

DELPHIC

WELHAM SCIENCE MAGAZINE

SEPTEMBER '15



A
GLIMPSE
OF
CERN

TIM BERNERS LEE
FOUNDER: WWW

FROM THE EDITOR'S DESK

"I have no special talents. I am only passionately curious."

-Albert Einstein

Dear Readers,

Fascination and curiosity are the founding blocks of Science. The seemingly simple questions "Why?" and "How?" build up a castle; and in this massive structure, reason and rationality act like cement, keeping everything together. The best part about this gigantic structure is that it seems to have something for everyone. It is ever expanding, and with all its nooks and corners, it always remains partially unexplored. Each time, it seems to have something new to delve into and as one goes deeper and deeper, more and more secret doors and tunnels seem to unravel. The entire structure, somehow, appears to be interconnected by some massive, intricate network.

By drawing this analogy, I hope to bring to each one of you, Science; in its most varied form and to help you see its realms: its outer enormity and inner intricacy.

This time, I urge each one of you to question; and further, to explore in order to find the answers. I implore all of you to read more and more. Do not limit yourself to texts and assigned reading but let your mind wander into what ever intrigues it. Just as we must feed ourselves in order to survive, we must also feed our curiosity so as to keep it alive and ever growing.

I present to you this issue of Delphic and I hope that this will provide some food for your hungry minds. I have tried to incorporate, within these twenty pages, a little something from every different sphere of life. From mantis shrimp to genetics to beauty contests and everything in between, the Editorial Board has worked fervently to put together an assortment of articles.

I hope to inspire you to view science as something relevant rather than something to simply mug up. Stay inspired. Stay fascinated.

Happy reading!

Manasvi Mathur

BEAUTY CONTESTS WITH A TWIST

The Science of Decision Making

You have a chance to be a judge at a beauty contest, (Yes, you can finally do better than half of those judges who sit and judge the pageants!) but there is a catch. This beauty contest is like no other. Here you do not have to choose the person whom you find the most beautiful depending on the conventional parameters, but the person whom people, on an average, would think is the most beautiful. Getting confused? What happened to plain old beauty contests, one might ask. Well, the man to blame is John Maynard Keynes: the economist behind the theory of the Keynesian beauty contest.

So let's get down to the basics: what does an economist have to do with a beauty contest? Well, it looks like Mr. Keynes felt that he could best expound his economic theory on the basis of how people make their decisions in a beauty contest. Hence, a London newspaper published 100 photographs and all its readers were given a chance to judge. Their job was just like yours – to choose not the most beautiful candidate but the 6 pictures which *most people* would think are the most beautiful. Hence, to shortlist not *your choice* but the *average choice*. To think not only about your own decision but also what every other person would be thinking while making their decision. In Keynes' words, *"It is not a case of choosing those which, to the best of one's judgement, are really the prettiest, nor even those which average opinion genuinely thinks the prettiest. We have reached the third degree where we devote our intelligence to anticipate what average opinion expects the average opinion to be. And there are some, I believe, that practice the fourth, fifth and higher degrees."*

So of what use is this beauty contest to Keynes and the modern world? Let's lay it as bare as is possible: all those hotshots on Wall Street are doing as well as they are because they follow the theory of the Keynesian beauty contest. So, in theory, the Keynesian beauty contest is what makes stock markets around the world tick and the outlook of each country's economy is based on how this convoluted beauty contest plays out. This is because here again you can't just sit tight with your personal favourite investment. You have to anticipate what most of the people are interested to invest in and hence toe the line and invest in the same.

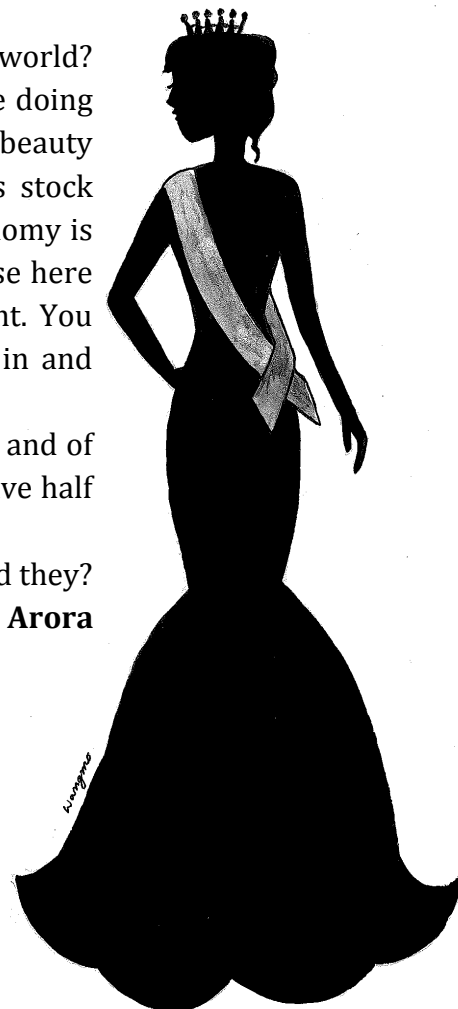
So the next time you're told that beauty contests are nonsensical and of no use, feel free to say that they are the reason why half the people have half the wealth that they have.

Well nobody ever said saying half a truth is equivalent to lying, did they?

-Girisha Arora

LIFE HACKS!

While running, exhale when your left foot hits the ground. This will improve the quality of your workout and also prevent you from getting a side stitch.



FIND OUT IF SOMEONE IS LYING TO YOU!

Disclaimer: Reading this article does not make you an expert at detecting lies. This article, in no way, advocates lying.

*"Lying has long been a part of everyday life. We couldn't get through the day without being deceptive."
-Leonard Saxe, Ph.D.*

A lie is a statement that is known or intended by its source to be misreading, inaccurate or false.

We all know that lying has become a part of our everyday lives. It has become a necessity. How would any of us get past a math class if we didn't lie, right? "Sir, I tried out some sums, but I didn't even understand one. They are very tricky!" (Did you even open your math book last night?) These are words which we speak without even realizing we are lying.

Men and women tell lies in around one fifth of their social exchanges which last for 10 or more minutes; over the course of a week they deceive about 30 percent of those with whom they interact one-on-one. Also relationships among family members, is a very common ground for deception: "College students lie to their mothers in one out of two conversations," says DePaulo.

BODY LANGUAGE OF LIES

- Hand, arm, and leg movement are toward their own body, the liar takes up less space.
- A person lying will avoid eye-contact.
- Touching or scratching the nose or behind the ear.

