Future Institute of Engineering and Management
FUTURE Kolkata

Acuity Newsletter

Department of Basic Sciences & Humanities

Issue: 4

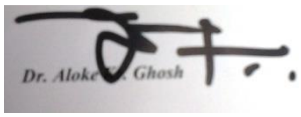
September 2019

Message from Principal's Desk

It gives me immense pleasure to pen a few words for our in-house Basic Sciences and Humanities departmental newsletter "ACUITY" exclusively meant for enriching the knowledge of the budding technologists in various fields and I believe such departmental newsletter will be beneficial for all.

I congratulate the efforts of the members of The Editorial Board that they have brought out this issue of the newsletter in such a beautiful form. It is because of their selfless and untiring efforts that we see the newsletter enriched with variety of articles.

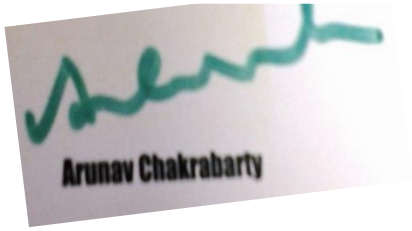
Once again, I extend my hearty congratulations to the entire team and wish the newsletter a great success.



Message from the Head of the Department

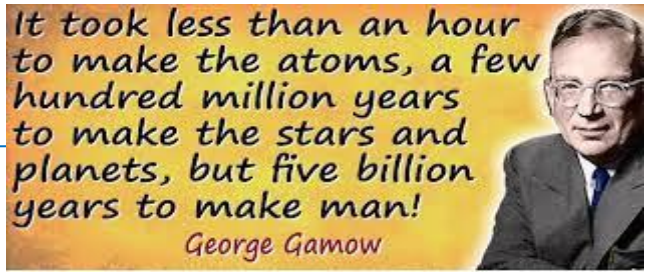
'A journey of thousand miles begins with a single step': With this conviction we decide to initiate this venture to progress in our pursuit of knowledge and excellence in academia. The task, we know, is not simple and requires united endevour for accomplishment. I hope that your enthusiastic cooperation will lead us to light.

তমসো মা জ্যোতির্গময়ঃ



For free subscription & Contribution

fiem.bsh.acuity@gmail.com



Physics

BriePhys

❖

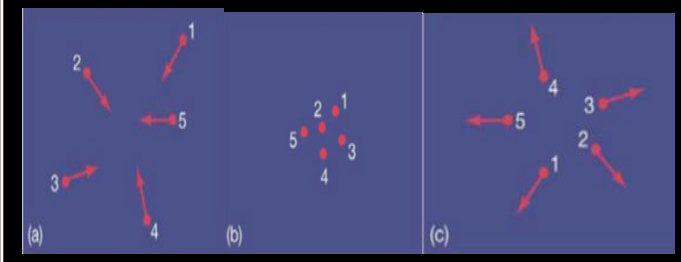
Theoretical physicists have developed a fully-symmetric formulation of quantum theory which establishes an exact link between asymmetry and the fact that we can remember the past but not the future

❖

A classical beam of light that would be expected to obey Bell's Inequality can fail this test in the lab, if the beam is properly prepared to have a particular feature: entanglement.

Formation of Star

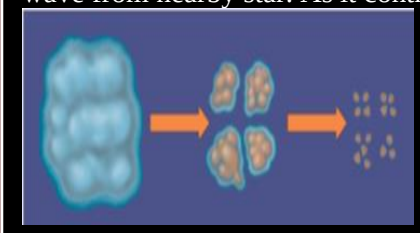
A star is a massive, luminous sphere of plasma held together by its own gravity. The nearest star to Earth is the Sun, which is the main source of the planet's energy. Star formation is the process by which dense region within molecular clouds in interstellar space (star forming region) collapses to form stars.



The interstellar medium consists of 10^4 to 10^6 particles per cm^3 and is typically composed of roughly 70% hydrogen by mass, with most of the remaining gas consisting of helium.Higher density regions of the interstellar medium form clouds or diffuse nebulae, where star formation takes place. In the dense nebulae where stars are produced, much of the hydrogen is in the molecular form, so these nebulae are called molecular clouds. Dark dust clouds, especially molecular clouds, are very cold. They may seed the beginnings of star formation. Star formation takes place in the darkest and coldest places of universe. In fact the extreme coldness (around 3 K) allows the molecular clouds to stay close. Star formation happens when part of a dust cloud begins to contract under its own gravitational force; as it collapses, the center becomes hotter and hotter until nuclear fusion begins in the core.

