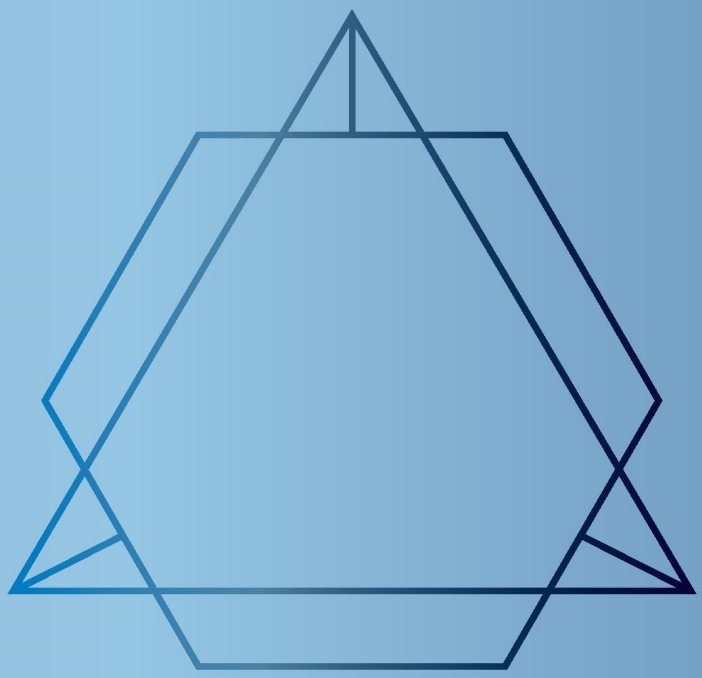
STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 86



PHYSIK '16

Annual Magazine

Department of Physics

FROM THE PRINCIPAL'S DESK

STELLA MARIS COLLEGE
(AUTONOMOUS)
17, CATHEDRAL ROAD
CHENNAI - 600 086.

MESSAGE

I am delighted that the Department of Physics is publishing its annual departmental magazine, "Physik". This is a step forward in the Department's commitment to all-round educational experiences and to widen the horizons of the thinking process of our student community.

This year's magazine is yet another attempt to merge academics with a holistic approach to encourage students through seminars, conferences workshops and other creative programmes in the institution to help them keep up with the advances in technology in their field of study..

Featured in "Physik" are reports of the wide range of co-curricular and extra-curricular activities in which every student of the department was involved. I applaud the students who have won awards and prizes for their efforts and for their whole-hearted participation in the activities of the Department thereby bringing laurels to our College.

Congratulations to the faculty and the students of the Department in bringing out this annual publication.

JQuadras fmm

Dr. Sr. Jasintha Quadras, fmm
Principal
January 22, 2016

Phone : 044 - 2811 1951 / 2811 1987 Fax : 044 - 2811 1129 email : principal@stellamariscollege.edu.in
website : www.stellamariscollege.edu.in

MESSAGE FROM THE SECRETARY

Message

Congratulations to the staff and students of the Department of Physics for bringing out their departmental magazine **Physik** every year with very good articles based on various themes.

This year they have chosen the theme **Light** .We all know the importance of light since we cannot do anything without light. The creation story as narrated in the Bible says, "In the beginning when God created the universe, everything was engulfed in total darkness and God commanded ' **Let there be light** ', and light appeared." **(Genesis 1/ 1-3)**

We have various sources of light, the main source being the Sun. Today we are using solar lights wherever possible.

I am happy to read some of the titles of the articles written by the students which are very informative and interesting.

God bless you and your efforts.

Sr. Susan Matheikal fmm
Secretary

STELLA MARIS COLLEGE
(AUTONOMOUS)
17, CATHEDRAL ROAD
CHENNAI - 600 086

NOTE FROM THE HEAD OF THE DEPARTMENT

STELLA MARIS COLLEGE
(AUTONOMOUS)
17, CATHEDRAL ROAD
CHENNAI - 600 086.

The Department nurtures the students by actively involving them in research and scholarly activities and provide various platforms throughout their period of study so as to foster scientific knowledge and curiosity. One such platform is the publication of the magazine PHYSIK which is a forum to unleash their writing skills. I place on record the immense contributions of the editorial board which is ably guided by our faculty Sr. Francisco Nirmala F.M.M. in bringing out this magazine.

The year 2015 being declared by the UNESCO as the International year of light, the Department of Physics take up this global initiative and bring out the department's annual magazine PHYSIK centred on the various innovations and advances in the field of optics. I quote Edith Wharton,

"There are two ways of spreading light: to be the candle or the mirror that reflects it".

I hope this initiative would be like a candle and also a mirror in spreading and reflecting the radiance of knowledge among the student community.

The Department of Physics sincerely thank the Department of Biotechnology, Government of India for providing financial support through the **star college scheme.**

Dr. Belina Xavier
Head
Department of Physics

FROM THE EDITORIAL BOARD

Dear Readers,

We are pleased to present to you the annual magazine of the Department of Physics, Stella Maris College - PHYSIK'16.

The year 2015 was marked as the International Year of Light and Light-based technologies by the United Nations to raise awareness on the significance of light for mankind. Physik'16 has been themed to pay tribute to this observance. The articles in this edition of Physik cover a variety of topics in light ranging from the very origin of light to its most recent technological developments in the field of photonics.

We would like to extend our deepest gratitude to the Principal, Dr. (Sr.) Jasintha Quadras F.M.M and the Secretary, Sr. Susan Matheikal F.M.M for their encouragement.

Our sincere thanks goes to the Head of the Department, Dr. Belina Xavier and the faculty members of the department for their consistent support.

We are indebted to Sr. Francisco Nirmala F.M.M, the faculty in-charge for her guidance and her pivotal role in shaping the magazine.

Our thanks extends to the students for their tireless effort and contribution. We would like to express special thanks to Sindhujha K and Niveditha R for their timely assistance. We would also like to thank Varsha Mohan, 2nd year BA Economics for designing the cover page of the magazine.

With best regards,

Ashreya J

Dravina S

Elizebeth Jacob

Hridya V Varma

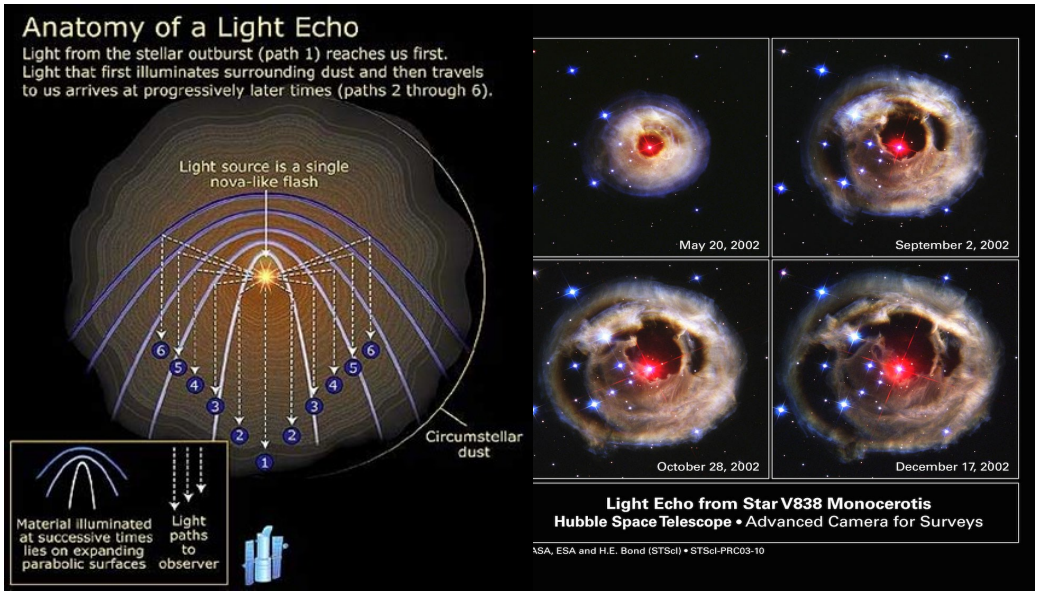
Riya Thomas

CONTENTS

ARTICLES

LIGHT ECHO

All of us are familiar with echoes in sound. But, what is a light echo? It is one of the fascinating phenomena observed in astronomy. When supernovae explode, they explode in three dimensions and all of the light is not aimed directly at Earth. Some part of the light gets reflected by the interstellar dust and it can reach the Earth after a much longer period. Since light from different parts of the nova reach us at different times, it creates an illusion. So basically, these light echoes act like time machines. Astronomers can study about a star that has exploded centuries ago because of this phenomenon.



One of the most spectacular astronomical events of all times is the light echo produced from an unusual star called V838 Monocerotis (20,000 light years away from Earth) in 2002. The light echo was about six light years in diameter.

Sindhujha K

13/UPHA/009

DARK SKIES AND LIGHT POLLUTION

Dark skies is the term used to describe the sky when it is dark without any sign of stars and planets. This happens due to inefficient public lightings, which not only wastes energy but also causes "LIGHT POLLUTION". This, in turn, causes a distortion in the beauty of the night sky i.e., it blurs the way between our eye and the outer universe.