VERBAL CONTEXT AND CONTENT

- A liar will always answer replicating the exact words used in the question.
- A liar will make less use of pronouns and speak in a monotonous tone.
- In truthful statements pronouns are emphasized as much as the rest of the words.
- Using humour or sarcasm to avoid a subject.

REACTIONS AND INTERACTIONS

- A guilty person gets defensive when they are accused of lying.
- A liar feels uncomfortable facing his inquirer and tends to turn his head or body away.
- A liar also tries to place things between the questioner and the accused.



EMOTIONAL GESTURES AND CONTRADICTION

- When someone is lying, the facial expressions do not match the verbal statements.
- Expressions are limited to mouth movements when someone is faking emotions (like happy, surprised, sad, awe) instead of the whole face.

-Rhea Tuteja

TEENAGE TROUBLE

How many times have you been reprimanded for not behaving in a socially acceptable manner? How often do you end up taking rash decisions that you definitely regret later? Do you ever feel overjoyed one minute and ready to murder everybody around you the next?

Since this is a school magazine mostly read and written by adolescents, I am going to take the liberty to say for a large percentage of us that this has become the order of the day.

One of the brain regions that changes most dramatically and drastically during the years of adolescence is the pre-frontal cortex. This is a very interesting area of our brain as it is the largest in human beings and is the least developed in pre-adolescents. It deals with a whole lot of cognitive functions such as decision making, planning, understanding our environment and others, self-awareness, and even inhibiting inappropriate social behavior.

Sometimes adults may think that their teenage children are being stubborn as they refuse to look at a particular situation from the parents' perspective. However, it is actually due to the fact that their pre-frontal cortex may have not developed fully and that their brains cannot accommodate or even comprehend another person's point of view!

It is common knowledge that, unlike adults, teenagers have a tendency to take risks or make dangerous decisions. The limbic system, deep inside our brain, involved in emotion processing and reward processing is more sensitive to the feeling of risk-taking in adolescents as compared to adults. Taking a risk gives one a kick and makes the teenager feel more independent.

Globally, teenagers have been stereotyped and even demonized for their "typical teenage behaviour" for being moody, self-conscious, self-absorbed and taking risks. However, owing to science, we now know that all these changes actually reflect an excellent opportunity for learning and developing social skills, as the brain is particularly impressionable at this stage.

Therefore, teenage characteristics of impulsive behavior, rash decisions and isolation should not be stigmatized. Instead, we need to understand what a trying time adolescence is and provide teenagers with the secure and healthy environment that they require.

-Natasha Todi

BETWEEN

I AM ANALYTICAL.

I AM ALWAYS IN CONTROL.

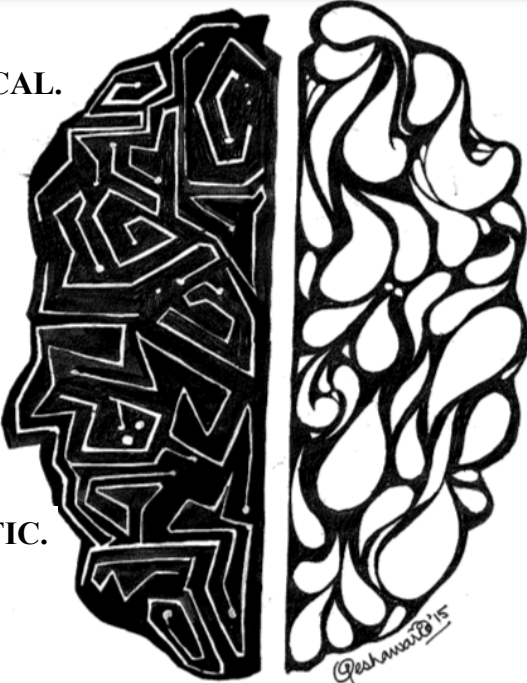
I AM PRECISE.

I DISCOVER.

I AM A PLANNER.

I CAN MAKE THINGS FLY.

I AM PRAGMATIC.



I AM CREATIVE.

I AM SPONTANEOUS.

I AM ARTICULATE.

I IMAGINE.

I DARE TO BE DIFFERENT.

I LIVE IN THE MOMENT.

I CAN FLY.

BRAINS

FUTURE INVENTIONS!

From the dawn of ages, the only direction in which the human creativity has been going is 'towards infinity and beyond!!' The progress of human race from cell phones to Voice over Internet Protocol (online calling), in only twenty years, speaks for itself. In fact, video chatting was achieved by humans almost 17 years before it was predicted. Following is the list of the top- 5 most awaited inventions that would signify our next infinity.

5. CARDBOARD CELL-PHONES: Soon people would be able to use disposable cell-phones with limited calling time. Some of them would also act like credit cards which would be used for swipe able purchases.

4. SELF-PARKING CARS: BMW has already started the process of producing self-parking cars which can help solve some of the parking and traffic problems in dense urban areas.

3: DREAM LINKING: It might be possible to download your dreams and share them with others. Using pillows with conducting fibers in the fabric, one may also be able to link their dreams to their friends and maybe even interact with them in the sleep world.

2: RECHARGEABLE GUM: ReBubble has announced that in the near future it would be producing a gum you can enjoy over and over again without ever having to buy another piece. It is also rumored that you can recharge this gum with different flavors.

1: THE CLOAK OF INVISIBILITY: The magical artefact used to render its wearer invisible might just be added to your closet! The scientists at the University of Rochester have developed a device which is capable of making an object invisible. In future this device may be metamorphosed to cloaks.

So as you sit patiently and wait for the arrival of these amazing inventions, you too could brainstorm for newer inventions and for another infinity!

