Cosmic Dive
into the unknown dimension...

BIG-BANG:
the theory of Origin

Transcendent Odyssey

Your sky this Session
the unparallel minds

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From the Director’s Desk

Wonderful to see NIST Astronomy Club launching their Quarterly Newsletter “Cosmic Dive.” This is a unique effort and will go a long way to reveal the mysteries of the space. 

Best wishes,

Sangham Misra
July 31, 2015

From the Placement Director’s Desk

Dear Members of the Astronomy Club and all students,

Congratulations to the Astronomy Club for starting their new quarterly astronomy based magazine “Cosmic Dive” for the first time in Odisha. This magazine gives information about the astronomical findings of the club.

This magazine covers everything in Astronomy like astrophysics theories, astrophysicists, the latest astronomical gadgets and sci-fi fictional stories.

I wish this magazine great success.

Placement Director
From The Editors’ Desk

It is our proud privilege and profound ecstasy to introduce the first ever version of the exhilarating tour of cosmos to our readers through our magazine “Cosmic Dive”. We admire it as a reader friendly approach which aims at disseminating valuable and yet precise information at the doorstep of every curious thoughts. The ubiquitous enigmatic knots which have baffled numerous generations preceding us has been lucidly explained by simplest and most established approaches of physics thereby unravelling the age old mysteries. It is our prime agenda to ignite a sense of awareness among the common masses about the universal happenings around us and nourish the tendency of answering the unusual events. According to Sir Albert Einstein “Anyone who doesn’t get awestruck by the beauty of universe is as good as dead.” Hence to yield his belief our magazine makes sincere efforts to foster a feeling of admiration in everyone by taking a dive into the eternal cosmos where occurrences are yet to be unveiled.

We express our humblest gratitude to every individual who have been directly or indirectly linked with us in our quest in exploring the unknown and simultaneously bringing up the facts to limelight with a motto of creating public awareness.

After all “Mystery creates wonder and wonder is the basis of man’s desire to understand.”

-Nell Armstrong

TRIBUTE

Our nation suffered a great tragedy on 27th July 2015, when we lost our honourable former president Dr. A. P. J. Abdul Kalam.

Dr. Kalam was a career scientist and studied physics and aerospace engineering. He was one of very few scientists sent to National Aeronautics and Space Agency (NASA) in USA for training of ‘sounding rockets’. Because of his work in development of ballistic missile and launch vehicle technology, he came to be known as The Missile Man of India. He was recipient of several prestigious awards and recognitions, like Bharat Ratna which is India’s highest civilian award.

Dr. Kalam was known as people’s president because of his connectivity with the masses, particularly the youth of India.

It was in IIM Shillong that we last heard Dr. Kalam, where he was giving speech about Livable Planet. During the speech, he collapsed and later died due to massive cardiac arrest. A seven-day state mourning has been declared in India to honour the life of our former president.

We pay our rich tribute to the nation builder, India’s ‘Missile Man’ who was country’s 11th president.

Dr. Kalam, you have been a great inspiration to many aspiring scientists and the youth of India. Thank you for all your efforts and contributions for the development and growth of our nation.

If a country is to be corruption free and become a nation of beautiful minds, I strongly feel there are three key societal members who can make a difference. They are the father, the mother and the teacher.