Light pollution is a form of pollution which degrades the natural ecosystem due to excessive wasteful outdoor lightings such as street lamps, neon signs and illuminated sign

boards etc. These kinds of unnecessary lightings emitted or reflected upward towards the sky is scattered by some suspended particles in the atmosphere. Thus, it results in the invisibility of stars in the sky due to a decrease of the light contrast.

Anu Ranjani

13/UPHA/051

THROUGH THE EYES OF A MANTIS SHRIMP

To introduce the protagonist, it can be seen on many pages of the book of world records for its strength and intellectual capabilities*. To cite an example, a forearm punch creates enough pressure to bring water in its immediate vicinity to boiling point! It also boasts of putting the eagle to shame when it comes to eyesight. The mantis shrimp (contrary to what the name suggests, it is not a shrimp!), a crustacean, is an animal to look out for in the waters between Hawaii and Africa.

Before blowing the trumpet about the ocular potentials of a mantis shrimp, let us understand how vision works in insects. Unlike us, most insects have mosaic vision i.e. they see the world in pixels. Insects' eyes could be thought of as a fine wire mesh in which the cavities correspond to units of light receptors (formally called 'ommatidia'). A mantis shrimp has 10000 of these in each of its three eyes. There is division of labour among the rows of ommatidia. This type of specialized functionality is rare in the insect world.

The 'colours' it can see are way more than what we can. Humans, in general (unless colourblind), have three functional colour receptors – red, green and blue. All other colors are perceived when these receptors are differentially switched on. The mantis shrimp sees a very colourful world with twelve colour receptors – that's four times what we have! This enables them to see IR and UV in addition to light of visible wavelengths. Moreover, it can also figure out the polarization state of light. The icing on the cake is its trinocular vision. This ability precludes the need of more than one eye for depth perception.

Maybe, 'mantis shrimp eye' is a better compliment than 'eagle eye' after all!

***** YouTube has a video in which it solves a Rubik's cube!

J Ashreya

13/UPHA/046

THE BEAUTY OF BLACK

Theatre is a form of art that uses live performers to present an event on a stage. The stage usually is decorated with colourful lights or dim lights according to the concept of the play.

But, do you know what a black light theatre is?

A black light theatre is dark, black in colour as the name says. The stage is covered with black blankets and curtains that obviously are not visible to human eye. Nothing on the stage is visible to human eye.

Then, how does the audience watch the show? The show is seen with ultraviolet light that is absorbed by certain materials in the costumes of the artists. The concept of this black light theatre or black box was conceived in Asia by Director Georges Méliès and Stanislavski, who wanted to bring a change in the way of presenting dramas. Mr. Jiri Scnec performed a whole play with this technique and he came to be known as `The father of black theatre'.

The principle behind the black light theatre is the inability of the human eye to detect black objects in black background. We know that human eye is capable of detecting colours from the range blue to red. The blue colour has higher frequency compared to red colour. Black light is a lamp that emits long wave UV radiation at a frequency that the human eye cannot detect. Thus, the frequency of light plays a major role here. The light that has frequency lower than red is known as infrared (IR) radiation and higher than blue is known as ultra-violet (UV) radiation. These two - IR and UV - radiations are not visible to human eye as they are out of our visible range. UV radiation is emitted from black light. A black light is a normal light that differs only in the brightness. They glow in a very dim colour (almost violet) and this why they do not produce enough brightness to make objects visible when placed in a dark room.

Cold luminescence – the electrons of the atoms are given extra energy and are excited. As these electrons become unstable at a higher energy level they release extra energy in the forms of photons (packets of light). This phenomenon is known as fluorescence.

The black light emits ultraviolet light and the absorbed UV light is again absorbed by the nearby objects at lower frequency. Fluorescent black light use a phosphor which emits UV light and a very little of visible light whereas the light made up of dim violet wood's glass optical filter, filters the visible light that is it blocks the visible light with wavelengths longer than 400 nm. Mercury-vapour black lights with UV emitting phosphor and an envelope of wood's glass are used for theatrical and concert displays.

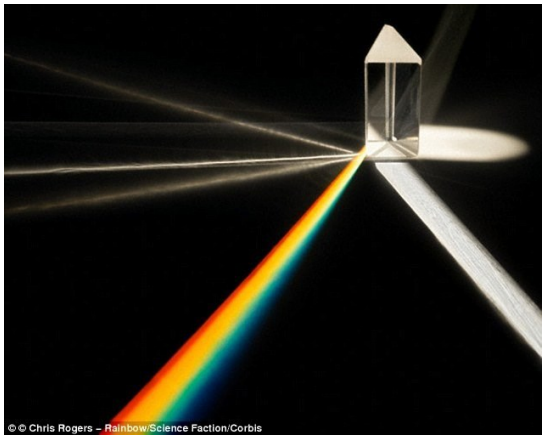
Fluorescent materials, when placed in a black background, get brightened. They glow in colours! But as these fluorescent objects come under normal light the glow isn't visible but they still glow. The costumes of the artists performing in the black light theatre are made up of these materials (not fully, places wherever needed or designed) and thus only some parts glow according to the concept of the show whereas other parts remain dark or black in colour. They utilize this to their best and entertain the audiences.

Thus, the invisible ultra-violet light is transformed to glowing colours in the black background and there lies the beauty of black in black!

Madhuvanti.S .S

13/UPHA/003

SPACETIME - A RAINBOW?



Makes sense? I guess not. I am sure most of us had a childhood where we wondered about many a things, especially a rainbow. We all know that rainbow is a result of dispersion of white light resulting in vivid colours. But, did you know that spacetime is like a rainbow?

According to theorists from the University of Warsaw, spacetime is also composed of a certain kind of rainbow.

Let me explain this theory further. When white light is passed through a prism, dispersion takes place showcasing a spectrum of colours. This is because of the difference in wavelengths (hence energies) of photons composing the light . Greater the energy of the photons, more deflection takes place. So it might be said that photons of different energies treat the same prism as having slightly different properties.

Likewise, particles of different energies in our quantum universe models treat spacetimes with slightly different properties. The fabric of spacetime felt by the particle not only depends on the type of particle but also on its energy. So, spacetime can be treated as a rainbow. Makes sense?

Elizebeth Jacob

13/UPHA/039

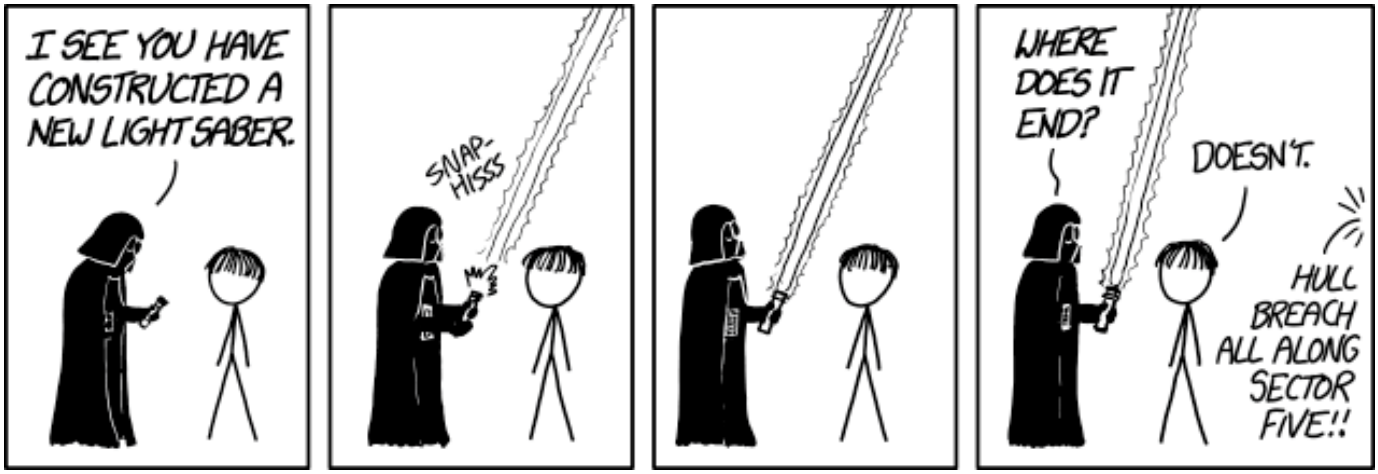
THE ELEGANT WEAPON

All of us fancied ourselves a lightsaber the very first time we saw Star Wars. It still remains a precious unfulfilled wish for most of us. Technological development has made numerous fantasies a reality. Will that ever be the case for a lightsaber as well?

Hopefully, yes. We aren't very alien to the physics of the lightsaber. Most of us believe they're similar to laser swords. Despite advanced laser technology, there are few noteworthy issues with the idea of a laser sword as a lightsaber. Light cannot be contained to a specific length, as it evident from a laser pointer. Also, lasers are invisible to naked eye unless it is scattered somehow. So, it doesn't really make sense to make a laser sword that would extend indefinitely and remain invisible. Even Darth Vader would find it difficult to wield such a weapon.

But don't lose hope just yet. Is there another alternative? Yes.