-Compiled by
Aishwarya Kumar



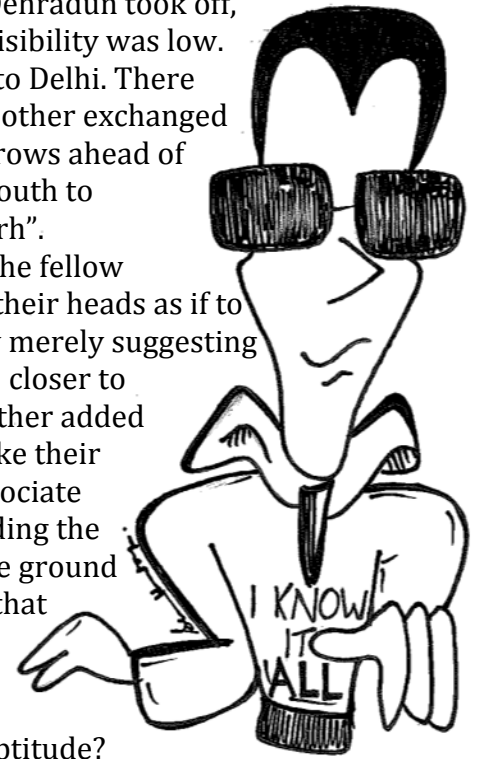
**SCIENCE
BLOOPERS**



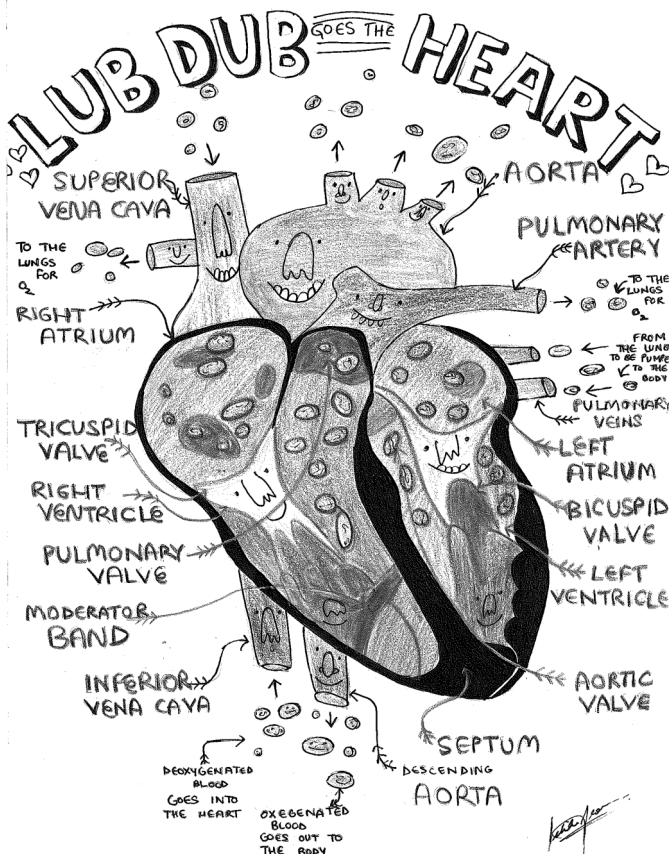
WHY SCIENCE TEACHERS SHOULD NOT BE GIVEN PLAYGROUND DUTY!

I KNOW IT ALL!

About twenty-five minutes after the plane from New Delhi to Dehradun took off, the pilot announced that the weather outside was turbulent and the visibility was low. Minutes later, there was another announcement of the flight's return to Delhi. There were sounds of disappointment and the strangers sitting next to each other exchanged frowns. Just then, a young well-built man with gelled hair seated two rows ahead of me, hollered from his seat. He cupped his hand on either side of his mouth to enhance his sound quality and yelled out "Take the plane to Chandigarh". "Chandigarh, Chandigarh" he yelled again, half standing in his place. The fellow travellers looked perplexed. Some, especially those near him nodded their heads as if to second his idea. The turbulence made the plane wobble. Not happy by merely suggesting a new destination, this bright ideator, explained loudly "Chandigarh is closer to Dehradun than New Delhi is". "Delhi is at least six hours away", he further added as if he had unravelled an ancient mystery. The cabin crew finally broke their silence by making an announcement in a voice and accent we only associate with an archetypal air hostess. It said something to the effect that landing the plane was according to a protocol and that they were in touch with the ground crew. Not to be outdone, this persistent, overconfident man declared that the pilot was incompetent and did not know how to land a plane in bad weather!!



What makes unskilled, ignorant people not recognise their ineptitude? Psychologists call it the Dunning-Kruger effect. Simply put, it means that less competent people rate their competence higher than it actually is, while more competent people humbly rate theirs lower. This effect is not merely an imagination, it is a genuine cognitive bias demonstrated by experiments. It also implies that the competent overestimate others' skill levels and the incompetent overestimate their own skills. So, the incompetent are too incompetent to realise their own incompetence. This means that it takes intelligence to evaluate and realise one's own limitations. This particular ability to know about one's own knowing is called metacognition.



Clearly, the man in the airplane demonstrated this ability in good measure. He had no clue about the flight plan and airways, but suggested a change of destination as if he were travelling in an auto rickshaw. It's interesting to see the spiritual leaders and bearded babas on TV blame modern medicine and technology, for the ills of the society. Many of them tell their followers that they must return to their ancient way of life. All this, when they use the latest technology to perpetrate their regressive ideas. Clearly, it is the Dunning-Kruger effect in action.

