CATHEDRAL COMPOSITE PRE-UNIVERSITY COLLEGE
63, Richmond Road, Bangalore - 25

THE FORCE

SCIENCE MAG

Volume - I ISSUE-I Date-14-08-09

GAS CLOUDS IN THE EAGLE NEBULA
BY HUBBLE SPACE TELESCOPE

THE FORCE

SCIENCE MAG

CONTENTS

EDITORIAL COLUMN

The year 2009 is commemorated as the "International year of Astronomy" to mark the invention of the Telescope by Galileo Galilee in 1609.

It is been 400 yrs since the telescope came into use. Ever since its invention the field of astronomy is growing briskly & steadily to understand the fast accelerating expansion of the universe.

The United States in 1969 sent its first manned mission to moon & after 40 yrs, of research & development our nation launched its first mission to the moon the Chandrayan, we boast ourselves to have had ancient astronomers & physicists who contributed to science & society but of late the takers for pure science is on the decline. Higher Education in our country needs a total revamp so as to encourage the young minds to explore the outer world & beyond.

HUBBLE SPACE TELESCOPE

By ARAVIND. V II PCME

The HUBBLE SPACE TELESCOPE (HST) is a space telescope that was carried into orbit by the Space Shuttle 'Atlantis in April 1990. It is named after the American astronomer EDWIN HUBBLE, It is one of the largest, most versatile and is well known as both a vital research tool and public relations boon for astronomy. It orbits the earth every 96 min and is placed 360 miles above the atmosphere.

Extremely sharp images with almost no background light can be captured by this HST. Its ultra deep field image for instance is the most detailed visible light image ever made of the universe's most distant objects. It is also the only telescope ever designed to be serviced in space by astronauts.

Some of the achievements of HST are :

a) June 1994 - NASA releases Orion Nebula Images that confirm the birth of planets around New born stars.

b) November 1995 - NASA releases 'Eagle Nebula' images showing where stars are born.

c) January 1996 - reveals atleast 1500 galaxies at various stages of development

Physics N Religion

It is been a misconception for centuries that science & religion can never coexist or prove each other right.

The Bible in the book of Genesis describes that, "In the beginning was the Word & the Word was God;

Physics originates with the evolution of the universe with its 'Big Bang' theory, thus both refer to the energy 'SOUND'.

Albert Einstein in his theory of relativity gives the Energy Equivalence of a certain mass through his famous mass- Energy principle as $E=mc^2$ & suggests that nature manifests itself as matter and Energy again referring to the body & soul as in the Bible.

Celestial Phenomenon like the Solar Eclipse though considered superstitious in many parts of the country and the world finds parallel in the Bible with reference to the crucifixion of Christ and in the battle of all times the Mahabharata from the above few analogies, correlations & coincidences the anomalies of science intending

to paralyse/is paralytie to the growth of religion can be kept in abeyance & both can strive for the betterment of mankind. However its only that science is making its presence felt by taking baby steps to make mankind understand nature in a much more scientific method of logical reasoning.

By FRANCIS. L

"VALVE" - ABLE

We as humans have a value or do we have a value?. Yes we do have a value because God loves us the way we are. Thus every individual can be considered as a rational number which has a definite value. In other words we can establish a one to one correspondence between each human being and a rational number. A number of the form $\frac{a}{b}$ where a and b are integers, is called a rational number. Having a fixed value for '$\frac{a}{b}$', if we decrease the value of 'b', the value of a increases.

[Example : $\frac{2}{10}=0.2$, $\frac{2}{5}=0.4$, $\frac{2}{0.9}=2.22$, $\frac{2}{0.5}=4$, $\frac{2}{0.2}=10$, $\frac{2}{0.02}=100$ etc]

In a rational number a the value of '$\frac{a}{b}$' is what we really are and the value of 'b' is what we think about ourselves or how humble we are in our daily life and finally the value of $\frac{a}{b}$ is what we are to others in this society and it won't be an exaggeration to say the value of $\frac{a}{b}$ is our value in the eyes of the Almighty. Having defined a one to one correspondence between the value of a human being and the set of rational numbers, we understand that to achieve a greater value as a human being, we have to humble ourselves not only before God when we pray but in all our dealings in this world. The more humble we are the greater our value as we draw closer to God.