Plasma, essentially ionised gas, is known as the fourth state of matter. The excitation and de-excitation of electrons emit photons of characteristic wavelength to produce the glow we observe. In order to use plasma in a lightsaber, it has to be contained to a particular region. Strong magnetic field has been used to contain plasma in the nuclear fusion research. The same technology can be used to hold the charged particles in the desired region of a lightsaber. So far so good. But, if we had two magnetically contained tubes of plasma, they'd pass through one another. There would be no epic battles if this was the case and that's just disappointing. So, we need a solid core for the lightsaber that would be able to withstand plasma's high temperatures. A solution presents itself – Ceramics. They have the capacity to tolerate exorbitantly large temperatures. Thus, a ceramic core that springs out of the hilt at the press of a button seems to be the best fit.



The energy required for a lightsaber is about 25 MW, which is an enormous amount of power. Thus, the power source should be able to heat the plasma up to extremely high temperatures. The current technology does not facilitate such a source which can be confined to 8 to 10 inches of the hilt. But, nanotechnology might just have a solution for this as well. Carbon nanotubes are an allotrope of carbon. They take the form of cylindrical carbon molecules. These carbon nanotubes are about 20,000 times thinner than a single human hair and remarkably, they're extremely good conductors of electricity (carbon is a poor conductor). The unique symmetrical structure of the nanotube leads to its metallic properties. Not just another metal, an exceptionally good one which is 1000 times more conductive than copper. These tubes can act like simple batteries that store charge between two plates. Imagine trillions of such nano batteries; they would be the perfect power source to the elegant weapon. Scientists are yet to unveil the reason behind the tremendous growth rate of these nanotubes. Answering this question will facilitate the construction of said nano batteries and the attainment of our dream. With the fast- paced growth in nanotechnology, one can surely hope to see our favourite weapon in action in a couple of decades.

May the force be with you.

Dravina S

13/UPHA/044

THE HUMAN TETRACHROMAT

Would you believe me if I told you that there are people who can perceive up to one hundred colours more than we do? The three cones in our eyes absorb red, green and blue wavelengths, transmit them to the brain and all the colours that we see are just a combination of these primary colours. When you look at a fresh leaf, what colour will you see? Just green, right? But, an Australian artist Concetta Antico can see orange or red or purple around the edge because of her additional cone! The colour which you call as 'dark green' is a mosaic consisting of violet, turquoise and blue to her. This condition is called tetrachromacy and it is a common condition in many species of amphibians, reptiles and birds.

Scientists have carried research on this and found that mutations in the X chromosomes can cause humans to perceive more or less colours than normal. If one X chromosome is mutated, it may lead to congenital colour blindness and if two X chromosomes are mutated, it can lead to tetrachromacy! Therefore, congenital colour blindness is more common in men (XY) and tertrachromacy can occur only in women (XX). Antico's fourth cone is believed to absorb wavelengths that are reddish-orangey-yellow. The surprising

thing is that Antico's daughter is colour-blind because of the fact that only one of her X chromosomes is mutated. Antico started painting at the age of 7 and therefore her brain is trained to perceive more colors from a young age. An extra cone complicates the transmission of signals to the brain and hence scientists believe that even though there are more people with the same condition, their brains are comparatively less trained for the exceptional colour perception. So, you might be a tetrachromat as well without your knowledge!

Sindhujha K

13/UPHA/009

DEMYSTIFYING THE SUN'S ANALEMMA

Did you know that when you take a picture of the Sun at the same time and same place every day for an entire year and superimpose all the images, the Sun will trace out a figure 8 pattern? If you don't believe me, here's a picture from APOD, NASA.

This is called the sun's analemma. But, why does such a pattern arise?

Before we begin to answer this question, let me show you some more (less) fascinating pictures of the sun.

Here's a superimposed image of the sun's position taken from sunrise to sunset:

As we see in these pictures, the sun "rises" in the east and reaches its highest point in the sky before it "sets" in the west.

In summer, we have the summer solstice when the tilt of the earth's axis towards the sun is maximum. So the days tend to be longer than nights and the sun goes highest in the sky during this period.

This is seen as the highest arc in the image seen to the right. Similarly, during the winter solstice, the tilt towards the sun is minimum. Therefore, the sun traces out a lower, smaller arc during this period as seen in the image.

So, now we know that the sun doesn't remain at the same height throughout the year. It keeps moving up and down. Why, then, is the analemma not a straight line?

This is because the earth actually takes 23 hours, 56 minutes and 4 seconds to rotate once about its axis instead of the 24 hours that we daily assume. 24 hours is the average length of the day in a year. The extra 3 minutes and 56 seconds per day is introduced by the revolution of the earth around the sun.

So, here's how I understand it:

Let's say that we're at the summer solstice now. The day is almost 24 hours long. The sun is highest in the sky – higher than it ever was the entire year. Take a picture of the sun at noon.

Now, as days progress, the sun will peak lower and lower in the sky. Take a picture every day at noon. What you'll notice is that, even though you're taking a picture at 12 noon every day, you're not actually capturing the highest point of the sun in the sky. You're capturing the parts of the arc just before the sun reaches its peak or just after. This is because, when the actual length of the day is, say 23 hours, 56 minutes and 4 seconds, the time at which the sun peaks in the sky may not be 12:00. It may peak earlier than that. So what you'll actually be capturing would be the picture of the sun on its way down. Then, continuing on our journey, we go through the autumnal equinox and move towards the winter solstice. At the winter solstice, the sun's peak is at its lowest. This will be the bottom tip of our figure 8. We then go back towards the summer solstice to complete one full revolution. For this, we pass through another equinox – the vernal equinox. When you take a picture at this equinox, you'll notice that the sun is at the same position as it was for the autumnal equinox. This is because, during the equinox, the plane of the earth's equator passes through the centre of the sun. So, the tilt of the earth's axis towards the sun at both the equinoxes are the same, making their daily arcs and peaks the same. This marks the point of intersection in the figure 8 pattern. Finally, when the earth reaches the summer solstice again, our analemma would be complete and we'd have a pretty picture.

Hridya V Varma

13/UPHA/048

NOT SO FAST!

You can never reach the speed of light but did you know that you can slow it down?

Now you might ask, what the big deal is as light tends to slow down naturally as it enters a medium. The challenge here is to slow down light and make it remain that way even after it exits that medium. An impossible feat you say?

Well, a team of Scottish Physicists actually achieved the feat. They not only slowed down light, they also changed the shape of the photons.

They did this by allowing a single photon to pass through a mask made up of software-controlled liquid crystals. The mask resembled a bull's-eye target and it forced the photon to change its shape by passing in lengthwise through the crystal, alternating between empty space and the crystal.

Then began the photon race. The re-shaped photon was pitted against a normal photon, one that was unaltered by the mask. A metre-long dash in vacuum ended with the normal photon emerging as the winner.

But, wait! How did this happen? If both had been travelling at the speed of light, as they should, the result should have been even-steven. But the re-shaped photon lost every single time. Not by much, only a few millionths of a meter, but, it was slower.

The researchers hypothesise that the mask had forced the photons to change its shape by patterning on the light beam. They show that it is this patterning that slows down the light and makes it remain slow even in vacuum. They essentially have hypnotised light into believing that it is still in the mask.

The idea that some photons can be slower than others is a lot to take in, especially now that most of our accurate measurements are by using light. We might be forced to take a second look at these tardy photons not just for achieving optical precision but also its everyday uses.

Niveditha R

13/UPHA/047

PHOTONICS

Photonics is an emerging field of technology. It deals with properties and applications of photons, mainly as a medium for transmitting information. It is the technology of generating, controlling and detecting light waves and photons. Photonics is an area where photons are used in the same way as electronic applications use electrons.

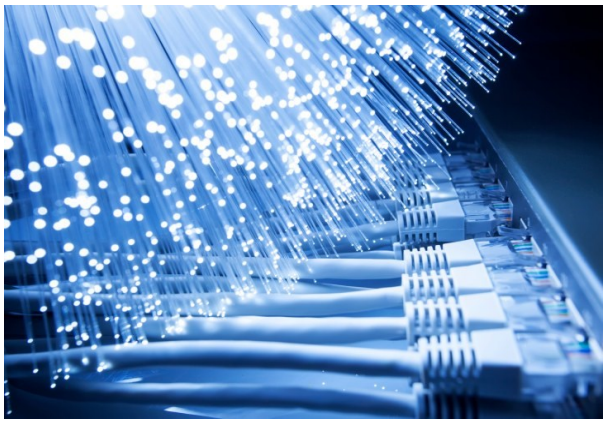
This technology is similar to the semiconductor technology - in fact, better. Photonic devices can replace semiconductor devices because of its unique characteristics as mentioned below:

- Wide bandwidth, fast data processing and transfer
- Contactless measuring characteristics
- Energy-saving
- Cost and dimension reduction

Photonics, as a field, began with the invention of the laser in 1960. It is related to quantum mechanics, optomechanics, electro-optics, optoelectronics and quantum electronics. But the term photonics specifically connotes:

- The particle properties of light
- The potential of creating signal processing device technologies using photons
- An analogy to electronics

The Advantages of photonic devices are:



- Very quick
- High confining optical technology
- Stable and well characterized processing

The Disadvantages of photonic devices are:

- Spurious reflections are more troublesome
- More expensive and harder to fix
- Waveguides and fibres are harder to use then wires

It has wide range of applications in consumer electronics (barcode scanners ,DVD players, remote TV control), telecommunications (internet), health (eye surgery, medical instruments), manufacturing industry (laser cutting and machining), defence and security (infrared camera, remote sensing), entertainment (holography, laser shows) and photonic computing.