-Ms. Richa Joshi Pant

IS COLONIZATION OF FOR

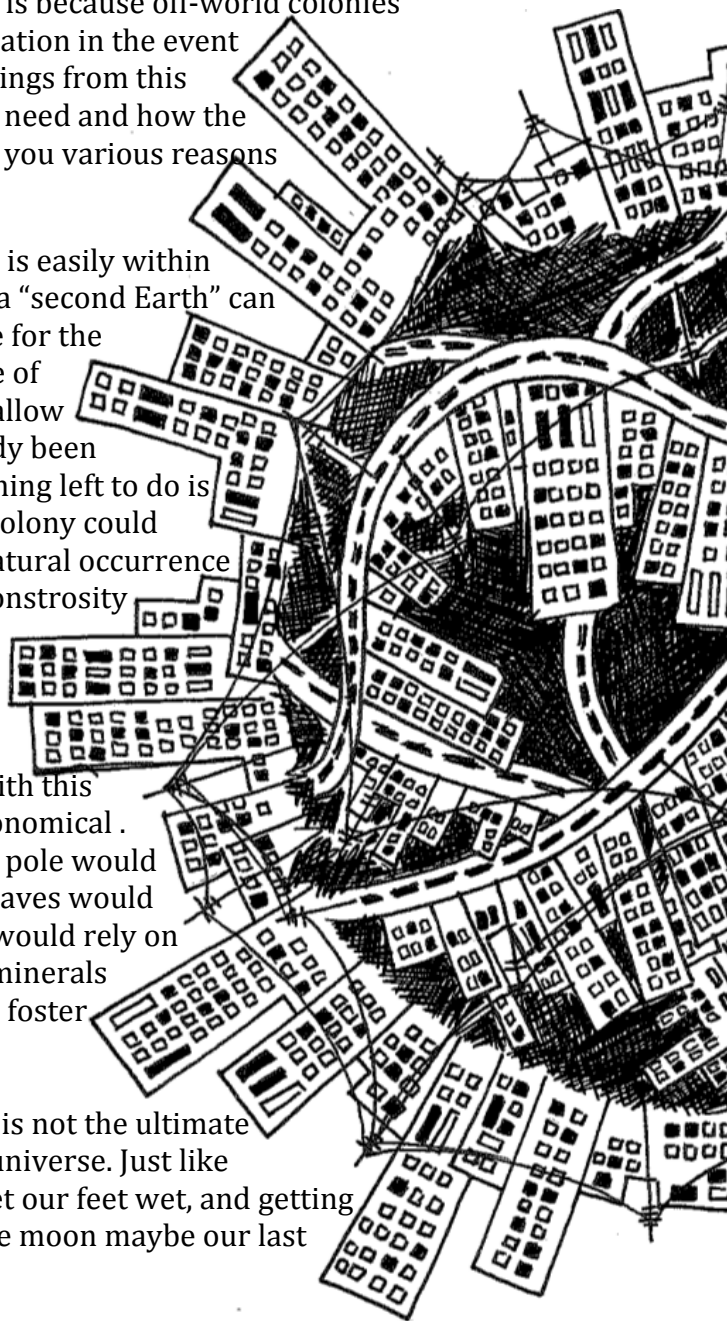
First things first, let's be clear about why we want, and more importantly, *need* an off-world colony. It's not because it would be amazing to have humans living in multiple worlds or because Earth is now officially overpopulated- it is because off-world colonies would improve the chances of survival of the human civilization in the event of a planetary disaster on Earth. Since we are examining things from this perspective, let's consider what an off-world colony would need and how the moon would fulfill each of those requirements. Here, I give you various reasons why colonization of the moon is a brilliant idea.

Firstly, the moon is preferential as a base because it is easily within human reach. Also, the technology required for colonizing a "second Earth" can be developed on the Moon, as its environment is conducive for the development of a biosphere. Secondly, the impending issue of gravity can also be tackled as the moon and its properties allow the creation of artificial gravity. Artificial gravity has already been developed on a smaller scale for space research; the only thing left to do is apply the concept on a larger magnitude. Thirdly, a Moon colony could serve as a safeguard against asteroids and meteoroids, a natural occurrence that has been plaguing the Earth for centuries, a kind of monstrosity that has claimed millions of lives. Most importantly, there is an availability of water in the form of ice - a boon that almost guarantees sustenance.

Now, the major problem that my opponents have with this proposal is that this colonization is neither feasible nor economical. Well luckily, that's not true, for a colony in the Lunar north pole would avoid temperature extremes, the existing holes and lunar caves would serve as a moon base and most importantly such a colony would rely on solar energy. To add to this, colonized moon could export minerals to the earth and as an added bonus, colonized moon would foster space commercialization.

It's important to note that colonization of the moon is not the ultimate goal; it is, instead, a platform to reach out further into the universe. Just like Ken Murphy once said, "the Moon is the ideal location to get our feet wet, and getting there can lay the foundation for a civilization", and truly the moon maybe our last chance of survival.


-Anahita Sahu



THE MOON FEASIBLE?

AGAINST

Ever since Man landed on the Moon, there have been a lot of speculations regarding the creation of a human out post or even a permanent settlement on this natural satellite itself. Before we can even think about colonizing the moon, there are certain factors to be kept in mind. For instance, how habitable is the area? Is it practical to invest billions of dollars in what might turn out to be a dead project? Is it even necessary?



The first reason why colonizing the Moon is not practical in any way is that the Moon's gravity is 17% less than that of Earth's. In other words, humans will not be able to survive on the Moon for long periods of time. Long exposure to low gravity conditions will result in a significant loss in bone density and lead to muscle atrophy, just to name a few of the common issues associated with low gravity. Unfortunately, this is not even the beginning of our problems. The more sinister effect would be on the upcoming generations, our children. The human development project has evolved in such a way that it is in complete sync with the Earth's environment.


Now, colonization would mean that the descendants of the colonizers would be cursed with the likes of fatal deformities, brittle bones and extreme heights that would only lead to many more terrifying complications. The most horrifying result would be the extinction of the human race as the next generations would have drastically reduced life spans, and would be unable to produce any offspring of their own.

Secondly, is it even feasible to colonize the moon? From an engineering perspective, the most glaring problem would be that of the building material. It is impossible to judge what kind of damage would take place when the building material would be subjected to vacuum. For the recreation of a complex biosphere which suits the human body, great financing would be needed which would be a huge drain on any country's economy.

In conclusion, the colonization of Moon would only be a disastrous let down as the cons would outweigh the pros by a long haul and would lead to more disasters. One thing that everybody agrees on is that we do not need to be bogged down with any more complex calamities than we already are!

-Natasha Todi

GENE



Genetically you are more like your father than your mother!!!!

How do you chromosomes with a replication fork?

2 genes found linked to tendency towards violent crime.

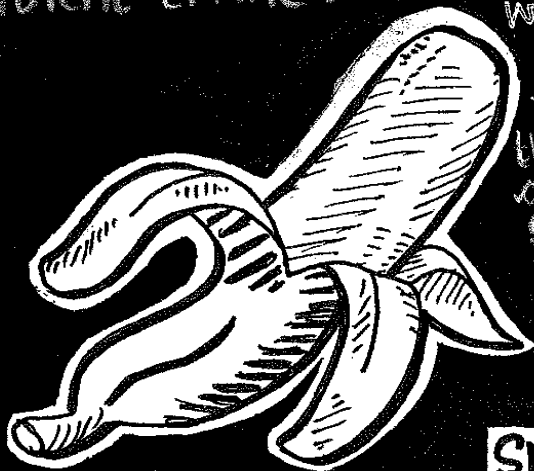
There is a genetic disease that results in short stature, longer life expectancy and near immunity to cancer. People with this condition look like HOBBITS! this condition is called LARON SYNDROME!