The Bible says, In the same way, you yonger men must accept the authority of the elders. And all of you, serve each other in humility, for :God opposes the proud but favours the humble".

So humble yourselves under the mighty power of God, and at the right time he will lift you up in honor. I Peter 5:5 & 6

by ANIL KUMAR. S

CO_2 LASER

By **ARUN KUMAR**
II PCMB

LASER is expanded as "Light Amplification by Stimulated Emission of Radiation". CO_2 - Carbon dioxide Laser was one of the earliest gas lasers that was invented by Kumar Patel of Bell Labs in 1964. These Lasers are the highest power continuous wave lasers that are currently available with an appreciable efficiency. The ratio of Out put Power to Pump Power is as large as 20%.

CO_2 laser produces a beam of infrared light with the principal wave length bands centering around 9400° to 10600° A. The active laser medium of CO_2 lasers is a gas discharge which is air cooled or water cooled as in higher power applications. The discharge tube primarily consists of CO_2 around 10%-20%, N_2 - Nitrogen (10%-20%) H_2 Hydrogen or Xenon and Helium.

Population inversion in a CO_2 laser Election impact exciles the vibrational motion of Nitrogen. Nitrogen collides with Carbon dioxide and home collisional Energy gets transfered between the two, which brings in the desired population inverssion necessary for laser operation. The Nitrogen molecules are left in a lower Excited state. Their transition to ground State takes place by collision with cold helium atoms. The resulting hot helium atoms must be cooled in order to sustain the ability to produce a population inversion in the CO_2 molecules.

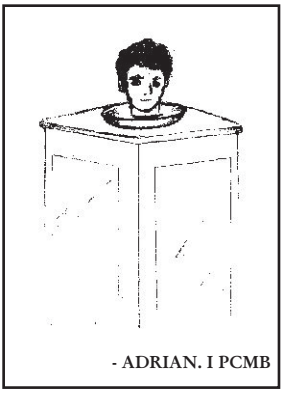
APPLICATION

CO_2 lasers are used Industries, to cut or weld metal sheets and to engrave letters or numbers on metals. They are used for surgical procedures since H_2O absorbs this frequency of light very well, these are used in laser surgery, skin resurfacing ("laser facelifts") and dermabrasion. Researchers in Israel are experimenting with using CO_2 lasers to weld human tissue as an alternative to traditional sutures.

Due to the atmosphere which is quite transparent to infrared light, CO_2 lasers are used for finding military range using LIDAR Techniques.