A sea mouse (Aphrodita aculeata) showcasing colourful spines is a remarkable example of photonic engineering by a living organism.

Archana R

13/UPHA/002

WHAT GLOWS RIGHT

LEDs or Light Emitting Diodes are semiconductor devices which produce visible light when an electrical current is passed through them.

LEDs are directional light sources. They emit light in a specific direction. Other lights like incandescent and CFL bulbs emit light and heat in all directions. Because of this reason, LED lights have multiple efficient applications. Another important thing is that sophisticated engineering is needed to produce an LED that shines all around like other bulbs (incandescent and CFL bulbs). LEDs emits very little heat. In comparison, incandescent bulbs release 90% of their energy as heat and CFLs release about 80% of their energy as heat. It is small and has a unique design. In LEDs, a mix of red, green and blue is used to make white light. Typically, LEDs do not burn out or fail. The best property of LEDs is its energy saving ability. Widespread usage of LED lighting has had the highest potential impact on energy saving.

Gomathi

13/UPHA/034

ISAAC NEWTON'S CONTRIBUTION TO OPTICS

Born to a poor family in Woolsthorpe, England, in 1642, Isaac Newton attended Trinity College in Cambridge. While there, he took interest in Mathematics, Physics and Astronomy. After his graduation, he began to teach at the college.

Many scientists believe that light is a simple entity, but Sir Isaac Newton with his experience from building telescopes, believed otherwise. Isaac Newton's discoveries in optics include his observation that white light could be separated by a prism into a spectrum of different colors, each characterized by a unique refractivity. He proposed the corpuscular theory of light. He was also the first person to understand the rainbow and use a curved mirror in a telescope to prevent light from being broken up into unwanted colours. We all know about his contributions to motion, the three laws of motion, but his contribution doesn't stop there, he has contributed significantly to optics, Newton's rings is named after him.

Sharon Francis

14/UPHA/033

ACHOO

Hour-long hiccups and wild whistling wheezing
Occur less often compared to coughing and sneezing.
So what's in a sneeze?
Caused just by cold air breeze?
Well, sneezes expel mucus getting your nasal cavity clean
But excuse yourself, else you might seem a li'l mean.
A sudden exposure to brilliant bright light,
Triggers sneezing too, yes, you heard it right.
The trigeminal and ocular nerves receive the stimulation
Thereby leading to a phonic, photic sternutation.
This disarmed disorder is widely known as the photic sneeze reflex;
Its exact mechanism still does perplex the scientist's cerebral cortex.
A frequent genetic trait it is, hence carry your Kleenex,
The irritation sometimes is as powerful as a whirling vortex.
This disarmed disorder causes uncontrollable successive sneezes;
To stop eyeball falls, your eye closes and squeezes.
Christened by scientists as the ACHOO syndrome,
It can be prevented if you dwell in darkness, like a gnome.
ACHOO stands for Autosomal-dominant Compelling Helio-Ophthalmic Outburst,
Might affect any family, be it Williamson, Washington or Whitehurst.
Who knows, you might have the ACHOO gene too!
To stay away from light sneezing, this is all you have to do:
Shield your good eyes with sunglasses, scarves or huge hats,
Don't get exposed to lights of varied intensities as your eye bats.
Now that's the best way to shoo
This seemingly harmless syndrome, ACHOO.

Shifana Lourdes
14/UPHA/001

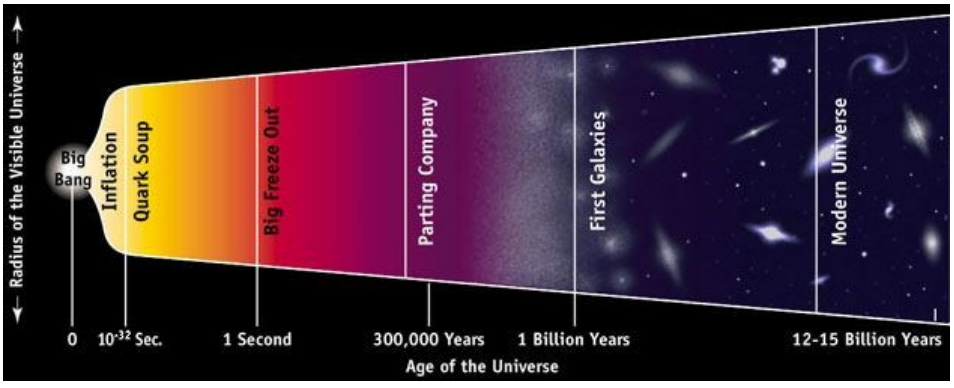
THE BIG BANG AND THE ORIGIN OF LIGHT

Every day, when we open our eyes, light rays reflect off of objects and enter our eyes through a small hole called the pupil. This light then falls on a lens which projects an upside down image on the retina. Photoreceptors in the retina translate the image into electrical impulses which travel along the optic nerve and into the brain. The brain then interprets the signals and tells us what we are seeing. The best thing about the whole process is that all of this happens in mere nanoseconds. We take this wondrous ability to see things and the presence of an energy called "light", which makes vision possible, for granted. Without light, the universe would be dark, big and hidden away from our consciousness. Light is the connection between us and the universe and through light we can experience distant stars and look back at the beginning of existence itself. So, what is light?

Light is energy in the form of electromagnetic radiation with a wave-particle duality. When we say 'light', we generally refer to visible light which is a part of the electromagnetic spectrum that has wavelengths that range between 400-700 nm. All electromagnetic waves travel at a speed "c" which is approximately 3x10^8 m/s and have wave-particle duality. So what makes visible light so special? Why is it that our eyes can register only electromagnetic waves with wavelength between 400-700 nm?

The answer is simple - we have evolved eyes that can see exactly this part of the spectrum. This, however, is not a complete coincidence. Visible light is the only set of electromagnetic radiation that propagates well in water, which happens to be where most eyes first evolved millions of years ago. Light not only interacts with matter, it is also altered by it. This could be used to gather information about our surroundings. Hence, animals evolved eyes that could register light as a way to escape from predators. It was basically a survival mechanism. So, where does light come from?

When electrons in an atom drop from a high state of energy to a lower one, excess energy in the form of photons (elementary light particles) is released. This now brings us to the next big question - when was light first created? To answer this we must go back to the exact moment when the universe and time as we know it was created - The BIG BANG.



It is a common misconception that the big bang was an explosion. It was actually just a very very rapid expansion of space. According to the big bang theory, the universe is believed to have emerged from a point which was smaller than an atom. Due to reasons that are still unknown to us, the universe started to expand and give birth to all the matter and energy we know today. This might seem ridiculous if you think about it. But, scientists have found many evidences that support this theory. One of the most important evidence to support the big bang was the discovery of cosmic background radiations, a relic of the early universe, by accident in 1964. So, the present accepted theory for the origin of light is: the universe came into existence from nothing and started from a point called singularity that shot out matter and radiation (like radio waves) in all directions and then slowly started to cool. The universe was dark for about 200 million years, until gravity worked its magic. Dust particles began to clump together and started to form stars, thus, giving birth to light.

Light carries the information about the universe's origin and helps us understand the it better. We know now, from studying the redshift of light from various galaxies, that the universe is expanding and that the expansion is accelerated. Also, it is possible to find the chemical composition of stars by studying the absorption and emission spectra of stars. Light helps us detect black holes and, helps us see and identify quasars (the brightest objects in the universe). On the whole, light helps us see, appreciate and learn more about the universe around us.

S.Thillai Shanmughi

14/UPHA/052

HOW ARE STARS BORN?

Stars take birth out of clouds of hydrogen, helium and dust particles present in galaxies. Due to the turbulent motion in these gas clouds, the dust particles undergo random collision and condense under the influence of strong gravitational pull. As the gases and dust particles begin condensing, the temperature inside rises due to increasing pressure. As the condensing mass grows bigger, the gravitational pressure at the centre increases further till the intense heat raises the temperature to around 10 million ˚C . At this temperature, the hydrogen atoms start colliding so vigorously that they fuse with each other to form helium atoms. In the process, some mass is lost. For every 1000 kg of hydrogen used up, 993 kg of helium is formed. The rest is converted into tremendous amount of energy.

According to the relationship $E=mc^2$,

E – energy ; m – mass ; c – velocity of light .

This energy is liberated in the form of light and heat, and a star is born .

Once the hydrogen fuel at the core is exhausted, a star with at least 0.4 times the mass of the sun expands to become a red giant, fusing heavier elements at the core or in the shells around the core. The star then evolves into a degenerate form, disposing a portion of its matter into the interstellar environment where it will contribute to the formation of a new generation of stars with a higher proportion of heavy elements.

Nasrin Banu

14/UPHA/040

COLOURS OF A BUTTERFLY - PERCEPTION OR PIGMENT?

All of us have seen butterflies and admired their beautiful colours. So many of us would have wondered how these butterflies get such unique patterns and colours that are almost never repeated. The reason for this is in the nanostructures on the wings of the butterflies. During a study on a morpho butterfly wing, research showed that there are scales on the wings of the butterfly that help reflect light.

While examining the butterfly wing under an electron microscope, researchers observed that there are scales next to each other that have very different patterns. Nature has designed something so intricately that it's impossible to believe something so complex can be observed on something so small. On further observation, it was found that when white light hits these wings, it gets reflected numerous times and hence, we see colours of different wavelengths.