HUMANS AND BANANAS

SHARE ABOUT HALF THEIR

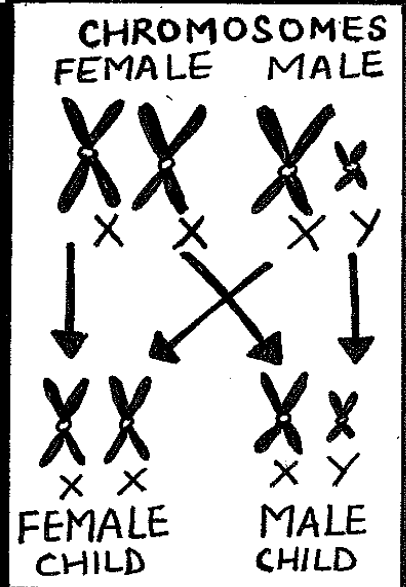
DNA



ETICS

u eat a
al spaghetti?
plication

Elizabeth Taylor's
apparent "clark
outlined" eyes were
due to a genetic
mutation giving her
"double eyelashes"



humans are
genetically closest
to chimps and
Bonobos.

Identical twins can be
alike in almost every way
except their fingerprints.



of em.

ANTIMATTER

In 1928, a physicist Paul Dirac wrote an equation that combined Quantum Theory and Special Relativity to describe the behavior of an electron moving at a relativistic speed. The equation posed a problem: just as the equation $x^2=4$ can have two possible solutions ($x=2$ or $x=-2$), so Dirac's equation could have two solutions, one for an electron with positive energy, and one for an electron with negative energy. But classical Physics (and common sense) dictated that the energy of a particle must always be a positive number. Dirac interpreted the equation to mean that for every particle there exists a corresponding antiparticle, exactly matching the particle but with an opposite charge. For the electron there should be an "anti-electron", for example, identical in every way but with a positive electric charge. The insight opened the possibility of entire galaxies and universes made of antimatter.

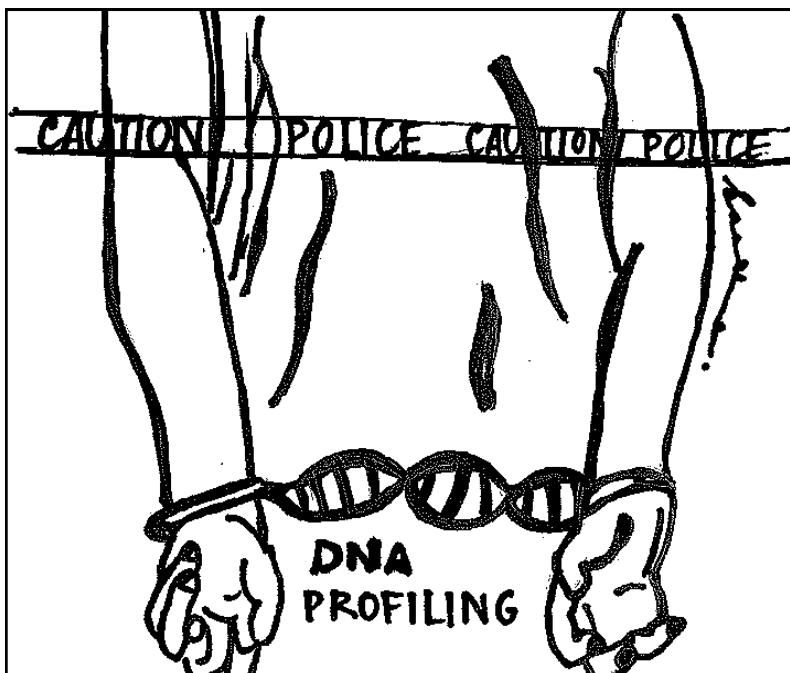
Antimatter is the particle opposite of matter. When matter and antimatter come in contact, they completely destroy each other. Consequently, storing antimatter becomes extremely difficult. It is contained using a combination of electric and magnetic fields in a device called a Penning trap. For neutral antiparticles, however, optical traps are used.

Scientists claim that antimatter is the costliest material to make. In CERN, it costs about a few hundred million Swiss Francs to produce one billionth of a gram of antimatter. Therefore, the antimatter bomb, as suggested in Angels and Demons, is certainly not a possibility yet.

Antimatter as an energy source is also not possible yet. To produce antimatter, the energy needed is greater than the energy released during annihilation, which makes it very inefficient. Though only half a gram of antimatter is needed to be as destructive as the Hiroshima bomb, it would take two billion years for production. It has applications in the medical field, though, for PET-Positron Emission Tomography. Here, positrons are injected in the body, and on annihilation, they release gamma rays, which are then detected; thus, revealing neurological aberrations. This is extremely useful in detection of tumors.

Through many experiments like the AEGIS, the behaviour of antimatter is being analyzed at CERN. A breakthrough in this field could really take the world's technology to a whole new level.

-Saumya Ratan



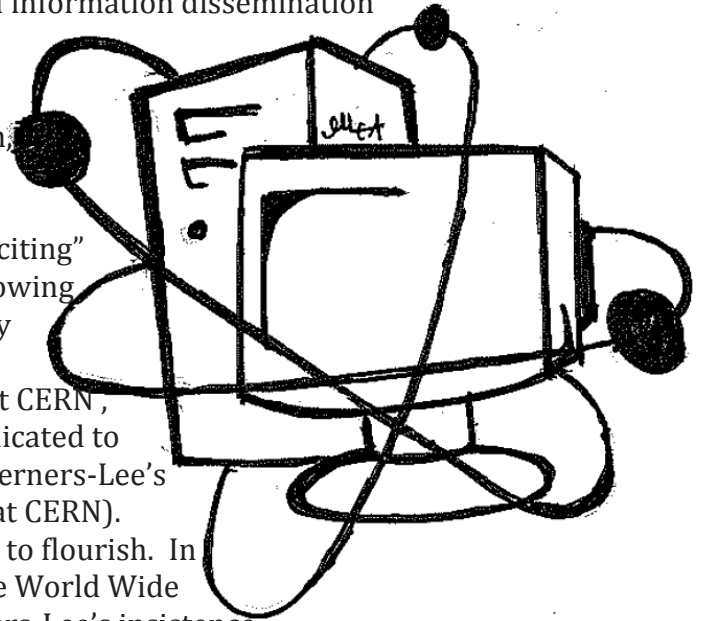
DNA PROFILING

Leicester university geneticist, Alec Jeffreys developed a technique called DNA fingerprinting in 1985. This technique, now known as DNA profiling, can be used to identify individuals. Modern day DNA profiling is a very sensitive technique which only needs a few skin cells, a hair root, or a tiny amount of blood or saliva. DNA profiling is especially useful for solving crimes but can also be used to confirm if people are related to one another, as in paternity testing.