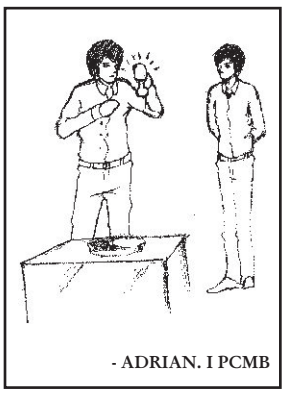
ALLEZ AU MUSEE - GO TO THE MUSEUM

HEAD ON A PLATTER



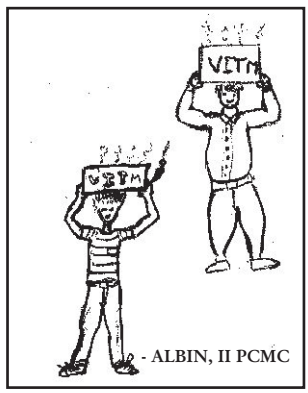
- ADRIAN. I PCMB

MAGIC LIQUID



- ADRIAN. I PCMB

FUMING WITHOUT FIRE



- ALBIN, II PCMC

AWESOME, AMAZING SPELLBOUND ! WORLD OF SCIENCE

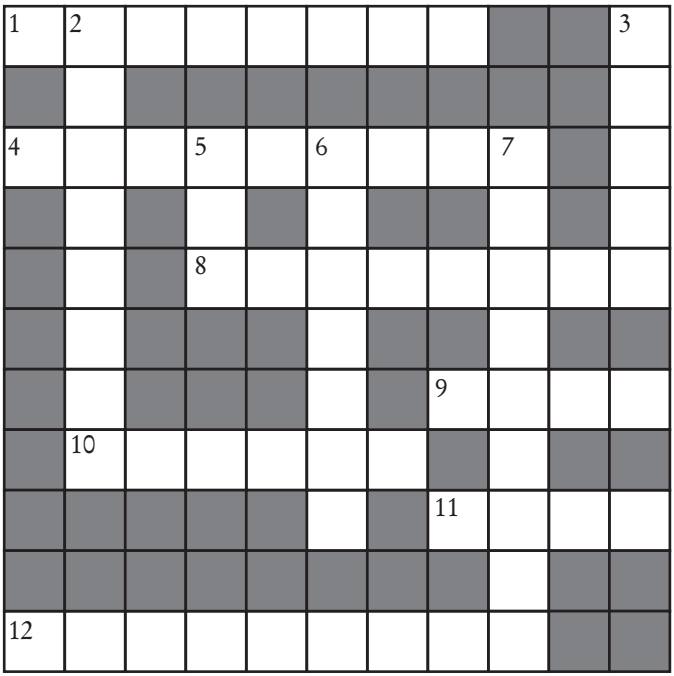
The Chemistry club of our college, Chemoradarie, took initiative to explore the subject apart from our regular curriculum.

The students of second the Pre-university science, were taken for an educational trip to the Visveshwaraiah Museum (VITM) to watch an amazing magic show on Chemistry.

On reaching the museum, we were first taken to the Engine room, which had many types of machineries working on the principles of Physics and Chemistry. We then went to the Dinosaur room containing a model of the dinosaur which roared on moving close to it.

Later we were taken to the auditorium to watch the magic show. The magician, Mr. Bharathan was different in his approach. Every trick he performed was followed by an explanation. He was very lively and all of us were involved in the performances. Some of the best tricks were the magic sand, liquid magnet, elephant toothpaste etc. He threw a liquid on us which just disappeared - that was liquid Nitrogen that converts into gas at room temperature. The entire show was amazing. After the magic show, we visited the museum to see the wonders of science that left us spell bound. The whispering disc., water running out of a hanging tap, head on a platter were some interesting, must watch, exhibits in the fun science corner.

CROSS WORD ON PERIODIC TABLE



Across

1. Green like the chlorophyll (8)
4. No longer a planet but very much an element (9)
8. In liquid form it is used for cryogenic experiments (8)
9. A Plum in fuel (4)
10. Jai Ho to this element (6)
11. 'Zee' in brass (4)

Down

2. It cannot heal (6)
3. A radioactive noble gas (5)
6. The latin word for the element which is stored in kerosene (7)
7. The ribbon which burns brightly (9)
5. The symbol of this element is Sn (3)
12. Born in USA (9)

Did you know about this XDR™ 2 Memory Architecture

The XDR™2 memory Architecture is the world's fatest memory system solution capable of providing twice the peak band width per device when compared to a GDDR5-based system. Further, the XDR2 memory architecture delivers this performance at 30% lower power than GDDR5 at equivalent bandwidth.

Designed for scalability, power efficiency and manufacturability, the XDR2 architecture is a complete memory solution ideally suited for high-performance gaming, graphics and multi-core compute application.

Initial systems can achieve memory bandwidths of over 500GB/s into an SoC. Each XDR DRAM can deliver upto 38.4GB/s of peak bandwidth from a single, 4-byte-wide, 9.6Gbps XDR2 DRAM device, and the XDR2 architecture supports a roadmap to device bandwidths of over 50GB/s.

Capable of data rates of 6.4 to 12.8 Gbps, the XDR2 architecture is part of a continuously compatible road map, offering a path for both performance upgrades and system cost reductions.

The XDR2 memory architecture is the first to incorporate innovations from Rambus 'Terabyte Bandwidth Initiative along with other key Rambus innovations.

16X Data Rate enables high data rates (up to 12.8Gbps) at lower system clock and on-chip bus interface speeds.

Fully Differential Memory Architecture (FDMA) improves signal integrity, reduces power and enables the highest memory performance available.