DR. APJ ABDUL KALAM
Have you ever stared at the wondrous night sky? A spectacular, stunning, exhilarating, sublime view captures our imagination. And have a look on the world around us. First thing of life with natural charm never ceases to wonder. Surprisingly, everything we visualise comes from one miraculous moment- “The Big Bang”. The Big Bang was more than the creation of matter. It was the creation of the universe which actually means the creation of ‘Space’ and ‘Time’. Creating space, time and everything is a pretty neat trick. Obviously it happened but so far physics hasn’t figured out how. But we know that it was the beginning of the 1st second. Here the time started from zero. It is very interesting to know that all we see around- The world, all 100 billion galaxies each of which contains nearly 100 billion stars were compressed in a region which was infinitely small having an infinite density(imagine that of a pinhead). Approximately 13.8 billion years ago, the matter inside it started to expand which is termed as Inflation. At this instant time and space were born. The Big Bang is the most accepted theory for how the universe began. It was not an explosion. It did not occur inside anything. It was the stage for all physical laws. Universe spread-out with superluminal speed (faster than speed of light). Initially, the temperature and pressure of the universe was very high. After gradual expansion universe continued to decrease in density and temperature resulting in the decrease of typical energy of each particle. With the flow of time, basic particles started to combine to form new complex particles. New elements were created (Only group-1 and 2 elements were formed). About 13.3 billion years ago, the 1st generation stars were evolved. The stars actually originated from Nebulas (cloud of dust, hydrogen, helium and other ionized gases). But phenomenon such as Supernova triggered the existence of heavy elements. And such millions of stars came into being aggregated around a common centre giving birth to a formation called Galaxies. About 4.6 billion years ago, the Protoplanetary disc of our solar system formed planets (even this Earth and the Moon). Initially the Earth was a ball of fire which contained only volcanoes and magmas. The whole new born planet was disrupting the possibility of any life. There was no water, no ideal atmosphere to furnish life. But as time passed, the Earth cooled down slowly. Then somehow this planet got an atmosphere and water. Then, it was the turn of the 1st living cells to survive in it and welcome life. Due to the presence of suitable atmosphere, organisms survived. It is said that the first cell emerged at 3.8 billion years ago, approximately 750 million years after Earth was formed. During the next years the Earth gave opportunities to many types of organisms to grow. About 228-200 million years ago, Coelophysisis- the first dinosaurs appeared on the Earth. Meanwhile, 258-187 million years ago, Cynodont- the 1st mammals appeared on this Earth. Besides this, the geographical positions of the continents were also changing during this period. Continents that used to be attached with each other during the formation of Earth were departing from each other which can be seen from the present geographical scenario of the Earth. Then 65 million years ago, something terrible happened that shattered the whole Earth. A meteorite collided with the Earth and the shock waves were so powerful that they terminated most of the living species of Earth. For many years, the Earth’s surface was devoid of sunlight. Every part of the Earth was covered with ice which is why this span of time came to be known as the Ice Age. But the fate of the Earth was something else. In spite of this mammoth tragedy around 50-40 million years ago, Earth managed to change its atmospheric conditions and generated the suitable conditions for a renewed beginning of life. But this time, there were no Dinosaurs. The planet eventually became the abode of many species of mammals. 20 million years ago, our ancestors Homo sapiens appeared on Earth. And by this way humans evolved........

**Supernova**-An event of exploding star more massive than the sun.

**Protoplanetary disc**-The disc made up of hot gases to make a new planet.
UNPARALLELED MINDS

THE VIRTUAL TIME-TRAVELLER

Study of astronomy in modern times revolves around certain masterminds whose contribution towards this field is so enormous that if their views are discarded then even a stare towards the night sky would be frivolous. **Stephen Hawking** comes under such revered category. Born on 8th January 1942 in St Albans he was drawn to Physics and Mathematics as he believed they offered the most fundamental insights into the world. He completed his doctorate from Cambridge University. Soon after a rare motor neurone disease had ravaged his body, he could no longer walk or feed himself, used an electric wheelchair to get around, and exalted his speech so much that many struggled to understand him. Hawking is now working on one of science's most inexplicable ideas – *black holes* which is an extreme prediction of Einstein’s general theory of relativity. They are created when huge stars collapse to zero size and infinite density. Hawking realised that black holes can also be stated as the **Reverse Big Bang**, justifying the Big Bang really happened. Hawking realised black holes could be a way to explore physics’ holy grail: a unified theory that combined general relativity with quantum mechanics describing universe at cosmic scale and subatomic scale respectively. His attempts to combine them produced a surprising result – *that black hole should shine*. This effect is now known as 'Hawking radiation'. In 1974 he was elected as one of the youngest fellow of the Royal Society, aged 32. Aged 35, Hawking became Professor of Mathematics at Cambridge – a post held by some of Britain’s most important physicists including Newton. Hawking's ‘**A Brief History of Time**’ was the best-seller of all times. It lucidly explains the theory of *space time continuum* as proposed by Albert Einstein and also theoretically explained travel across time is possible if a *stable wormhole* can be created. He had presented a documentary series, 'Stephen Hawking's Universe', guest starred on ‘Star Trek: The Next Generation’ and lent his distinctive voice to Pink Floyd's album ‘The Division Bell’. In 2004, he came up with a bold new idea underpinning quantum theory that physical properties of subatomic particles (or 'information') cannot be destroyed. For years, Hawking argued that black holes don't destroy information, but have never shown how. At a conference, everyone expected a defiant defence of his ideas. Instead Hawking made a startling U-turn stating that the information is transmitted into other universes (as proposed by M-theory).The idea is still controversial and is under serious interrogation.