‘VAGUE BUT EXCITING’

The 21st century would be unrecognizable if not for the contribution of Sir Timothy Berners-Lee. We will tell you how. In 1980, while working at the EUROPEAN CENTRE FOR NUCLEAR RESEARCH (CERN), the world's largest physics laboratory, Berners-Lee realized that physicists worldwide needed to share data and that they lacked common machines and software which would enable this exchange. CERN is not and has never been an isolated laboratory; rather it is the focus of an extensive community that includes more than 10000 scientists from over 100 countries. Good contact, therefore, was essential. And this is how TimBL thought of inventing something different. Voila! The web was born. It was his vision of providing a hypertext system that ran across the internet on different operating systems that turned into an all powerful tool for global information dissemination and communication.

While working on many experimental projects which were actually a precursor to his grand invention, a very funny thing happened. He submitted a proposal to his boss, Mike Sandal at CERN in 1989, of a large hypertext for information management. “Vague but exciting” were the words that Sandal wrote on the proposal, allowing Lee to continue. By Christmas 1990 he had successfully built the hypertext transfer protocol (http) and the hypertext markup language (html). The first website at CERN, also being the first in the world (info.cern.ch), was dedicated to the world wide web project itself and was hosted on Berners-Lee’s neXT computer (the original web server which is still at CERN). After all these important actions, the web was allowed to flourish. In August 1991 the "vague" thing, which is now called the World Wide Web, was made available as a public service and Berners-Lee’s insistence that his idea be made free and available to all, led to the birth of the free internet as we know it.



-Soumya Chaudhary



CERNERDS

THE FEROCIOUS FIGHTER

Mantis shrimp is an unusual organism, usually found in warm, shallow water. It has more than four hundred species which grow about 6-15 inches. Out of these, the peacock mantis is extremely colourful. The unusual thing about mantis shrimp is its wide range of colour vision. Our eyes consist of rods and cones (for colour vision). Dogs have green and blue receptive cones. Humans have additional red cones. This red enables us to see all colours derived from red, like orange and violet. Butterflies have two other receptors, in addition to ours. Mantis shrimp, on the other hand, has **sixteen** colour receptors. If three colour receptors enable us to see our rainbow, we cannot even imagine the massive rainbow that the mantis shrimp must be seeing!

Although it sees such beauty around itself, it is essentially a violent creature. It has two raptorial appendages (like claws) in the front of its body. These accelerate with the velocity of a gunshot from a 22 caliber rifle and in less than 3000th of a second, can strike a prey with 1500N of force. To give you an idea: if our arms could accelerate at 1/10th of that speed, we could throw a baseball into orbit. Its quick limbs boil the surrounding water (also known as super cavitation process). When the bubbles collapse, they create an undersea shockwave that kill the prey, even if the target is missed. The force of these bubbles produces temperatures up to thousands of Kelvins, emitting tiny bubbles of light! This effect is called sono-luminescence.



Researchers are studying the cell structure of their limbs for the development of body armour for combat troops. Aquariums don't keep mantis shrimp as it slaughters every other creature it shares a tank with, and can even break the glass. These are the only invertebrates that recognize other individuals of their species and can remember the outcome of a fight against a rival for upto a month.

"It is bright. It is dark. And it is beautiful."

-Saumya Ratan

(Inspired by oatmeal comics)

GLITTER IN THE SKY

While glancing at the night sky, we all think that it is static but we don't know that every millisecond thousands of stars explode. Gamma rays burst is one of the most enigmatic explosions scientists have ever seen. When a massive star runs out of nuclear fuel, it collapses under its own weight and forms a black hole. The black hole shoots jets of particles through the star at nearly the speed of light and astronomers believe they create the gamma rays burst. NASA's new mission carried out by the SWIFT team is to create telescopes and other instruments that could enable us to see such explosions. Gamma rays bursts are believed to be beamed –the energy does not escape from the explosion everywhere equally, but is focused into a narrow jet. Gamma rays burst temporarily outshine the entire universe in Gamma ray light, packing the energy of over million billion suns. Yet these explosions are fleeting-lasting for only a few seconds to a couple of minutes, and occur randomly from all directions in the sky, making them difficult to study.

-Sneha Roy

THE THREE PARENT BABY!

We all know about how a baby is formed; a sperm from the father fertilizes the mother's egg and Voila! We got a baby (or at least the initial stage- a *zygote*.) We also know that in this process of fertilization, the DNA from both the parents comes together, in no fixed pattern, to form one unique offspring.

What we are not familiar with is the presence of a third kind of DNA. Apart from the nuclear DNA from each of the parents, the new individual also needs what we call the *mitochondrial DNA*. Yes, mitochondria have their very own DNA! What's more is that this entire mitochondrial DNA comes from the mitochondria present in the ovum alone.

Sometimes, due to certain mutations or disorders, the ovum might have slightly distorted or dysfunctional mitochondria or sometimes even no mitochondria at all! These situations can prove to be extremely harmful, or even lethal, for the baby. Thanks to the scientific advancement today, we do have a solution to this problem!

The fertilized nucleus is removed from such a mutated zygote and implanted into another enucleated ovum from a woman with healthy mitochondria. In this way, the child now has nuclear DNA from each of his/her parents as well as mitochondrial DNA from a third lady; and is thus a three parent baby!

-Manasvi Mathur



WHY DO WE RUN ANTICLOCKWISE ON A TRACK?

One day, while I was running in the field, a question struck my mind, "Why do we run anticlockwise on the track?" Is it because of the size of the field or because we just prefer running counter clockwise? Most athletes, when questioned about the conventional direction of running, were taken aback because very few had actually ever contemplated this. Well, today the Delphic will answer your question. The reason why athletes always run in the counter clockwise direction is based on the structure of the human body. An important part of the human body, the heart, is located on the left side of the body, so running in the counter clockwise direction ensures that the centrifugal force in the body acts from left to right, resulting in better blood circulation. Better blood circulation does not tire the athlete and helps him/her accelerate.



Another reason behind running in the anticlockwise direction is related to the Earth's rotation. The Earth rotates counter clockwise. Therefore, when we run in the counter clockwise direction i.e. along the direction of the earth's rotation, our speed increases relative to that of running in the opposite direction. When we run in the opposite direction, we have to spend some energy to overcome the centrifugal force of the Earth - which is greater in the opposite direction. However, in the Southern hemisphere, it is the other way round. If a person runs in the clockwise direction, he/she will run faster. Unfortunately, according to the rules of the track events, the athlete has to run in the anti-clockwise direction. For this reason, the athletes in the Southern hemisphere are at disadvantage when compared to those in the Northern hemisphere. This could explain why no world records have been set in the Southern hemisphere till now.