Enhanced FlexPhase TM enables high data rates, simplifies layout and eliminates trace length matching.

FlexLink C/A reduces system costs and controller pin-count while providing scalable capacity and flexible access granularity.

Micro-threading increases transfer efficiency on micro-threaded workloads while reducing power consumption.

COMPUTER BRAIN TEASER

I. Select the proper answer for the following questions.

1. What is IRC?
   a. Internet Relay Channel
   b. Internet Respond Channel
   c. Internet Relay Chat
   d. Internet Response Cache
2. What is a Cookie?
   a. Cooking Software
   b. Web Site
   c. Internet Information file
   d. Hacker file

3. What does the term IRQ stand for?
   a. Input Request Que b. Interrupt Request Que
   c. Interrupt Request d. Input Request
4. What does the term MIME stand for?
   a. Mail Internet Mail Exchange b. Mail Interleave Method Exchange
   c. Multipurpose Internet Mail Extensions d. Multipurpose Interleve Mail Exchange
5. Which of the below is not a text editor?
   a. Vim b. Perl c. Pico d. Vi

II. Answer the following questions in one word.

1. The communication mode which supports data flow in both directions but one at a time.
2. A device that allows digital information from several sources to be routed onto a single line for transmission over to a common destination.
3. The term used to measure the width of the transmission channel on a network.
4. A data transmission technique that connects a sender and receiver in an unbroken path.
5. A device that amplifies and improves the quality of signals on a network.
6. A command or service that provides an interface between the process and operating system
7. The application of the computer graphics where one object is transformed into another.
8. The part of a modem that converts digital signal into analog signal.
9. The physical or logical arrangement of network nodes and link.
10. A Graphics package used in the design of buildings, automobiles, textiles etc.

Complete the following SU-DO-KU choosing only the letters used in the word COMPUTERS

R			C			P		E
T	C						O	
			R					
P				M	S	O	R	C
	O							
		U	O	C			P	T
U	E						C	S
		C	P	R	U			
		T				U	M	

Food Guide for Selecting an Adequate Diet

A diet which provides all the essential nutrients in sufficient quantities to meet your3 needs is an adequate or a balanced diet. A good healty diet should include the following foods in appropriate quantities.

Body - building foods	Proteins, Minerals
Energy - Yeilding foods	Carbohydrates, fats
Protective foods	Vitamins, Minerals
Regulatory foods	Water & Roughage

An ill-balanced diet does not provide the minimum daily requirement of the various nutrients and hence an individual taking such a diet is bound to suffer from various degrees of malnutrition or deficeincy diseases and the physical efficiency will be very low.

Not only quantity but quality also is required in food.

FOOD GUIDE

A proper practical plan known as the FOOD GUIDE is essential to ensure good nutrition to keep you fit and healthy.

All the food we use in our daily meals are divided into five groups in the food quide. The food groups are chosen because of the specific nutrients contributed by each to the total diet.

If sufficient amounts of food from each of the five groups are included in the daily diet, the nutrient requirements of the body will be met. Such a diet is a balanced diet as it meets the persons, nutritional needs.

As you may observe, the first column in the table indicates the food group, the second includes the food to be taken, the third specifies the amount in one serving and the last column indicates the minimum number of servings to be taken to meet your nutritional needs.

Study the food group and use the food guide as a practical tool.

Food Group	Foods to be taken	Size of Servings	Suggested No. of Servings
1.	**CEREPLS AND BREADS**		
	The staples rice, wheat, maize, ragi and their preparations.	25 g	9-10
2.	**PROTEIN FOODS**		
	Dals, Legume, nuts and oil seeds,	25 g	
	Milk and Milk Products	150 g	3 -5
	Eggs, 1 No		
	Fish, Poultry, Meats	30 g	
3.	a) **PROTECTIVE VEGETABLES & FRUITS**		
	All green leafy vegetables, Orange, Yellow Vegetables and Fruits	50 - 75 g	1 - 2
	b) **VITAMIN C RICH VEGETABLE AND FRUITS**	50 - 75 g	1 - 2
	Amla, Guava, Drum Stick, Orange, Musambi etc		
4.	**OTHER VEGETABLES AND FRUITS**	50 - 75 g	3 or more
	All the remaining Vegetables, Gourds, Onions etc., Fruits such as Bananas, Melons, Apples, Chikkoo, etc.		
5.	**OILS, FATS, SUGARS**		
	Ghee, Butter	5 g	5 or more
	Sugar, Jaggery	5 g	5 or more