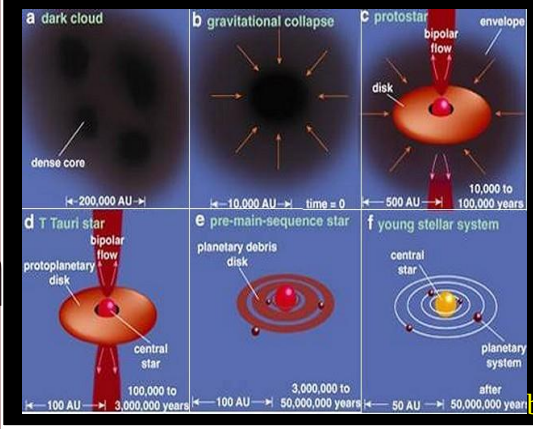
Birth OfStar

Stage 1: Fragmentation: Interstellar cloud starts to contract, possibly triggered by shock or pressure wave from nearby star. As it contracts, the cloud fragments into smaller pieces.



Stage 2: Collapse: Individual cloud fragments begin to collapse. Once the density is high enough, there is no further fragmentation, because the star has become opaque to its own radiation. It has a photosphere! After this, the trappedradiation heats the interior of the object as it contracts.

Stage3: Objects become Opaque and Heated: The interior of the fragment has begun heating and reach about 10,000 K. This is hot enough to ionize hydrogen, but not much else. The interior will continue to heat as it contracts, until, at several million degrees, nuclear fusion stops the collapse.



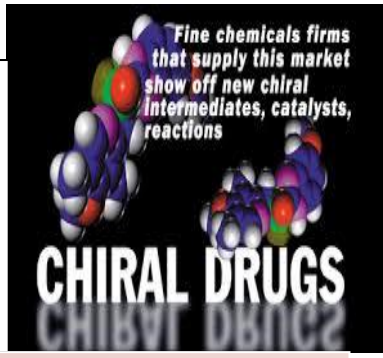
Stage 4: Protostar: The high density Nebula is thought to contain interstellar clouds in the process of condensing, as well as protostars.

Stage 5: Planetary formation has begun, but the protostar is still not in equilibrium—all heating comes from the gravitational collapse. The protostar's luminosity decreases even as its temperature rises because it is becoming more compact. At this stage the core reaches 10 million K, and nuclear fusion begins. The protostarnow become a star.

by Palash Sarkar

Chemistry & Environment

"Time is the best appraiser of scientific work, and I am aware that an industrial discovery rarely produces all its fruit in the hands of its first inventor."
-Louis Pasteur



Chem-Call

❖

Researchers have developed a very promising prototype of a new solar celll. The material gallium phosphide enables their solar cell to produce the clean fuel hydrogen gas from liquid water

❖

Researchers used LEDs and a thin film of gold to turbocharge the heating and cooling cycles of the PCR test so results are ready in minutes, not hours

Chiral Drugs

Drug is a substance used in the diagnosis, treatment or prevention of a disease. Pharmaceuticals with an assymetric carbon(chiral center)are referred as chiral drugs. Today most new drugs and those under development consist single active**enantiomer** and so chirality is now becoming an important factor.

Chirality or Handedness: ***Chiral comes from the Greek word "cheir" meaning "hand". Hands are non-superimposable mirror images — They are chiral.***

The right-handed and left –handed forms of achiral molecule make up a pair of stereoisomers called enantiomers.

Enantiomers (from Greek word enantio means "opposite" and merso means "part")have opposite configuration.

Enantiomers have identical physical properties,so difficult to be separated but chemical properties are different. That's why, ENANTIOMERS show drastically different behaviour in living system

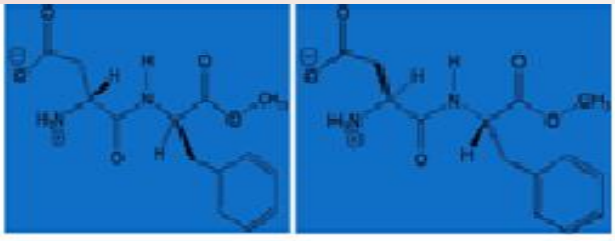
Anticlockwise configuration S"Sinester" LEFT

Clock Wise configuration R "Rectus" Right

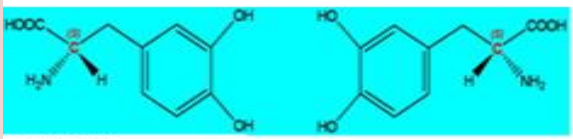
SIGNIFICANCE OF STREOCHEMISTRY ON DRUG EFFECTS

Drug molecules must interact withthe biomolecules(e.g. receptors and enzymes)in a very stereospecific way (just like a Lock & Key concept) to generate a pharmacological response.So, L-DOPA (L-enantiomer) can only prevent Perkinson disease but not D-isomer.