So, the next time when you want to beat your friend on the track, ask her to run clockwise and run counter clockwise yourself. Victory will surely be on your side.

-Palakh Sharma

ROCKET TO DREAMS

Trip to NASA

During the summer vacations, a group of 39 AIs visited NASA's Kennedy Space Center as part of an educational 3-day rocketry programme along with Mrs. Neena Agarwal, Mrs. Anima Singh, Mr. Kapilesh Agarwal and Mr. Jakhmola. The girls built water rockets using plastic bottles and launched their creations. In the course of this activity, they assumed the roles of flight directors, system engineers and safety officers.

They also watched an IMAX movie on Space, saw an exhibit on the three rovers from Mars, toured the rocket launch pad and learnt about the SPACE-X Orion capsule's planned journey to Mars.



Based on the experiments performed by the girls, one team was announced as the winner. After graduating from the summer programme at the Space Center, the girls' went on to visit Sea World, Universal Studios, Washington D.C. and New York.

The excursion to Kennedy Space Center was an enriching experience as the girls learnt immensely.

**-Suhani Dhawan
Ishika Arora**

' $\sqrt{2}$ ' Death

The father of a certain triangle-related property which haunts middle school students indiscriminately, Pythagoras – was also a radical, apart from being a Math nerd. Obviously self-absorbed, Pythagoras invented a whole new “religion” – Pythagoreanism – apart from discovering several mathematical properties. What he dubbed as a religion was nothing short of a dangerous cult. One instance of this is the tragic story of Hippasus – a student of Pythagoras.

A curious thinker, Hippasus spent his time playing around with the number $\sqrt{2}$. In the process, he discovered that $\sqrt{2}$ had no equivalent fractions and was an irrational number. To the contrary, Pythagoras had developed the idea that all numbers were purely rational. Instead of being overjoyed by his discovery, Hippasus was afraid, and he had reason to be. His teacher, Pythagoras, was not amused and could not stand his theory being challenged. Threatened by his student's discovery, Pythagoras consequently sentenced Hippasus to death by drowning in order to keep his own infallibility safe. A preacher of conformism to his own views, Pythagoras not only created terror in the minds of modern students with his theories but also in the community of his own pupils.

Such volatile tendencies were a part and parcel of Pythagoreanism and this cult was not limited to just Mathematics. In light of such instances, one can only feel privileged to be born in a modern scientific era where thirst for knowledge is appreciated and Pythagoras is not one's teacher!

Physicist Max Planck's statement holds good in this case, “Science advances one funeral at a time.”

-Dhruva Shukla

NUMBER SENSE

How can a rat know that $2+2=4$? How can a pigeon compare 45 pecks with 50? I know from experience, that these results are often met with disbelief, laughter or even exasperation, especially when the audience composes professors of Mathematics! Western society, right from the time of Euclid and Pythagoras, has placed Mathematics at the pinnacle of human achievements. We view it as a supreme skill that either requires painful education or comes as an 'innate' gift. In many philosophers' minds, the human ability for Mathematics derives from our competence for language. In accordance with that, it is inconceivable that an animal can count, much less calculate with numbers! But what if I give you evidence to refute this point?

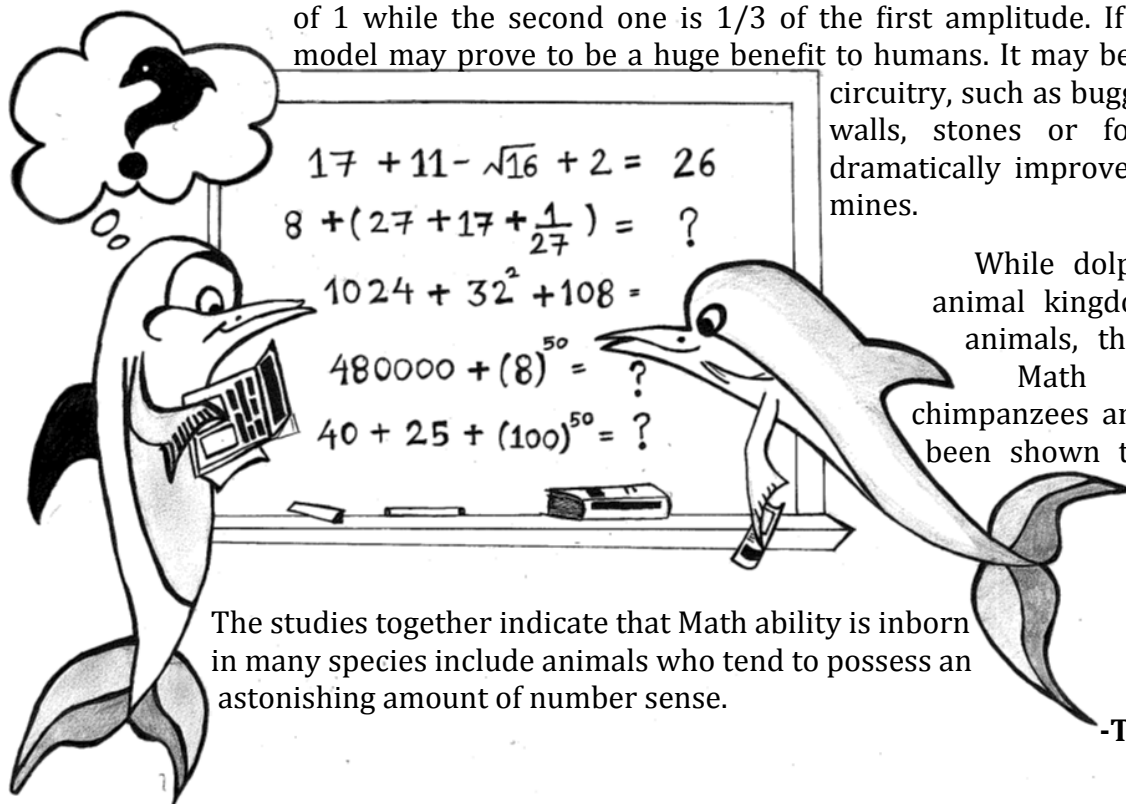
One of Otto Koehler's (a famous German ethnologist) trained cows, Jacob, apparently learned to choose, among several containers, the one whose lid bore a fixed number of five points. Because the size, the shape, and the location of the points varied randomly from trial to trial, only an accurate perception of the number '5' could account for this performance.

