick called "truth."

- Dan Rather

Ways to Reduce Your Carbon Footprint

Cool kids help a warm planet

Buy organic and local. *Pay attention to packaging.* Ditch bottled water. ***Energy-proof your home.*** Go native. **Window shop**. *Take a direct flight.* Switch water heaters to vacation mode. Unplug it! Keep your car. Chuck your microwave. Use cold water. **Have the family over.** Make time for errands. **The Three Rs: Reduce, Reuse, Recycle.**

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