*Nevertheless we express our heartfelt gratitude to this brilliant mind which never knelt before any ordeal rather enlightened us with his unparalleled thinking.*

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<th>PROGNOSTIC X 30</th>
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<td><strong>1. August 12, 13 - Perseids Meteor Shower</strong>. The Perseids is one of the best meteor showers to observe, producing up to <strong>60 meteors</strong> per hour at its peak. Resplendent vision is guaranteed from any dark location after midnight. The shower runs annually from <strong>July 17 to August 24.</strong></td>
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| **2. Major constellations seen in August sky**  
a) Scorpius   
b) Ursa Major   
c) Libra   
d) Sagittarius |
| **3. Saturn**- Have a glimpse of Saturn (the planet with enchanting rings) in the southern sky at an angle of 50° from the horizon. Being a planet it will not twinkle and is easily recognisable. |
| **4. Mars**- The Roman god of war will be seen in the eastern sky during the whole month. The red planet can be seen by a binocular. It will not twinkle. |
SEXTANT CUM DHANURYANTRA

Sextant is a doubly reflecting navigation instrument with a graduated arc of 60 degree and a sighting mechanism, used for measuring the angular distances between objects and especially for taking altitudes in navigations and surveying. It was first implemented in 1730 by John Hadley and Thomas Godfrey. It was also found later in the unpublished writings of SIR ISAAC NEWTON (1643-1727).

The primary use of sextant is to determine angle between an astronomical object and the horizon for the purpose of celestial navigation. This process of determining angle is known as “sighting”. The angle and time when it was measured can be used to calculate a position line on an aeronautical chart. It also sights the sun at solar noon or Polaris at night to determine latitude and also measures the lunar distance between the moon and celestial object in order to determine “Greenwich mean time” and hence longitude.

It allows the celestial objects to be measured relative to the horizon with excellent precision. It also allows direct observations of stars. A sextant neither require a complete steady aimnor is dependent upon electricity or anything human controlled (like GPS satellites). This is why it is considered as an eminently practical back up navigation tool.

This year NAC (NIST Astronomy Club) gave a shot to design a tool which is inspired by the above described instrument, which was named as “DHANURYANTRA”. The concept which have used in the design is inspired by the ancient Indian astronomer PATHANI SAMANTA’S magnum opus “SiddhantaDarpan”. It is aconical shaped instrument having a radius of 57.3 units making an angle of 30 degree with the horizontal. It measures the angular displacement between two stars.

MILESTONE CONQUERED

NASA's three-billion-mile journey to Pluto reaches historic encounter
After a decade-long journey (Launched on 16 January 2006) through our solar system, New Horizons made its closest approach to Pluto on Tuesday i.e. 14th July 2015, about 7,750 miles above its surface.

ISRO’s commercial launch capability reached a new height on Friday (10th July 2015) night when it successfully launched five satellites for the UK. Polar Satellite Launch Vehicle (PSLV-C28) lifted off from the SatishDhawan Space Centre in Sriharikota at 9.58pm. A triumph for ISRO’s genius!!!