One wing of a moth has so many patterns (holes, scales, lines and petals) that are minute and invisible to the eye that it appears like the butterfly is simply absorbing pigment from the sunlight when, in fact, simple interference and reflection are taking place.

Another phenomenon which takes place is iridescence, which causes the butterfly to show different colours when seen from different angles. The blue colour on the morpho wing of the butterfly is because of the interference pattern caused due to varying refractive indices on the scales of the wing. It also depends on the distance between the scales and how white light reflects upon it.

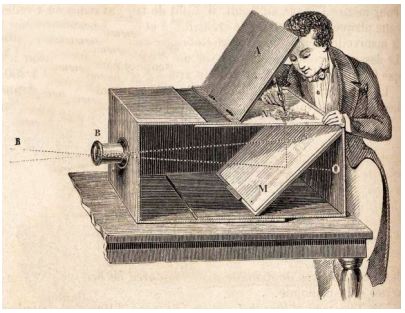
Anaam Qureshi

14/UPHA/050

TIMELINE OF LIGHT

In the beginning, God created the heavens and the earth. Then, God said, "Let there be light" and there was light. God saw that the light was good. Oh, don't get me wrong! I am not going to preach from the bible though I just quoted it. Since God said, "Let there be light", light has been encompassing us. We have travelled many years with it; from lighting a bulb to the largest of machineries. So, let's go into the stream.

Once upon a time, long, long ago, many philosophers considered the question of the nature of light. Some said it was a stream of particles while the father of physics, Isaac Newton, proposed the corpuscular theory. Then came Christiaan Huygens, Newton's rival, with the wave nature of light. It was not until hundred years later that Thomas Young showed that light exhibits interference.



The camera obscura - or the projector as we know it today - has a long history dating back to 400 BC. Mo-ti, a Chinese philosopher, believed that the image is flipped upside down because light travels in straight lines. Later, in 350 BC, Aristotle proved Mo-ti's theory that light travels in straight lines.

One wintery night, on 20th December 2013, the 68th session of the UN General Assembly proclaimed 2015 as the International Year Of Light and Light-based technologies. The year 2015 was chosen mainly because a lot of inventions and discoveries about light was done in years which ended with 5 like 1905 and so on. The reason for making 2015 the international year of light was to emphasise three major points: to recognize, to stress, to consider.

Light has a great power in the 21st century. The impact can be made even greater if coupled with co-operation. Discover the power of light and light up your lives.

Junia Shelomi Solomon

15/UPHA/048

LIGHT IS LIFE

Our world would come to a standstill and we would become extinct the moment the source of our life, the source of all life on earth, the Sun, becomes extinct.

It is estimated that the Sun's luminosity will increase in the next 4.8 billion years. Thereafter, the Sun will expand into its red giant phase and result in the end of life on Earth in 7.5 billion years.

For Indians in particular, light signifies life in more than one sense. Philosophically speaking, the sages have been urging us to see the light of wisdom in our lives. Religiously speaking, the sacred spaces like temples and churches are made more meaningful for the devotees when the lights of the lamps and candles fill the ambience. Light signifies not just the opposite of darkness, but also future, its associated hopes and the self-confidence that nurtures those hopes.

As students of Physics, our notions of light are grounded in the science of optics. We define light as visually perceived radiant energy. We define light as a small part of the electromagnetic spectrum, that is 380 nm to 700 nm. The optical and cognitive systems of human beings help us to see the objects and their colours effortlessly. The science of optics works in tandem with the science of colours. Short wavelength of light is blue and the longer wavelengths are yellow and red colours. Brightness of light is measured in lumens and colour temperature. Colour temperature refers to the potential of a light source to emit blue, orange or red colours in the range of 6000-2500 kelvins. Lumen refers to the quantity of light emitted by a light source and Watt refers to the quantity of electricity consumed by the light source.

Thus, it is essential to understand light better for a better life.

R Nandhini

15/UPHA/039

DID EDISON INVENT YOU?

Although it has been known for many years that living organisms emit light, this is the first time light emitted by humans has been captured on camera. The human body literally glows, emitting visible light in small measures. The weak light emitted by humans is the result of metabolic processes and is assumed to be the by-product of biochemical reactions involving free radicals produced through cell respiration. This weak light is 1000 times less intense than the level to which the naked eye is sensitive.

In order to learn more about this faint phenomenon, Japanese scientists employed an extraordinary experiment involving ultra-sensitive cameras capable of revealing the weakest light emitted by human body that is invisible to the naked eye.

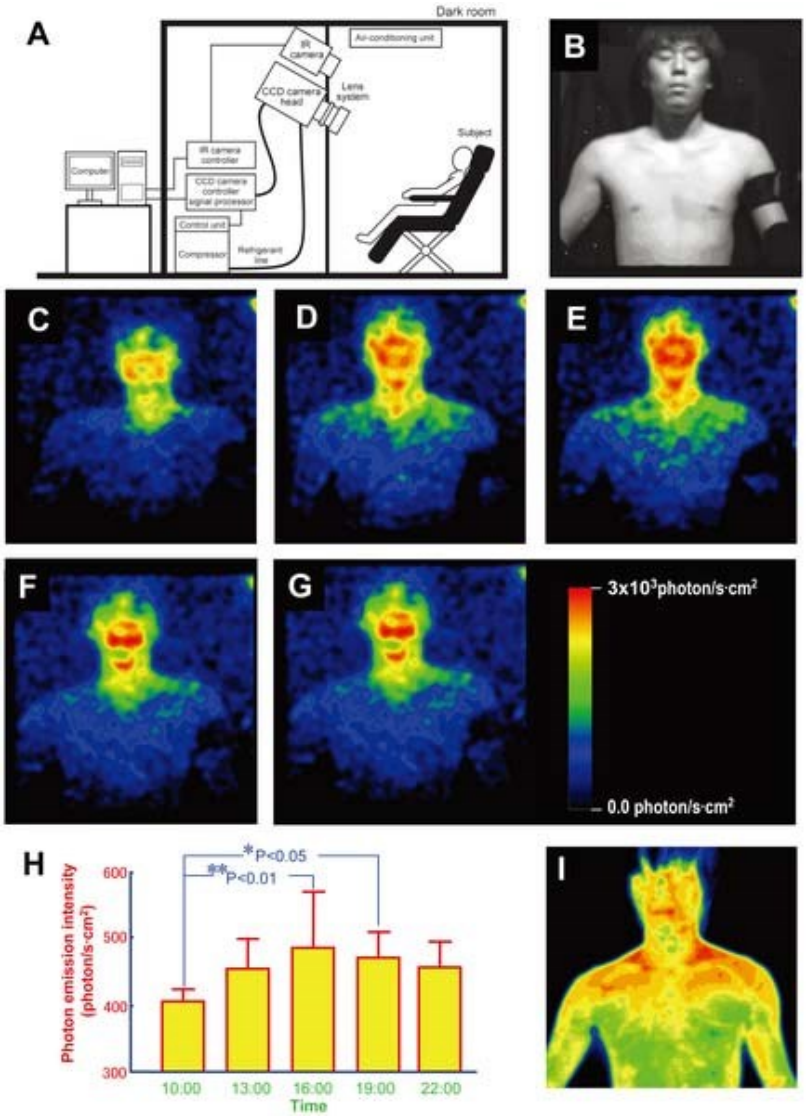
This experiment involved several steps, namely :

1. Five men volunteered to be a part of this experiment.

2. The five men were made to sit in a dark room bare-chested. The experiment was conducted every three hours from 10 am to 10 pm for three days.

3. Scientists found the emission of weak light, with its lowest point at 10 am and its peak at 4 pm.

4. It was noted that the face glowed the most of all parts of the body since it had direct and constant exposure to sunlight.



Researchers Masaki Kobayashi, Daisuke Kikuchi and Hitoshi Okamura carried out the experiment. Probably upon further research and study of this phenomenon, the practical applications of human bioluminescence may develop.

"Light can only be understood with the wisdom of darkness"-Anonymous

KEERTHANA S

15/UPHA/031

HOW I WONDER WHAT YOU ARE!

I wondered, I wondered what you are, Rainbow!

I wondered, what makes you this bright,

I wondered, what makes you colourful and glow,

I wondered at your beauty that caught my sight.

Your splendorous look, it melted my heart

Which said, "Be grateful! Bow down to Nature,

To God for giving rain, keeping our sins apart

And making happy every creature."

But gave me answer the Physics mind,

Laughed at my heart for being this kind,

And said, "It's sun's refracted rays forming a colorful spectrum

After rain, thus, Physics always explains the system."

Now I wonder at

Both the beautiful rainbow

And the Physics mind of man!

P.J.Dhanvarsha

15/UPHA/019

LIGHT ACCORDING TO SCIENTIST :

Light is an electromagnetic radiation having the property of dual-nature. It travels in straight lines with a velocity of 3X10^8 m/s.

LIGHT ACCORDING TO PHILOSOPHER :

The mind needs to be enlightened by light from outside itself, so that it can participate in truth.

-- Philosopher Augustine

LIGHT ACCORDING TO THE BIBLE :

Light is the removal of darkness.

