Future Institute of Engineering and Management
FUTURE Kolkata

Acuity Newsletter

Department of Basic Sciences & Humanities

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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.

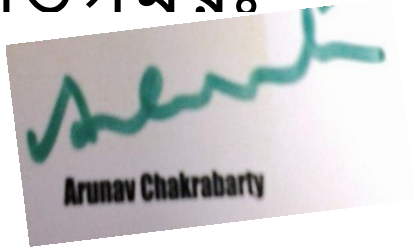
I congratulate the efforts of the members of The Editorial Board that they have brought out this issue of the newsletter in such a beautiful form. It is because of their selfless and untiring efforts that we see the newsletter enriched with variety of articles.

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

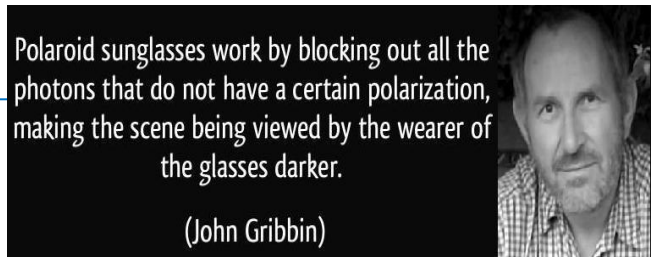
Message from the Head of the Department

'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



Physics



BriePhys

- Scientist Developed new technique to reduce the halo effect by lenses
- Physicists tune Large Hadron Collider to find 'sweet spot' in high-energy proton smasher
- Quantum Criticality in life's proteins
- Physics community to discuss latest results of the Alpha Magnetic Spectrometer experiment

The Science behind Polarized Sunglass

The phenomenon due to which the vibrations of light are restricted to a particular plane and its corresponding direction of vibration is perpendicular to the direction of propagation of light is called Polarisation of light. Polarisation has many applications in the modern world. Among the various applications the most important is polarised lenses which reduce eye fatigue, improve safety and let you see more detail by reducing blinding haze of glare. This is applicable in driving,sports, fishing etc. For safety we must look for polarised lenses that filter out 99% to 100% of both UVA and UVB. Dr. Edwin invented world's first man made polariser for commercial use in 1929. The first pair of Polaroid sunglass was sold in 1935.

Polaroid, as the inversion of the polarised lens, continues to innovate with a new generation of lenses created in their European research centre in the Vale of Leaven (Scotland).High quality polarised lenses like SunRx poly carbonate polarized lenses offer the best protection from harmful UV light and blinding glare. Polarised lenses used to benefit with the film at the correct axis in order to block horizontal glare. The axis of the polarising filter is placed 90° to the plane of the polarised light. The 180° or horizontal axis of the lens oriented 90° from the polarised lights.

How polarized lenses are made?

To filter polarized light, a long chain of molecules (hydrocarbons) is placed on to a thin film of polyvinyl acetate (PVA). Then the film is heated and stretched, forcing the molecules to align end to end, or become polarized. The film is then dipped into a solution containing a conducting molecule (e.g. iodine). These conducting molecules are now aligned along a pole (polarized) creating a microscopic grid of dark parallel lines that block light waves travelling along a plane that is perpendicular to their length. The alignment of the molecules on the polarising filter results in the degree of polarization or efficiency of polarized lenses.

Advantages of polarized polycarbonate lenses:-

1) Safer driving vision: These lenses eliminate direct and reflective glare of sunlight.

2) Greater comfort outdoor: These lenses reduce the intensity of sunlight to more comfortable levels, thus helping to prevent eyestrain, fatigue and headaches caused by glare.

3) Superior eye protection for sport: Polarized polycarbonate lenses are 10 times more impact resistant than other lenses.Courtesy: Sanjiban Mukhopadhyay

Chemistry & Environment

"Let food be thy medicine and medicine be thy food."
-- Hippocrates

Chem-Call

❖

Wristband that measures rest, activity schedule may help predict response to antidepressa nt