Lock & Key Theory: Lock=Receptor,Key= Drug



Aspertame : Sweeter *Beeter*

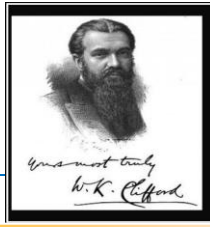


L-DOPA *D-DOPA*

Anti Perkinson's disease drug *serious side effects*

Taste buds are Chiral

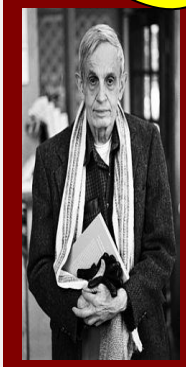
By Chandan Kumar Bhukta



We may always depend on it that algebra, which cannot be translated into good English and sound common sense, is bad algebra.

(William Kingdon Clifford)

MATH - MAGICA



A Beautiful Mind: Sir. John Nash

Born: 13/6/1928

Died: 23/5/2015

Known For:

Nash equilibrium

Nash embedding theorem

Nash functions

Nash–Moser theorem

Apply Linear Algebra

Application Of MATRIX to Cryptography

Cryptography, to most people, is concerned with keeping communications private. Indeed, the protection of sensitive communications has been the emphasis of cryptography throughout much of its history. Encryption is the transformation of data into some unreadable form. Its purpose is to ensure privacy by keeping the information hidden. Decryption is the reverse of encryption; it is the transformation of encrypted data back into some intelligible form. **Today governments use sophisticated methods of coding and decoding messages. One type of code, which is extremely difficult to break, makes use of a large matrix to encode a message. The receiver of the message decodes it using the inverse of the matrix. This first matrix is called the encoding matrix and its inverse is called the decoding matrix.** **Example**

Let the message be PREPARE TO NEGOTIATE and the encoding matrix be $\begin{bmatrix} -3 & -3 & -4 \\ 0 & 1 & 1 \\ 4 & 3 & 4 \end{bmatrix}$ We assign a number for each letter of the alphabet. For simplicity, let us associate each letter with its position in the alphabet: A is 1, B is 2, and so on. Also, we assign the number 27 (remember we have only 26 letters in the alphabet) to a space between two words. Thus the message becomes:

P	R	E	P	A	R	E	*	T	O	*	N	E	G	O	T	I	A	T	E
16	18	5	16	1	18	5	27	20	15	27	14	5	7	15	20	9	1	20	5

Since we are using a 3 by 3 matrix, we break the enumerated message above into a sequence of 3 by 1 vectors:

$$\begin{bmatrix} 16 \\ 18 \\ 5 \end{bmatrix} \begin{bmatrix} 16 \\ 1 \\ 18 \end{bmatrix} \begin{bmatrix} 5 \\ 27 \\ 20 \end{bmatrix} \begin{bmatrix} 15 \\ 27 \\ 14 \end{bmatrix} \begin{bmatrix} 5 \\ 7 \\ 15 \end{bmatrix} \begin{bmatrix} 20 \\ 9 \\ 1 \end{bmatrix} \begin{bmatrix} 20 \\ 5 \\ 27 \end{bmatrix}$$

Note that it was necessary to add a space at the end of the message to complete the last vector. We now encode the message by multiplying each of the above vectors by the encoding matrix. This can be done by writing the above vectors as columns of a matrix and perform the matrix multiplication of that matrix with the encoding matrix as follows

$$\begin{bmatrix} -3 & -3 & -4 \\ 0 & 1 & 1 \\ 4 & 3 & 4 \end{bmatrix} \begin{bmatrix} 16 & 16 & 5 & 15 & 5 & 20 & 20 \\ 18 & 1 & 27 & 27 & 7 & 9 & 5 \\ 5 & 18 & 20 & 14 & 15 & 1 & 27 \end{bmatrix}$$

which gives the matrix

$$\begin{bmatrix} -122 & -123 & -176 & -182 & -96 & -91 & -183 \\ 23 & 19 & 47 & 41 & 22 & 10 & 32 \\ 138 & 139 & 181 & 197 & 101 & 111 & 203 \end{bmatrix}$$

The columns of this matrix give the encoded message. The message is transmitted in the following linear form

$-122, 23, 138, -123, 19, 139, -176, 47, 181,$
$-182, 41, 197, -96, 22, 101, -91, 10, 111,$
$-183\ 32\ 203.$