LIGHT ACCORDING TO THE BHAGAVAD GITA :

Light is the spiritual substratum pervading all existence.

LIGHT ACCORDING TO THE QURAN :

Allah is the Light.

FAMOUS QUOTES :

There is a crack in everything. That's how the light gets in.

-- Leonard Cohen

Walking with a friend in dark is better than walking alone in the LIGHT.

-- Helen Keller

Deep in their roots, all flowers keep the light.

-- Theodore Roethke

There are two ways of spreading light: to be the candle or the mirror that reflects it.

-- Edith Wharton

Give light, and the darkness will disappear of itself.

-- Desiderius Erasmus

It is during our darkest moments that we must focus to see the light.

-- Aristotle Onassis

Caroline Kennedy

15/UPHA/013

LIGHT, MY FRIEND

We may not know,
What will come or go;
When the first morning LIGHT
Comes to shine on our life,
It will give us the clue
That everything is pleasant and new.
Our life has its challenges,
And its woes.
So just hold on to LIGHT, my friend,
And pray with all your might.
We will shine as a star in the sky,
And make everything bright as the LIGHT!

J. Fennyl Britto

15/UPHA/046

FUN FACTS

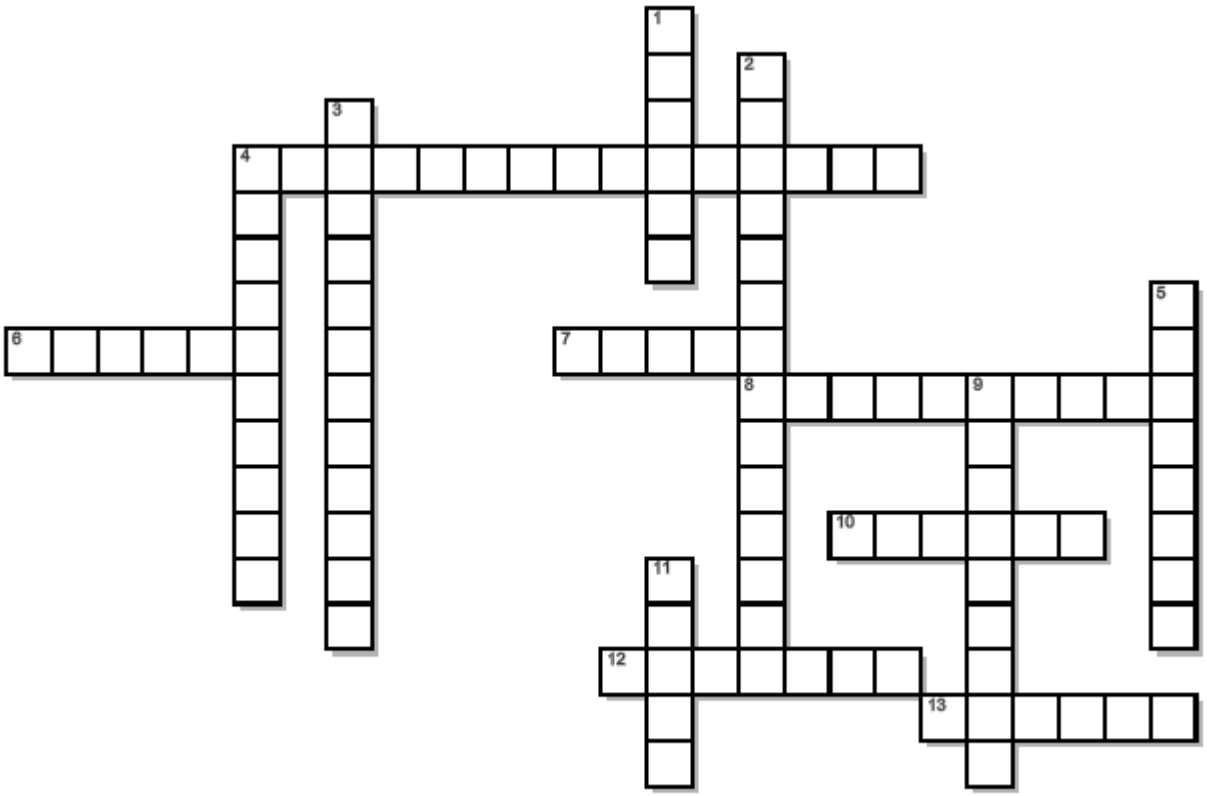
- Sunlight can reach a depth of 80 meters in the ocean. Roughly 2000 meters deeper lives the bioluminescent anglerfish, which has "lure" of glowing flesh to attract prey.
- Humans are bioluminescent from metabolic reactions, but our glow is 1000 times weaker than the naked eye can register.
- More than 1000 billion photons of light strike a tip of a needle every second (unless it is tucked quite deep in a haystack).
- The photic sneeze reflex which causes uncontrollable sneezing in the presence of bright light, affects roughly 18-35% of the population, though nobody is quite sure why. One suggested cure: sunglasses.
- The Centennial Light is the world's longest lasting bulb, other than during power cuts, it has only been turned off once for 20 minutes, since 1901.
- Niagara Falls was first electrically lit in 1879, using lights with illumination equivalent to 32,000 candles. Today, the lights at the falls are equivalent to 250 million candles-an increase matched only by touristy tackiness of nearby Clifton Hill.
- Frog's eyes are so sensitive to light that researchers in Singapore have used them to develop extremely precise photon detector.
- If the sun were suddenly snuffed, nobody on earth would notice until eight minutes and 17 seconds –the time taken for sunlight to reach us. But don't worry: sun has about 5 billion years of fuel left.
- To study how our eyes perceive colour, young Isaac Newton stuck needles in his eyes sockets to determine if colour was a product coming from outside the eye, or from within.(Answer: Both Rods in the eye react to certain electromagnetic frequencies).
- Fireflies emit cold light through a chemical reaction with near-100-percent efficiency. Scientists are working to mimic nature's design to make LEDs more efficient.
- The sun is actually white when seen from space, because its light is not scattered by the atmosphere. From Venus, you wouldn't see the sun at all because the atmosphere is too thick. And you'd be dead.
- A chameleon's eye have 360 degree arc of vision. It can rotate each eye independently of the other, and so, can see two directions at once.
- Birds have extra muscles around the lens, when the birds dive these muscles squeezes the lens to give sharper focus.
- Despite the name, black holes are actually the brightest objects in the universe. Even though we can't see past the event horizon, they can generate more energy than the galaxies in which they are housed. Black hole is so dense that not even light can escape its gravitational pull meaning it cannot be observed directly but detected by observing the behaviour of space around it.
- The Copila is a marine animal that has eyes which works like television cameras do. It has two lenses and a retina that scans each image 10 times for better picture quality.

- The octopus, cuttlefish and squid have special cells that are filled with different coloured pigments. The size of these cells can be controlled by the brain, e.g., by making the red cells large and all the other sells small, the animals can produce a red colour over its body to signify that it is angry.
- The hatchet fish found only in the deep sea, has sides that are covered with large silver scales that act like mirrors, and two rows of light-producing organs on its underside. The effect is to make the fish invisible to its enemies.
- One of the many things Italian scientist Galileo Galilei worked on was telescopes, producing telescopes with around 30x magnification in some of his later work. These telescopes helped him discover the four largest moons orbiting Jupiter (later named the Galilean satellites).
- A 100W light bulb left on for just 30 minutes creates enough CO_2 to fill a party balloon.
- The effect of Relativity made Astronaut Sergei Avdeyev a fraction of a second younger upon his return to Earth after 747 days in space.
- Because of differences in gravity, a 200 pound person would only weigh 76 pounds on Mars- gravity facts.
- Electric eels can stun both predators and prey with electric shocks of around 500 volts -electricity facts.
- Uranus is the only planet in our solar system that rolls on its side like a barrel, while Venus is t1he only planet that spins in the opposite direction to Earth.
- The mass of our entire atmosphere is estimated to be some 5.5 quadrillion tons (55 followed by 14 zeros).
- If you yelled for 8 years, 7 months and 6 days, you would have produced just enough sound energy to heat up one cup of coffee.