❖

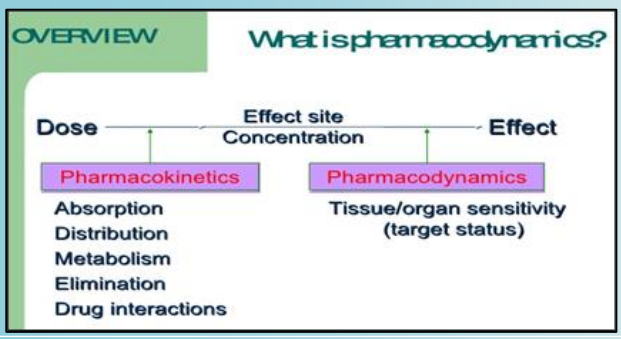
Fast charging cycles make batteries age more quickly: X-ray study images damage in lithium-ion batteries

❖

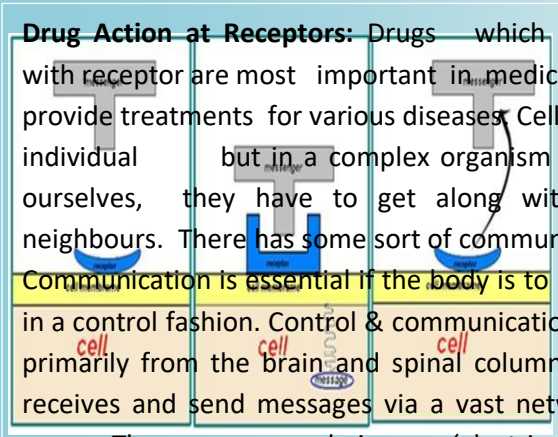
Bardarbunga Eruption gases estimated

Medicinal Chemistry

Medicinal chemistry and **pharmaceutical chemistry** are disciplines at the intersection of chemistry, especially synthetic organic chemistry, pharmacology and various other biological specialities, where they are involved with design, chemical synthesis and development for market of pharmaceutical agents or bio-active molecules (drug).Compounds used as medicines are most often organic compounds, which are often divided into the broad classes of small molecules (e.g. atorvastatin, fluticasone) and "biologics" (infliximab, erythropoietin). Inorganic and organometallic compounds are also useful as drugs (e.g. lithium and platinum based agents such as lithium carbonate and cis-platin.

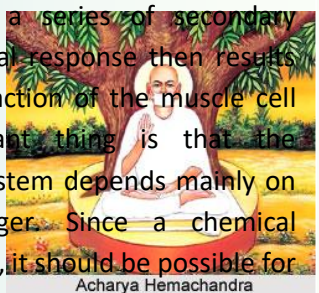


It is important to identify particular target for a specific drug. Also to establish how the drug interact with the target to produce biological effect. Various drug targets are present in living system. This is an area of study known as **Pharmacodynamics**, so it is the study of how a drug interacts directly with the targets.



Pic: Binding a messenger to a receptor

Drug Action at Receptors: Drugs which interact with receptor are most important in medicine and provide treatments for various diseases. Cells are all individual but in a complex organism such as ourselves, they have to get along with their neighbours. There has some sort of communication. Communication is essential if the body is to operate in a control fashion. Control & communication come primarily from the brain and spinal column, which receives and send messages via a vast network of nerve. The message as being an 'electrical pulse' which travels down the nerve cell towards the target.**"Howdrugs could affect this communication system".** The nerves do not connect directly to their target cells. They stop just sort of the target cell surface. The distance is very small about 100 Angstrom but it is a space which the 'electric pulse' is unable to jump. So, there must be some way of carrying the message across the gap between the nerve ending and the target cell. The problem is solved by release of a chemical messenger called **neurotransmitter** from the nerve cell.Once released, then it can cross the gap between the nerve ending & the target cell, where it can bind and interact with a specific protein (receptor). This process of binding leads to a series of secondary effects. A biological response then results such as the contraction of the muscle cell etc. The important thing is that the communication system depends mainly on chemical messenger. Since a chemical process is involved, it should be possible for other chemicals (drugs) to interfere and take part into the process.