Five stars system discovered
The first ever family of five stars bound to each other by gravity has been discovered by astronomers of the Open University, UK. This bizarre system is located around 250 light years away from us in the constellation of Ursa Major.
**EVER THOUGHT OF...**

1. **Coldest place in the universe.** It is on Earth, in Wolfgang Ketterle's lab in Massachusetts (810 trillionth of a degree Fahrenheit above absolute Zero (-459.67°F)). The second being the Boomerang Nebula at temperature -457.87°F.
2. **Moon abandoning us.** Every year, the Moon is moving away from Earth by 3.78 centimetres. Interestingly, the reason of such an action is due to Earth’s tides.
3. **Astronomer’s fate.** In space, astronomers can get taller, but at the same time their hearts can get smaller.
4. **Seasons in Venus.** It does not have any seasons at all. Part of the reason is the fact that the axial tilt of Venus is only 2.7° which makes “Summer and Winter” alike. (Axial tilt of earth is 23.5°). Other part of the reason is contributed to its thick atmosphere. (93 times that of Earth.)
5. **Movement of Venus.** It takes 224.65 earth days to complete its orbit around sun and 243 earth days to rotate around its own axis. This makes days on Venus longer than its year.
6. **Jupiter's day.** It has the shortest day of all the planets of our solar system. Its turns in its axis once every 9 hour and 55 minutes.
7. **Sun's motion.** Our sun is not static; it revolves around the galactic centre with the speed of 220 kilometres per second and takes 225-250 million years to complete one revolution.
8. **Pre-death of a star.** The repulsion among subatomic particles holds the star when it ends up burning its fuel.
9. **Brightest star.** The pistol star is the most luminous star known 10 million times the brightness of the Sun.
10. **Voyager's intention.** NASA has sent golden disc to end of our solar system with its voyager mission which contains sounds of earth with hope that someday some other civilisation will come to know about our planet earth.
11. **Universe's largest structure.** It is found in our universe named as the Sloan Great Wall, a super cluster of galaxies 1.37 billion light years wide.
12. **Eternal Fluid.** Helium is the only substance in the universe that cannot be in solid form. It can't be cold enough.

**INFORMATION LOADING....**

1. **Absolute Magnitude:** A scale for measuring the actual brightness of a celestial object with accounting for the distance of the object.
2. **Absolute Zero:** The temperature at which the motion of all atoms and molecules ceases and no heat is given off. Absolute zero is reached at 0 degrees Kelvin or -273.16 degrees Celsius.
3. **Ablation:** A process by which the atmosphere melts away and removes the surface material of an incoming meteorite.
4. **Accretion:** The process by which dust and gas accumulated into larger bodies such as stars and planets.
5. **Accretion Disk:** A disk of gas that accumulates around a centre of gravitational attraction, such as a white dwarf, neutron star or a black hole.
6. **Angular Size and Distance:** The apparent size of an object in the sky, or the distance between 2 objects, measured as an angle
7. **Aperture:** The diameter of a telescope’s main lens or mirror – and the scope’s most important attribute.
8. **Asterism:** Any prominent star pattern that isn’t a whole constellation, such as the Northern Cross or the Big Dipper.
9. **Asteroid (Minor Planet):** A solid body orbiting the sun consists of metal and rock. Most are only a few miles in diameter and are found between the orbits of Mars and Jupiter.
10. **Astronomical Unit:** The average distance from Earth to the Sun, slightly less than 93 million mile.

The Sloan Great Wall
BEYOND THE VISION

The colossal Universe is a mystical place which has mesmerized sky gazers for centuries. Thanks to all those intellectuals who have provided us with the simplified views of cosmos by developing high resolution instruments which have disentangled the enigmatic knots of enthralling cosmos. One such ‘space spies’ aiding in achieving this feat is a telescope. It is an optical instrument designed to make distant objects appear nearer, containing an arrangement of lenses, or of curved mirrors and lenses, by which rays of light are collected and focused and the resulting image magnified.