To decode the message, the receiver writes this string as a sequence of 3 by 1 column matrices and repeats the technique using the inverse of the encoding matrix. The inverse of this encoding matrix, the decoding matrix. Thus, to decode the message, perform the matrix multiplication of the decoding matrix(in the following multiplication the first matrix) with the matrix form of thee encoded messageand get the matrix

$$\begin{bmatrix} 1 & 0 & 1 \\ 4 & 4 & 3 \\ -4 & -3 & -3 \end{bmatrix} \begin{bmatrix} -122 & -123 & -176 & -182 & -96 & -91 & -183 \\ 23 & 19 & 47 & 41 & 22 & 10 & 32 \\ 138 & 139 & 181 & 197 & 101 & 111 & 203 \end{bmatrix}$$

$$\begin{bmatrix} 16 & 16 & 5 & 15 & 5 & 20 & 20 \\ 18 & 1 & 27 & 27 & 7 & 9 & 5 \\ 5 & 18 & 20 & 14 & 15 & 1 & 27 \end{bmatrix}$$

The columns of this matrix, written in linear form, give the original message:

16 18 5 16 1 18 5 27 20 15 27 14 5 7 15 20 9 1 20 5

P R E P A R E * T O * N E G O T I A T E

APPLICATIONS OF LINEAR EQUATIONS IN CHEMISTRY

One of the application of linear systems to chemistry is **balancing a chemical equation**. The relation behind this is the **Law of conservation of mass**

As an example consider the following chemical equation $C_2H_6 + O_2 \rightarrow CO_2 + H_2O$

Balancing this chemical reaction means finding values of x, y, z and t so that the number of atoms of each element is the same on both sides of the equation:

$xC_2H_6 + yO_2 \rightarrow zCO_2 + tH_2O.$

This gives the following linear system and its solution:

$$\begin{cases} y = 7/2x \\ z = 2x \\ t = 3x \end{cases} \quad \begin{cases} 2x = z \\ 6x = 2t \\ 2y = 2z + t \end{cases}$$

Since we are looking for whole values of the variables x, y z, and t, choose x=2 and get y=7, z= 4 and t=6.

The balanced equation is then: $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$ **by Moumita Bhunia**

The biggest communication problem is we do not listen to understand. We listen to reply.

We have all grown up watching the sizzling war between a mouse and a cat, I mean Tom and Jerry. Did you know that this petty war actually corresponds to the actual World War 2. The war was fought between English and the Germans. During the period of the war,Walt Disney with his touch of creative pen gave birth to the famous cartoon characters Tom and Jerry. The English were known as "TOM" as the common name for the English was THOMAS. The Germans were known as "JERRY". The cartoon characters Tom and Jerry are seen fighting with each other always. So, the cartoon programme TOM AND JERRY is basically a sarcastic representation of World War

- By DebaratiBiswas

Candour in Communication

Communication, in general, may be defined as the process by which information is exchanged between individuals using written messages, spoken words, or gestures. It is an interpersonal process in which an individual modifies his response on the basis of the behaviour of the recipient of the message. Good communication is the most important tool in any organization and its appropriate application can be the making of one's career and vice versa.

The term Candour in Communication might be used to explain how too many people, too often, consciously or unconsciously don't express themselves with frankness. They prefer to keep their mouth shut to make people feel better or avoid conflicts. For them, it's simply easier not to speak their mind.
The Six Hat Theory is a method to improve the results of thinking and discussion. It may be used either by oneself or in a group

The White hat: A person wearing this hat is ready to provide facts, information and statistical data, as well as identifying missing information and from which sources it may be collected. He is basically the 'Helping one'

The Red Hat: The red hat is worn by a person who likes to express his feelings about the subject or to share his general mood. This hat does not require logical reasoning or justification, as feelings are almost always subjective rather than rational. He is the 'Emotional one'.

The Yellow Hat: A person wearing the Yellow Hat ispositive, rational and looks at the positive aspects of a situation or idea. He gives weight on the potential benefits of the suggested course of action.**He is the 'Rational one'.**