WORD SEARCH

N U L E E E A M E L L O E O B
E F L C O U L O M B M B E E M
L R A C A D D E L A C S A P D
E A K L M E W E R S H I E A T
N E N R E M A G U E U L R M L
O Z B R Y O O Q R C U A T P R
N R R C N L A T E O F Q E E N
L O W E I E Z X J N E E C R T
T H T K B H O E B D X N E E R
A M L W L X C Y X U E B S T B
V E A M E U R E O M E L M E H
M O M T K N X C B W A T T M L
A A Q N E O Q B Z Z L L R E C
U O L H C E L A C O E N D Q E
W A O E C L W O B C T A M R F

CROSSWORD



ACROSS

4 Production and emission of light by a living organism

6 He discovered dispersion of light

7 Highest point on a transverse wave

8 What kind of nebulae are typically blue in colour

10 The main type of galaxy in our universe

12 He proposed the wave nature of light

13 Clear tough membrane of eye that lets light enter

DOWN

1 Stars are made up of

2 'Braking radiation' also known as

3 3-D movies exist because

4 Failed star

5 Largest moon in our solar system

9 EM radiation emitted when a charged particle passes through a dielectric medium at a speed greater than the phase velocity of light

11 He discovered interference of light

ANSWERS

WORD SEARCH

- Coulomb
- Pascal
- Kilogram
- Ampere
- Becquerel
- Farad
- Henry
- Hertz
- Joule
- Kelvin
- Lux
- Meter
- Mole
- Newton
- Ohm
- Second
- Tesla
- Weber
- Volt
- Watt

CROSSWORD

ACROSS

4 Bioluminescence
6 Newton
7 Crest
8 Reflection
10 Spiral
12 Huygens
13 Cornea

DOWN

1 Plasma
2 Bremsstrahlung
3 Polarisation
4 Brown dwarf
5 Ganymede
9 Cherenkov
11 Young

MICROWAVE SYNTHESIS OF NANO-CRYSTALLINE THERMOELECTRIC MATERIALS

Thermoelectric materials are materials which can convert a temperature difference into an electric potential and vice versa. These materials can be highly useful in power generation as large amount of waste heat can be converted into electricity. Research is going on in this field so as to increase the thermoelectric efficiency of these materials. The efficiency of a thermoelectric material is dependent on its figure of merit (ZT) which in turn is directly proportional to its electrical conductivity and Seebeck coefficient and inversely proportional to its thermal conductivity. A figure of merit of 3 or more is essential for industrial use. After extensive research, it has been found that **Bismuth Telluride** is a potential candidate for this application. The main aim of my research project in Pondicherry University was to increase the figure of merit of Bismuth Telluride by employing the **Microwave Synthesis** method and a Multimode Microwave Synthesiser was used for this purpose. This method was employed in order to reduce its grain size which affects the lattice thermal conductivity, the main contributor to the total thermal conductivity. Moreover, the samples synthesized by this method are extremely pure. Addition of dopants can increase the Seebeck coefficient and hence Antimony was added in different proportions to observe the effect of dopants on Bismuth Telluride. A few characterizations on the samples such as Raman and FTIR Spectroscopy were also done. I am currently working on the other dopants that can be added and a few other characterizations like Physical Property Measurement to measure the figure of merit. I am looking forward to presenting and publishing a paper on my work.

Sindhujha K

Under the guidance of Dr. Ramaswamy Murugan,

Department of Physics, Pondicherry University.

NONLINEAR ORDINARY DIFFERENTIAL EQUATIONS

As part of the IAS Summer Research Fellowship Programme, I worked for two months at Bangalore University under the guidance of Prof. I. S. Shivakumara. During my fellowship, I concentrated on studying ordinary differential equations paying special attention to nonlinear ones.

Nonlinear systems crop up everywhere. Most continuous physical systems in nature are mathematically modelled as nonlinear differential equations. These systems are often impossible to solve by analytical methods. Therefore, in order to study the behaviour of the system described, one may either reduce the nonlinear system to a linear one by

approximation. Else, one may preserve the nonlinearity of the system and resort to studying the phase portrait of the system to understand its behaviour without actually solving the differential equation. I studied the latter.

I began by reviewing the concepts of elementary linear and nonlinear ordinary differential equations and tried to understand their various applications. Then, I began to study the numerical and geometrical tools used to describe the nature of the solutions of nonlinear ordinary differential equations. I learnt that identifying the stability and position of the equilibrium points and their bifurcations on variation of parameters is essential in understanding the behaviour of the system.

I spent most of working hours referring to various books at the Raman Research Institute and Indian Institute of Science libraries. I also began using the software *Mathematica* as recommended by my guide. It was very useful in studying the nature and properties of the solutions of various differential equations that cannot be solved analytically.

Throughout the project, I studied Edward Lorenz's paper on *Deterministic Non-periodic*

Flows in an attempt to know and understand the Lorenz System described. Most of my research was based on this paper.

Hridya V Varma

Under the guidance of Dr. I. S. Shivakumara,

Department of Mathematics, Bangalore University.

STUDY OF POPULATION DYNAMICS

Population dynamics studies why and how populations change spatially and temporally. Broadly, population models can be classified into:

(i) Continuous growth model. Human population, for example.

(ii) Discrete growth model. Annual plants, for example.

Continuous growth is modelled using differential equations. Discrete growth is modelled using difference equations, also called maps.

During these first four weeks of the program, emphasis was on understanding discrete growth models, particularly the logistic growth model. In general, a discrete growth model is given by:

$$x_{n+1} = f(x_n)$$

where x_{n+1} and x_n are populations (appropriately scaled to take values between 0 and 1) at n^{th} and $(n+1)^{th}$ generations. The logistic growth equation is given by:

$$x_{n+1} = rx_n(1-x_n)$$

The above function $f(x_n)$ gives a convex downward parabola. We find that there are two fixed points and one stable fixed point for the above equation for $0 < r < 3$. For $r > 3$, the population begins to show period 2 oscillations. On further increasing value of growth rate, the dynamics eventually becomes chaotic via period doubling cascade. This behaviour can be observed in the bifurcation diagram of the logistic map. Simulations were carried out in Python to understand how the population changes over time and with change in growth rate value in the logistic growth model. Also, the same was done analytically. Subsequently, the logistic model was used to understand host-parasite dynamics by assuming the interactions obeyed Poisson distribution. Therefore, if H_{n+1} and H_n are host populations and P_{n+1} and P_n are parasite populations, then for a given searching efficiency beta,

$$H_{n+1}=rH_n(1-H_n)e^{-\beta Pn}$$

$$P_{n+1}=H_n(1-e^{\beta Pn})$$

Another discrete growth model, Ricker growth model, is given by (symbols have their usual meanings):

$$x_{n+1}= x_n e^{r(1-Xn)}$$

The above function $f(x_n)$ decreases asymptotically to 0. The system has two fixed points, one of which is stable, for $0 < r < 2$. For $r > 2$, population displays period 2 oscillations. Eventually, on continuously incrementing growth rate, the dynamics become chaotic via period doubling cascade.

Over the weeks, group meetings were organized. These helped me gather an insight into varied areas of study. Lectures on linear algebra and behavioural ecology were also organized.

J Ashreya

Under the guidance of Prof. Somdatta Sinha,

Department of Biological Sciences, Indian Institute of Science Education and Research - Mohali.

A STUDY ON NANOPHOTONICS AND SYNTHESIS OF NANOMATERIALS BY ABLATION

Nano-photonics or nano-optics is the study of the behaviour of light on the nanometre scale and of the interaction of nanometre-scale objects with light. This is the field in which I did my summer internship at International School of Photonics (ISP), Cochin.

This area of nanoscience, called nanophotonics, is defined as "the science and engineering of light matter interactions that take place on wavelength and sub-wavelength scales where the physical, chemical or structural nature of natural or artificial nanostructured matter controls the interaction". Nanophotonics means different things to different people. Some consider near–field microscopy, an aperture-less technique used to enhance light interaction at nanoscale dimensions with the use of nanoscale tips, nanospheres etc., as the major thrust of nanophotonics. Others consider nanophotonics to be focused in 'photonic crystals' which are periodic optical nanostructures that affect the motion of photons in much the same way that ionic lattices affect the electrons in solids. Nanomaterials exhibiting size-dependent optical properties has been of keen interest to researchers in this field. These are quantum mechanically confined structures.

In the above discussed field of nanophotonics, I was interested in studying the optical properties of nanomaterials. At ISP, most of their research work focuses on the area of synthesis of nanomaterials using ablation.

Laser ablation is the process of removing material from a solid (or occasionally liquid) surface by irradiating it with a continuous laser beam of high intensity. A laser differs from other sources of light in that it emits light coherently. Laser induced augmentation of silver nanoparticles to nanowires in ethanol fostered by Poly Vinyl Pyrrolidone intrigued me**.** This work is of great interest to scientists as this can lead to the formulation of a simple method to prepare nanowires using photo irradiation technique. Nanowires so formed are polycrystalline.

Nanophotonics, in its broader vision, offers opportunities for interactions among many traditionally disparate disciplines of science, technology and medicine.

Riya Thomas

Under the guidance of Dr. M. Kailashnath,

International School of Photonics, Cochin University of Science and Technology.

ACTIVITIES OF THE DEPARTMENT

The activities of the department commenced with an exhibition on nuclear power plants organised by the Indira Gandhi Centre of Atomic Research as part of the diamond jubilee celebrations of the Department of Atomic Energy, Government of India. A state-level inter-collegiate science quiz was conducted in Stella Maris College from 22nd to 23rd July 2015. It was a proud moment for our department when Ashreya, Dravina and Hridya from 3rd year bagged the first prize. All the semi-finalists from across 6 zones in the state were given an opportunity to visit the IGCAR campus and receive their prizes from Dr. R. Chidambaram, Principal Scientific Advisor, Government of India.

The annual inter-collegiate technical fest of the Department of Physics "Electra" was revamped into "Illuminations" giving it a new structure and face altogether. The day, October 7, 2015 commenced with an inspiring speech by the chief guest, Dr. Rita John, a distinguished personality in the field of condensed matter physics. Being an alumna of our college, her speech motivated the students tremendously.

The events of the day included potpourri, quiz, paper presentation ,poster making, comic strip, variety and debate. New events like debate and potpourri received much appreciation. The events were received with enthusiastic participation from students from about 15 colleges across the city. The day concluded with Loyola college emerging as the overall victors.