LED

Light emitting diodes (LEDs) are solid-state lighting components. They have no moving, fragile parts and can last for decades. LEDs can be many times more energy efficient than light bulbs, depending on the application. Just as vacuum tubes in televisions were replaced with solid-state components, the last remaining vacuum tube light bulbs are also being replaced by solid-state components.

Imagine a grain of sand that emits a very bright light, usually red, amber, green or blue, depending on the material, when an electrical current is applied. That's essentially an LED. The actual science and manufacturing process to develop an LED is quite complex, but the principle is simple.

The first LEDs for commercial applications were red. They functioned as on/off or indicator lights in electronic devices such as VCRs, calculators, stereo systems and even automobile subsystems. Eventually, LEDs were produced in green and amber as well. The major breakthrough came in 1989 when Cree, Inc. of Durham, NC, started shipping the first commercially viable blue LED, based on Silicon Carbide. That blue LED enabled white LED-based light. Mixing red, bule and green light produces white light.
Today, a more-efficient and cost-effective white LED light is revolutionizing the lighting world. The white power LED, based on a blue LED chip coated with a phosphor, is bright and efficient enough to be used in general illuminiation. Fixture manufacturers are making LED-based products for outdoor street, walkway, parking and indoor-down light applications.

Cree introduced the first lighting-class white power LED in 2006 and followed up with the first lighting-class warm (softer) white power LED in early 2007. LEDs are ready for general-illumination applications, presenting a dramatically enhanced lighting option to save energy and maintenance costs as well as eliminate the hazardous-waste issues associated with mercury-containing light bulbs and tubes.

History of LIght (&Heat)

The history of man-made light is based on heat, Wax, Oil and Gas which ever burned to produce light. The filament in an incandescent bulb heats up to produce light. Gas in a fluorescent tube is trapped to illuminate. The basic method is "Heat it up, and it glows."
For more than 120 years, incandescent light bulbs have brightened and literally warmed our lives. Electric-powered bulbs were a major improvement over candle, gas and oil light sources, but they are extremely inefficient. Bulb-based light sources are far better at producing heat than light - up to 90 percent of the power going into a bulb is converted to heat.

Compact fluorescent bulbs (CFLs) are more efficient, and are an excellent alternative to incandescent bulbs for Edison-socket light fixtures. However, they contain a small amount of mercury, making them hazardous waste when they break or burn out.

In the past 12 months, a new light source has emerged that is sufficiently bright and efficient to be used for general illumination. The light emitting diode, commonly called the LED, uses far less energy and can last many times longer than most bulbs and contains no lead or mercuty, Cree, Inc. introduced the first commercially available lighting-class LED in late 2006. Lighting manufacturers are now producing a whole new class of LED lighting products for general illumination.

LEDs are now ready for broad deployment across general lighting applications such as parking garages and lots, streetlights and other outdoor installations. Indoor directional and down light solutions are also becoming available. According to the University of California, Santa Barbara, widespread deployment of LED-based lighting could save $280B in electricity costs in the U.S. alone by 2025.

By changing to LEDs in municipal lighting, cities are making a thoughtful energy choice that will greatly benefit their taxpayers, visitors and the environment.

Like a normal diode, the LED consists of a chip of semiconducting material impregnated, or doped, with impurities to create a p-n junction. As in other diodes, current flows easily from the p-side or anode, to the n-side, or cathode, but not in the reverse direction. Charge-carriers-electrons and holes - flow into the junction from electrodes with different voltages. When an electron meets a hole, it falls into a lower energy level, and releases energy in the form of a photon.

The wavelength of the light emitted and therefore its color, depends on the band gap energy of the materials forming the p-n junction. In silicon or germanium diodes, the electrons and holes recombine by a non-radiative transition which produces no optical emission, because these are indirect band gap materials. The materials used for the LED have a direct band gap with energies corresponding to near-infrared, visible or near-ultraviolet light.