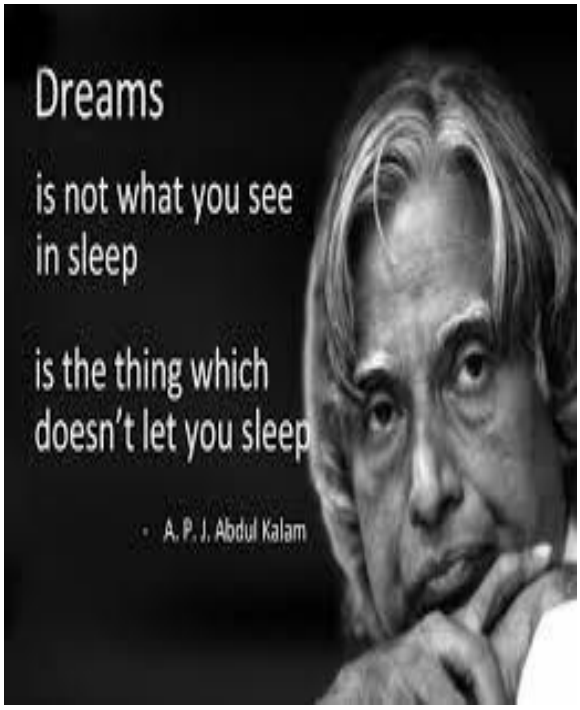
The Black Hat: The person wearing the Black Hat is not much of a positive mentality. He is prone to discussing the negative repercussions of a plan, the potential dangers, and is ready to welcome any criticism on the logic of arguments made to support his views. **He is the 'Negative one'.**

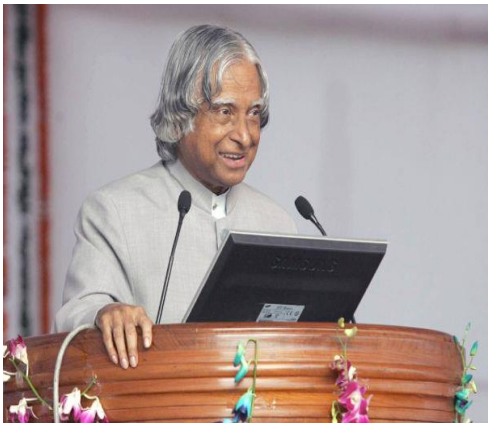
The Green Hat: The Green Hat stands for creativity and unconventional thinking. A person wearing this hat, prefers to think creatively. Brainstorming, creative thinking tools, lateral thinking and other such methods for unexpected developments in discussion, are his Forte′. **He is a symbol of Growth and Possibility**.

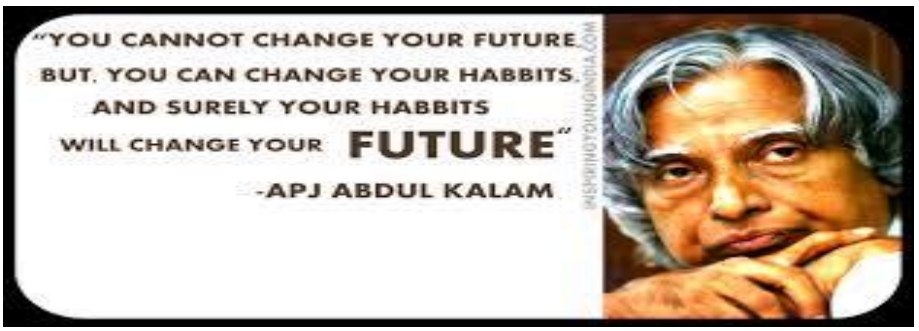
The Blue Hat: **The one who wears this hat is a multi -tasker.** He is ready to guide the discussion, to switch hats when necessary, to summarise the major points of the discussion, and does not squirm away from making decisions.**He is the 'Team Leader'**.

By Nivedita Gupta

PEOPLE'S PRESIDENT IN HIS HEAVENLY ABODE







- **In 1960, Kalam joined the Aeronautical Development Establishment of the Defence Research and Development Organization (DRDO) as a scientist.**
- **In 1969, Kalam was transferred to the Indian Space Research Organisation (ISRO) where he was the project director of India's first Satellite Launch Vehicle (SLV-III) which successfully deployed the Rohini satellite in near-earth orbit in July 1980.**
- **R Venkatraman was instrumental in getting the cabinet approval for allocating 388 crores for the mission, named Integrated Guided Missile Development Programme (IGMDP) and appointed Kalam as the chief executive.**
- **Kalam served as the 11th President of India, succeeding K. R. Narayanan.**
- **Kalam was the third President of India to have been honoured with a Bharat Ratna, India's highest civilian honour, before becoming the President.**
- **On 27 July 2015, Kalam travelled to Shillong to deliver a lecture on "Creating a Livable Planet Earth" at the Indian Institute of Management Shillong. At around 6:00 p.m. IST, only five minutes into his lecture, he collapsed. He was rushed to the nearby Bethany Hospital in a critical condition; upon arrival, he lacked a pulse or any other signs of life. Despite being placed in the intensive care unit, Kalam was confirmed dead of a sudden cardiac arrest at 7:45 p.m IST.**

Intimation

First Year Induction Program 2019