The final year students organised an excursion in the beginning of October. The forty students were accompanied by Dr. Rajini and Ms. Suganthi. The three-day trip to Ooty and Black Thunder was thoroughly enjoyed by the staff and students alike.

The science departments of Stella Maris College are active beneficiaries under the star college scheme initiated by the Department of Biotechnology (DBT), Ministry of Science and Technology, Government of India. As part of the 30th anniversary celebrations of the DBT, two colleges were chosen from Tamil Nadu to actively conduct student centric activities. The science departments of our college organised events ranging from project exhibitions and poster presentation to flower arrangement and adzap.

The Physics department organised two events for the same. The first event was a lecture followed by an inter-collegiate poster presentation held on 21st January 2016. The lecture titled "Phenotypic constraints drive the architecture of metabolic networks" was delivered by Dr. Areejit Samal. The poster presentation was themed on "Biophysics". Teams from Loyola College and DG Vaishnav College were tied for the first place.

The second event in the series was an exhibition conducted by all the four departments of science on 29th January 2016. Along with the exhibition, a quiz for school students was organised by Department of Physics and 1st prize was awarded to the students of Vidya Mandir Senior Secondary School. The valedictory lecture was given by Dr. Anju Chadha, professor of Biotechnology, IIT Madras on interdisciplinary biotechnology. This was followed by the prize distribution and the day came to an eventful close.

ACHIEVEMENTS

III YEAR STUDENTS

Antonita R:
Placed 3rd in face painting competition at Physica '15, Loyola College.

Anu C:
Placed 2nd in collage making competition at Reverberations, CTTE College.
Summer intern at Indian Meteorological Department, Chennai.

Archana R:
Placed 3rd in model making at Physica '15, Loyola College.
Summer intern at Indian Meteorological Department, Chennai.

Ashreya J:
Placed 1st in quiz and potpourri at Physica '15, Loyola College.
Awarded the Indian Academy of Sciences Summer Research Fellowship 2015 to work in IISER Mohali.
Summer Fellow at Institute of Mathematical Sciences, Chennai.
Placed 1st in State level IGCAR Science Quiz.

Dravina S:
Placed 1st in quiz and potpourri at Physica '15, Loyola College.
Placed 1st in JAM at Cherenkov '15, Anna Adarsh College.
Placed 1st in State level IGCAR Science Quiz.

Hridya V Varma:
Awarded the Indian Academy of Sciences Summer Research Fellowship 2015 to work in Bangalore University.
Placed 1st in State level IGCAR Science Quiz.

Madhuvanti Soman:
Placed 1st in treasure hunt at Physica '15, Loyola College.
Summer intern at Indian Meteorological Department, Chennai.

M Margreat Angelin:
Placed 3rd in face painting competition at Physica '15, Loyola College.

Narmadha A:
Placed 3rd in model making at Physica '15, Loyola College.

Niveditha R:
Placed 1st in treasure hunt and quiz at Physica '15, Loyola College.
Placed 2nd in quiz and 1st in collage making competition at Reverberations, CTTE College.
Placed 1st in potpourri at Cherenkov '15, Anna Adarsh College.
Awarded the Indian Academy of Sciences Summer

Ricia Margaret S:	Placed 2nd in collage making competition at Reverberations, CTTE College.
Riya Thomas:	Placed 2nd in quiz and 1st in collage making competition at Reverberations, CTTE College. Placed 1st in potpourri at Cherenkov '15, Anna Adarsh College. Placed 1st in potpourri at Physica '15, Loyola College. Summer intern at International School of Photonics, Cochin.
Sindhujha K:	Placed 1st in treasure hunt at Physica '15, Loyola College. Placed 1st in potpourri at Cherenkov '15, Anna Adarsh College. Summer intern at Pondicherry University.
Bruntha A, Junita J,: Shainy Infanta, Hinduja T, Vinnarasi N, Asha A	Summer interns at Indian Meteorological Department, Chennai.

II YEAR STUDENTS

Anu Graha:	Placed 2nd in quiz at Cherenkov '15, Anna Adarsh College.
Derimis:	Placed 2nd in treasure hunt at Cherenkov '15, Anna Adarsh College.
Dorothy:	Placed 2nd in treasure hunt at Cherenkov '15, Anna Adarsh College.
Fathima:	Placed 2nd in quiz at Cherenkov '15, Anna Adarsh College. Placed 1st in paper presentation at Reverberations, CTTE College.
Jerline:	Placed 1st in paper presentation at Reverberations, CTTE College.
Nishitha:	Placed 2nd in treasure hunt at Cherenkov '15, Anna Adarsh College.
Shifana:	Placed 3rd in comic strip at Physica '15, Loyola College.
Sylvia:	Placed 3rd in comic strip at Physica '15, Loyola College.

GALLERY

ILLUMINATIONS'15

Dr. Rita John being felicitated at Illuminations '15

Illuminations'15 inauguration

Workshop on microprocessors and microcontrollers

Third year students at Botanical Garden, Ooty

Champions at Physica '15, Loyola College

Dr. Areejit Samal interacting with young minds

Judging the poster presentation competition

Inauguration of the science exhibition

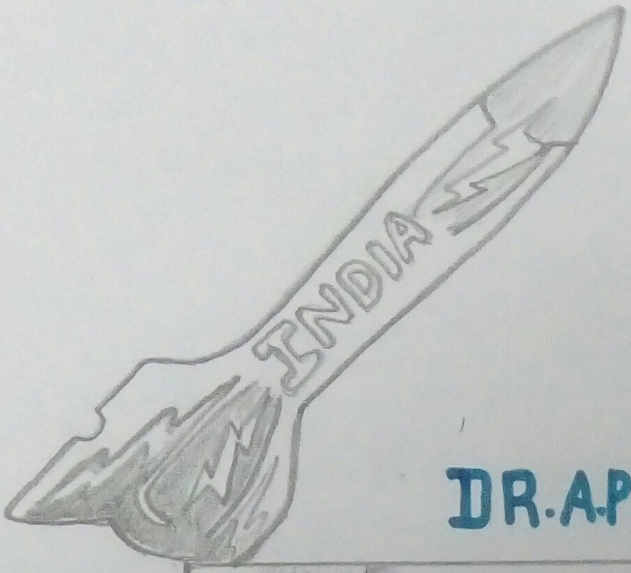
Prof. Sultan Ismail engaging with students

Conducting a workshop for school students

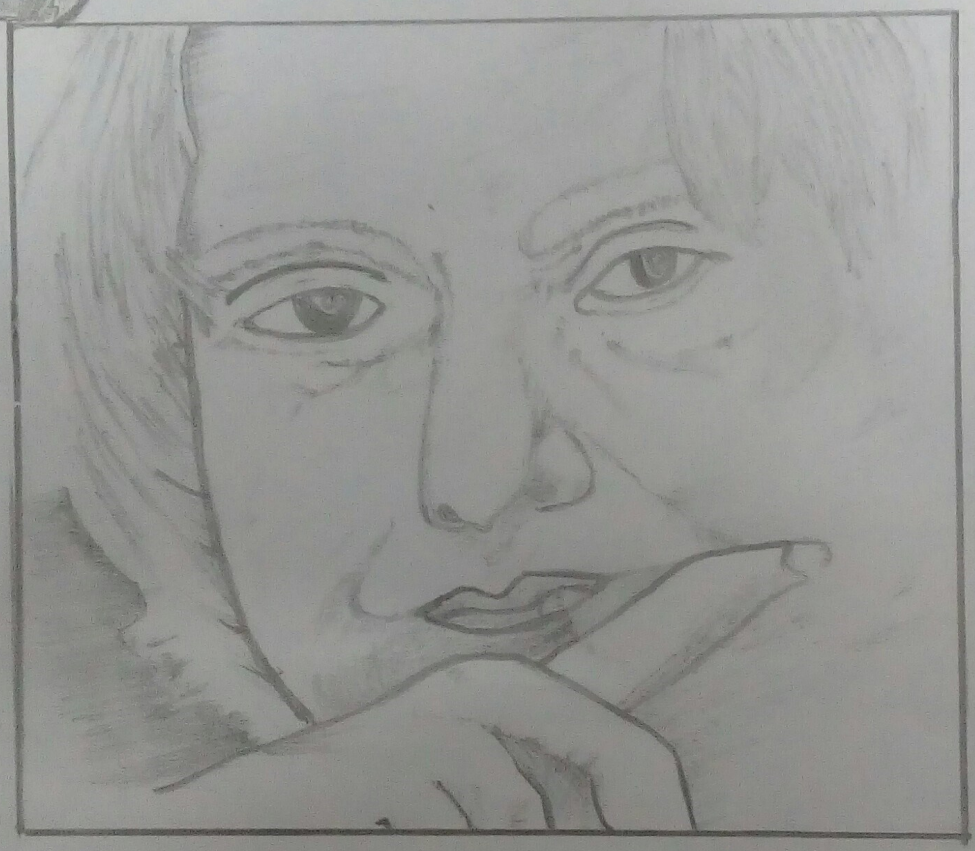
Winners of the science quiz - Vidya Mandir

Faculty and supporting staff

Third year BSc Physics



DR.A.P.J.ABDUL KALAM



" Unless India Stands Up To
The World, No One Will Respect Us.
In This World, Fear Has No Place.
Only Strength Respects Strength."

- Anugraha, 2nd year, BSc Physics

sponsored by