LED development began with infrared and red devices made with gallium arsenide. Advances in material science have made possible the production of devices with ever-shorter wavelengths, producing light in a variety of colors.

LEDs are usually built on an n-type substrate, with an electrode attached to the p-type layer deposited on its surface. P-type substrates, while less common, occur as well. Many commercial LEDs especially GaN/InGaN, also use sapphire substrate.

Most materials used for LED production have very high refractive indices. This means that more light will be reflected back in to the material at the material/air surface interface. Therefore Light extraction in LEDs is an important aspect of LED production, subject to much research and development.

Direct band gap semiconductors

In Semiconductor physics, a direct bandgap means that the minimum energy of the conduction band lies directly above the maximum energy of the valence band in momentum space. In a direct bandgap semiconductor, electrons at the conduction-band minimum space. In a direct bandgap semiconductor, electrons at the conduction-band minimum can combine directly with holes at the valence band maximum, while conserving momentum. The energy of the recombination across the bandgap will be emitted in the form of a photon of light. This is radiative recombination, also called spontaneous emission. In indirect bandgap semiconductors such as crystalline silicon, the momentum of the conduction band minimum and valence band maximum are not the same, so a direct transition across the bandgap does not conserve momentum and is forbidden. Recombination occurs with the mediation of a third body, such as a phonon or a crystallographic defect, which allows for conservation of momentum. These recombinations will often release the bandgap energy as phonons, instead of photons, and thus do not emit light. As such, light emission from indirect semiconductors is very inefficient and weak. There are new techniques to improve the light emission by indirect semiconductors. See indirect bandgap for an explanation. The prime example of a direct bandgap semiconductor is gallium arsenide - a material commonly used in laser diodes. (See indirect bandgap for an explanation of the connection between bandgap offset and light emission.)

Colors and materials

Conventional LEDs are made from a variety of inorganic semiconductor materials, the following table shows the available colors with wavelength range, voltage drop and material :

Color	Wavelength [nm]	Voltage [V]	Semiconductor Material
Infrared	> 760	V < 1.9	Gallium arsenide (GaAs) Aluminium gallium arsenide (AlGaAs)
Red	610 < < 760	1.63 < V < 2.03	Aluminium gallium arsenide (AlGaAs) Gallium Arsenide phosphide (GaAsP) Aluminium gallium indium phosphide (AlGaInP) Gallium (III) phosphide (GaP0
Orange	590 < < 610	2.03 < V < 2.10	Gallium arsenide phosphide (GaAsP) Aluminium gallium indium phosphide (AlGaInP) Gallium (III) phosphide (GaP)
Yellow	570 < < 590	2.10 < V < 2.18	Gallium arsenide phosphide (GaAsP) Aluminium gallium indium phosphide (AlGaInP) Gallium (III) phosphide (GaP)
Green	500 < < 570	2.18 < V < 4.0	Indium gallium nitride (InGaN) / Gallium (III) nitride (GaN) Gallium (III) Phosphide (GaP) Aluminium gallium indium phosphide (AlGaInP) Aluminium gallium phosphide (AlGaP)
Blue	450 < < 500	2.48 < V < 3.7	Zinc selenide (ZnSe) Indium gallium nitride (InGaN) Silicon carbide (SiC) as substrate Silicon (Si) as substrate - (under development)
Violet	400 < < 450	2.76 < V < 4.0	Indium gallium nitride (InGaN)
Purple	multiple types	2.48 < V < 3.7	Dual blue / red LEDs, blue with red phosphor, or white with purple plastic
Ultraviolet	< 400	3.1 < V < 4.4	Diamond (C) Aluminium nitride (AIN) Aluminium gallium nitride (AlGaN) Aluminium gallium indium nitride (AlGaInN) - (Down to 210 M^{29})
White	Broad spectum V = 3.5		Blue / UV diode with yellow phosphor

'Join the LED Lighting Revolution by becoming an LED City'

CATHEDRAL COMPOSITE PRE-UNIVERSITY COLLEGE
63, Richmond Road, Bangalore - 25