CELESTRON CGEM EDGE HD 1100:
Mount: German equatorial (Advance VX computerised go to mount)  
Scope Type: Schmidt Cassegrain (SCT)  
Focal length: 2800 mm  
F-stop: f/10  
Maximum Magnification: 660X  
Finder scope: 9X50 (50mm aperture, 9X magnification)  
Diameter/Aperture: 280 mm (11 inch)

The Schmidt-Cassegrain optical system uses a combination of mirrors and lenses and is referred to as a compound telescope. This unique design offers large-diameter optics while maintaining very short tube lengths, making them extremely portable. The SCT system consists of a zero power corrector plate, a spherical primary mirror, and a secondary mirror. Once light rays enter the optical system, they travel the length of the optical tube three times. Inside the optical tube, a black tube extends out from the centre hole in the primary mirror. This is the primary baffle tube and it prevents stray light from passing through to the eyepiece or camera.

AWAITING GLORIES...

ISRO:
Chandrayaan-2, an advance version of previous moon mission Chandrayaan-1 is aimed to place an orbiter around moon, sending a lander and rover to the surface of moon in 2017-18.

ISRO:
ASTROSAT is the 1st dedicated Indian astronomy mission aimed at studying distant celestial objects scheduled to launch on October-2015. The mission is capable of performing observations in UV, optical, low and high energy X-ray wavebands at the same time.

ROSCOSMOS & ESA:
EXOMARS (2016-2018) is a future exploration of sight enabling two staged mission, the former consisting of entry, landing and descent by 2016 and the latter to be launched by 2018, consisting of a rover.

IN THE RECORDS...

(NIST ASTRONOMY CLUB)

- Privileged to have first in-house college planetarium of Odisha.
- Fortunate to observe celestial bodies through Celestron CGEM 1100 scope which is one of the leading sophisticated telescopes.
- Creates public awareness towards Astronomy among school children by conducting outreach programs, workshops and documentary shows.
Chapter 1: The beginning of the end

The eternal Cosmos is ever bulging with arcane with its majestic beauty knowing no bounds. These series of awe-inspiring events all together define universe. So the one who created this also created a Keeper who was blessed with the true knowledge of this surreptitious happening. The lives who entrusted him, entitled him as Supreme Elder. He is adorned with the knowledge of timeline of universe and is sworn to protect it until the new universe is created and the baton passes to the new Supreme Elder. He have wisdom whichis acknowledged by his followers and power to feel the occurrences about to happen which was clandestine to normal life. The Supreme Elder watches over the universe and maintains balance within it.

It’s the year 2012 on earth’s calendar but far in the universe it is timeless and endless. Suddenly the universe is struck with unfortunate mishap and began to tremble which caught the Keeper’s attention. He realized that it is the end of what had begun. The beginning of the end had taken toll. The universe is collapsing and shrinking again to singularity. Without any further delay the Supreme Elder set to pass the wisdom, power and will to the next wielder. Knowing about Earth’s genius minds he sets off in a journey to Earth to pass down his legacy.

He prepared a wormhole (dimensional bridge) with its liberating end (a white hole) coordinated to a galaxy closer to the Milky Way, so as not to disturb the energy balance in the Milky Way due to large energy dissipation from the wormhole if the intended result goes otherwise. He entered safely into the wormhole but while travelling through the dimensional bridge he experienced a shock wave. Due to some serious miscalculation the wormhole had become unstable and as a result a point of singularity is created breaking the space time bridge. Completely aware of what might the consequences would be the Supreme Elder tried his best to tackle the situation so that the black hole formed doesn’t get transferred to an unknown wormhole with its opening far from destination. But his valiant attempt went futile and he was engulfed by the giant bleak black hole which tossed him to a faraway place known as “Galaxy of ruins”.

To be continued......

PILE-UP YOUR KNOWLEDGE

1. Guess the name of the scientist.
2. If you are on the surface of Earth and your weight is 588 N. What is your weight on the surface of Jupiter? (Hint: take g=9.8m/s² on the surface of Earth)
3. Why the planets and stars have a spherical shape?
4. If a person standing on the sun wants to see the earth, then after how much time he will be able to see the Earth after light ejects from the sun? (Hint: Assume the Sun is the only source of light.)
5. How can you tell that whether the moon is waning or waxing?
6. The nearest star The Proxima Centauri is 4.2 light years away from the Earth. Then what is the distance between Proxima Centauri and Earth in km?

Send your answers to naccosmicdive@gmail.com with name