By SayanwitaPanja

"A mathematician is a device for turning coffee into theorems"

— Paul Erdős

Mathematics

MATH - MAGICA

❖

Quantum computes this: Mathematicians build code to take on toughest of cyber attacks

❖

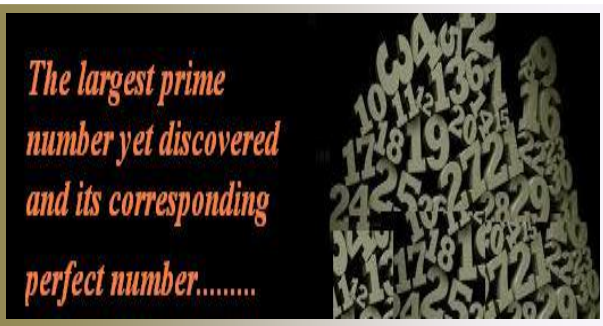
Should a political party form a coalition? Voters and math decide

❖

Stereotypes lower math performance in women, but effects go unrecognized

❖

Genetics of altruism: Is blood really thicker than water?



Prime Number:

Primes are numbers that can only be divided by themselves and 1, such as 2, 3, 5, 7 and 11. ***Ever since the ancient Greek geometer Euclid proved there were an infinite number of them, mathematicians have been on a quest to find higher and higher examples.*** In January 2013, the highest prime was discovered which is17 million digits long and was discovered on a computer in Warrensburg, Missouri, as part of the Great Internet Mersenne Prime Search (Gimps), a distributed computing project that has involved tens of thousands of machines since 1996. The previous highest prime was discovered by Gimps in 2008, but it was only 13m digits long.

French monk Marin Mersenne (1588-1648) stated that the numbers 2^n-1 were prime for n = 2, 3, 5, 7, 13, 17, 19, 31, 67, 127 and 257 and were composite for all other positive integers n< 257. When 2^n-1 is prime it is said to be a**Mersenne prime.**

Perfect Numbers:

A positive integer n is called a **perfect number** if it is equal to the sum of all of its positive divisors, excluding n itself. For example, 6 is the first perfect number because 6=1+2+3. The next is 28=1+2+4+7+14. Look at these numbers in the following partially factored form: 2*3, 4*7, 16*31, 64*127. Do you notice they all have the same form $[\mathbf{2^{n-1}(2^n-1)}]$ (for n = 2, 3, 5, and 7 respectively)? And that in each case 2^n-1 was a Mersenne prime? In fact it is easy to show the following theorems:

Theorem: k is an even perfect number if and only if it has the form$\mathbf{2^{n-1}(2^n-1)}$ and 2^n-1 is prime. You may have also noticed that the perfect numbers listed above (6, 28, 496, 8128) all end with eitherthe digit 6 or the digit 8--this is also very easy to prove (but no, they do not continue to alternate 6, 8, 6, 8,...). If you like that digit pattern, look at the first four perfect numbers in binary:

110
11100
111110000
1111111000000

It is not known whether or not there is an odd perfect number, but if there is one it is big! This is probably the oldest unsolved problem in all of mathematics.

Table of Known Mersenne Primes and Perfect Number:

#	2^n-1	Digits	Perfect Number $[2^{n-1}(2^n-1)]$	#	2^n-1	Digits	Perfect Number $[2^{n-1}(2^n-1)]$
1	2^2-1	1	$2^1\cdot(2^2-1)$	25	$2^{21701}-1$	6,533	$2^{21,700}\cdot(2^{21,701}-1)$
2	2^3-1	1	$2^2\cdot(2^3-1)$	26	$2^{23209}-1$	6,987	$2^{23,208}\cdot(2^{23,209}-1)$
3	2^5-1	2	$2^4\cdot(2^5-1)$	27	$2^{44497}-1$	13,395	$2^{44,496}\cdot(2^{44,497}-1)$
4	2^7-1	3	$2^6\cdot(2^7-1)$	28	$2^{86243}-1$	25,962	$2^{86,242}\cdot(2^{86,243}-1)$
5	$2^{13}-1$	4	$2^{12}\cdot(2^{13}-1)$	29	$2^{110503}-1$	33,265	$2^{110,502}\cdot(2^{110,503}-1)$
6	$2^{17}-1$	6	$2^{16}\cdot(2^{17}-1)$	30	$2^{132049}-1$	39,751	$2^{132,048}\cdot(2^{132,049}-1)$
7	$2^{19}-1$	6	$2^{18}\cdot(2^{19}-1)$	31	$2^{216091}-1$	65,050	$2^{216,090}\cdot(2^{216,091}-1)$
8	$2^{31}-1$	10	$2^{30}\cdot(2^{31}-1)$	32	$2^{756839}-1$	227,832	$2^{756,838}\cdot(2^{756,839}-1)$
9	$2^{61}-1$	19	$2^{60}\cdot(2^{61}-1)$	33	$2^{859433}-1$	258,716	$2^{859,432}\cdot(2^{859,433}-1)$
10	$2^{89}-1$	27	$2^{88}\cdot(2^{89}-1)$	34	$2^{1257787}-1$	378,632	$2^{1,257,786}\cdot(2^{1,257,787}-1)$
11	$2^{107}-1$	33	$2^{106}\cdot(2^{107}-1)$	35	$2^{1398269}-1$	420,921	$2^{1,398,268}\cdot(2^{1,398,269}-1)$
12	$2^{127}-1$	39	$2^{126}\cdot(2^{127}-1)$	36	$2^{2976221}-1$	895,932	$2^{2,976,220}\cdot(2^{2,976,221}-1)$
13	$2^{521}-1$	157	$2^{520}\cdot(2^{521}-1)$	37	$2^{3021377}-1$	909,526	$2^{3,021,376}\cdot(2^{3,021,377}-1)$
14	$2^{607}-1$	183	$2^{606}\cdot(2^{607}-1)$	38	$2^{6972593}-1$	2,098,960	$2^{6,972,592}\cdot(2^{6,972,593}-1)$
15	$2^{1279}-1$	386	$2^{1,278}\cdot(2^{1,279}-1)$	39	$2^{13466917}-1$	4,053,946	$2^{13,466,916}\cdot(2^{13,466,917}-1)$
16	$2^{2203}-1$	664	$2^{2,202}\cdot(2^{2,203}-1)$	40	$2^{20996011}-1$	6,320,430	$2^{20,996,010}\cdot(2^{20,996,011}-1)$
17	$2^{2281}-1$	687	$2^{2,280}\cdot(2^{2,281}-1)$	41	$2^{24036583}-1$	7,235,733	$2^{24,036,582}\cdot(2^{24,036,583}-1)$
18	$2^{3217}-1$	969	$2^{3,216}\cdot(2^{3,217}-1)$	42	$2^{25964951}-1$	7,816,230	$2^{25,964,950}\cdot(2^{25,964,951}-1)$
19	$2^{4253}-1$	1,281	$2^{4,252}\cdot(2^{4,253}-1)$	43	$2^{30402457}-1$	9,152,052	$2^{30,402,456}\cdot(2^{30,402,457}-1)$
20	$2^{4423}-1$	1,332	$2^{4,422}\cdot(2^{4,423}-1)$	44	$2^{32582657}-1$	9,808,358	$2^{32,582,656}\cdot(2^{32,582,657}-1)$
21	$2^{9689}-1$	2,917	$2^{9,688}\cdot(2^{9,689}-1)$	45	$2^{37156667}-1$	11,185,272	$2^{37,156,666}\cdot(2^{37,156,667}-1)$
22	$2^{9941}-1$	2,993	$2^{9,940}\cdot(2^{9,941}-1)$	46	$2^{42643801}-1$	12,837,064	$2^{42,643,800}\cdot(2^{42,643,801}-1)$
23	$2^{11213}-1$	3,376	$2^{11,212}\cdot(2^{11,213}-1)$	47	$2^{43112609}-1$	12,978,189	$2^{43,112,608}\cdot(2^{43,112,609}-1)$
24	$2^{19937}-1$	6,002	$2^{19,936}\cdot(2^{19,937}-1)$	48	$2^{57885161}-1$	17,425,170	$2^{57,885,160}\cdot(2^{57,885,161}-1)$

Mathematicians like discovering high primes and perfect numbers not because they are useful (in encryption and decryption codes) or not yet, anyway but because they are there. It is a fun challenge and a measure of the power of distributed computing projects. ***The campaign group Electronic Frontier Foundation gave a prize for the first 1m-digit and 10m-digit primes, and will give $150,000 (£96,000) to the discoverer of the first 100m-digit prime. You can try to find the next Prime number and Perfect one…by Sumana Bera***

Trees are the earth's endless effort to speak to the listening heaven.

– *Rabindranath Tagore*

Communiqué

❖

Rapid-fire Twitter and Facebook communication is making young women more "to the point" in ways that can seem aggressive.

❖

Texting is now the "dominant" daily mode of communication " for teens.

❖

"BetterWorks" is a software that blends aspects of social media, fitness tracking and video games into a singlesystem meant to keep employees more engaged with their work and with one another.

THE IMPORTANCE OF LISTENING IN EFFECTIVE COMMUNICATION

We know that sender and receiver are the two most important components in the communication process. The sender speaks, the receiver listens and vice-versa. Speaking and listening activities complement each other in the process of communication. Effective listening is important for the comprehension of the spoken word. Listening comprehension involves perceiving and interpreting the sounds correctly as well as understanding the explicit and implied meaning of the oral message. Effective listening entails several skills like speech decoding, comprehending and oral discourse analysis.

Speech decoding involves sound recognition, word recognition and accent recognition. Decoding of verbal messages require the ability to perceive and recognize sound patterns accurately and fathom the way sound combines to form first syllables and then words. For effective communication the listener has to be attentive to the spoken sound as there are numerous competing sounds in the environment which may interfere with the listener's concentration and cause misunderstanding. This may end in miscommunication. The need to recognize words and phrases accurately is important to understand the context of usage as it plays an important role in the comprehension of a message. If a listener wishes to decode an oral message he/she also has to recognize stress and intonation patterns. The listener needs to identify pauses, false starts, hesitations in a communication to understand it entirely.

Comprehending ability encompasses identification of the central theme, main ideas, deduction of incomplete information and decoding unfamiliar vocabulary.

Oral discourse analysis is the process of identifying relationships among different units within the oral message. It includes critical skills, attitude analysis and inferential skills.

EFFECTIVE LISTENING STRATEGIES

Listening is a major aspect of academic and professional interaction. A listener should actively and patiently listen to both content and presentation. Active listening includes using non-verbal skills, asking questions, making clarifications and analyzing an oral message. Non-verbal skills like eye-contact or an occasional nod or smile on the listener's part can be used to accentuate the motivation of the speaker. An active listener should take appropriate steps to improve the speaker's contribution. Asking questions is an important part of the listening process and leads to building good rapport between the speaker and the listener. The power of the listener to interpret and analyze can determine the inferences and conclusions from the speech.

THE IMPORTANCE OF LISTENING IN EFFECTIVE COMMUNICATION

We have now noted the importance of effective listening. Let us note why it is important for effective communication. Listening complements speaking as the sender complements the receiver. Without the two components simultaneously working the communication process would remain incomplete and ineffective. The feedback of the receiver is dependent upon his/her listening skills and the feedback is not only important for the communication process to continue but to reach its proper culmination.

By Dr. Jhumur Ghosh

Intimation

- M. Bhattacharyya and S.S. Sana published a paper on some integral inequalities involving third order derivative, Review of Research 7(4) (2018), 1-9, Article series no. ROR-11272 .
- Moumita Bhunia completed NPTEL online FDP course on Multivariable Calculus.
- Moumita Bhunia completed NPTEL online FDP course on Introduction to R software.
- Dr. Jhumur Ghosh completed NPTEL online FDP course on Business English Communication.
- Mr. Kapildev Maiti completed NPTEL online FDP course on Business English Communication.
- Mr. Tanmay Joarder completed NPTEL online FDP course on Numerical Methods: Finite Difference Approach .
- Mr. Tanmay Joarder completed NPTEL online FDP course on Advanced Graph Theory.
- Mr. Kaushik Sinha Ray completed NPTEL online FDP course on Numerical Methods: Finite Difference Approach.
- Mr. Tirtha Roy Chowdhury completed a Swayam course on MatLab programming for Numerical Computation.
- Bina Basak completed NPTEL online FDP course on Atomic and Molecular Physics.

Sphinx's Corner

- **Why do some enzymes exhibit faster-than-diffusion kinetics?**
- **What is bio prospecting?**
- **Express 5 using two 2's and mathematical operators**
- **Can you express 720 using six 0's and mathematical operators**
- **What is the next number in 12,13,15,17,111,113,117,119,123**
- **Assume that you travelled to your friends' place at 20 mph, then how fast you must make the return trip via the same route such that the average speed of total travel becomes 40mph ?**
- **100 people are standing in a circle .The person is standing at no 1 is having a sword .He kills the person next to him with the sword and then give the sword to the third person.This process is carried out till there is just one person left .Who survives?**
- **Why is it possible to drive a nail into a piece of wood with a hammer, but it is not possible to push a nail in by hand?**