The next experiment was carried out on ants where scientists put some ants on stilts, which would make them take longer steps, and for another group of ants, they cut off a part of their legs which would make them take shorter steps. In spite of moving towards the same destination, the ant groups had differing results. The ants on stilts took the same number of steps back home and walked back past their nest, while the stumpy - legged ants took the same number of steps and stopped before they got back home. Thus, the best explanation we have is that apparently, ants can count.

Dolphins may be using complex non-linear Mathematics when hunting. It turns out that these brainy marine mammals could be far more skilled at Math than was ever thought possible before. A dolphin's biological sonar is more advanced than the one developed by humans. The Math involved is complex. Essentially it relies upon sending out pulses that vary in amplitude. The first may have a value of 1 while the second one is $\frac{1}{3}$ of the first amplitude. If replicated, the sonar model may prove to be a huge benefit to humans. It may be able to detect covert

circuitry, such as bugging devices hidden in walls, stones or foliage. It could also dramatically improve the detection of sea mines.

While dolphins are among the animal kingdom's most intelligent animals, they are not the only Math champs. Parrots, chimpanzees and even pigeons have been shown to have an advanced understanding of numerical concepts.



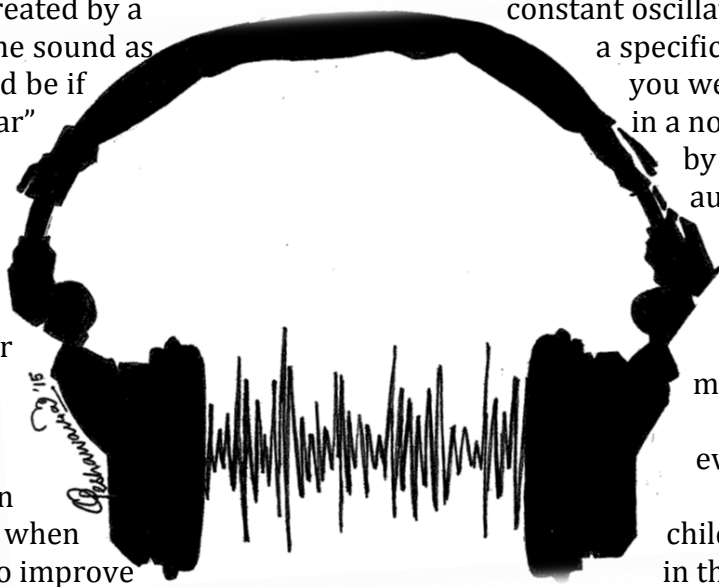
The studies together indicate that Math ability is inborn in many species include animals who tend to possess an astonishing amount of number sense.

-Tara Katyayini Singh

MUSICALLY YOURS

In today's tech-savvy world, where iPods and other music devices are a common sight, it has become easier than ever for music to become an integral part of our lives, in the form of a universal language. However, many people do not realize that behind every tone, whether pleasing or not, is intricate mathematics. This phenomenon serves as the alphabet of a universal language, which works subconsciously in the musician's mind to construct the pattern of tones, better known as performing music.

The philosophical difference between music and noise may be a bit fuzzy, but scientifically and mathematically, there is a well-defined difference. If there is a mixture of a large number of audible frequencies, such that the ear cannot perceive any specific frequencies or tones, the result is noise. However, if the sound is created by a constant oscillation at a given frequency, our ears would perceive the sound as a specific pitch, or musical note. A good example of this would be if you were to recite the words to "Twinkle Twinkle Little Star" in a normal speaking voice. The audible sounds produced by your vocal chords would be within a range of audible frequencies but not on a specific frequency. On the contrary, if you pronounced the same exact words, but with exact frequencies for each syllable, you would now be singing. With the proper enunciation, the human voice becomes a musical instrument.



There is much positive effects of music on Most research shows that when at a young age, they tend to improve

evidence that supports the one's ability to do math. children are trained in music in their math skills.

While music is a unique blend of mathematics and unexplainable right-brain human perception, if one person were to say that music is a set of mathematical relationships that can be explained purely by algebraic equations, and another were to say that music is a gift in life that mankind will never completely comprehend, both of these individuals would be absolutely correct.

-Pooja Patwari



BRAIN

Yuvraj's house is 2 kilometers away from the *samosa* shop. He sets out at a speed of 1 km/hour. Owing to the fatigue caused by the scorching heat of the sun, his speed reduces to half of the previous one, each hour. When will he reach the *samosa* shop?

TEASER

WHAT TO WATCH?

TV Series: Fringe

Cast: Anna Torv
Joshua Jackson
John Noble

Director: JJ Abrams



Imagine a world where you are at the fringe of reality, where you constantly tackle what you don't always understand, and to believe in the insane is an asset. Mutilated bodies devoid of spinal fluid, a gang of thieves that can go through walls and a series of murders where the victims die of fear is only the start of a show that explores advanced biotechnology and science in a captivating and engrossing way. Through the concepts of Fringe Science- a science ranging from invalid hypotheses to quite simply, mumbo jumbo- and the grey characters of an FBI agent, a mad scientist and his estranged son, we get an ingenious science fiction drama with An element of surprise.

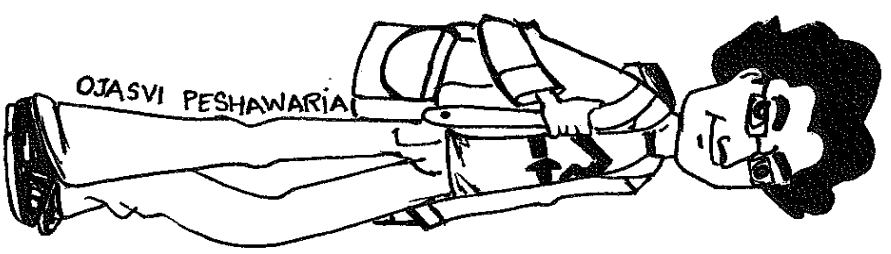
Created by JJ Adams and Alex Kurtzman, this American drama series starring Anna Torv, Joshua Jackson and John Noble deals with the cases solved by the Fringe department of the FBI concerning bizarre happenings that involve concepts from Fringe Science such as psychokinesis, reanimation, artificial intelligence and the like. The drama showcases the lives of its characters - Agent Olivia Dunham who tries to decipher the psychological link she maintains with her dead colleague and Walter Bishop who is hiding a terrible secret from his son, Peter – and, little by little, unravels the mysteries surrounding them.

Aired in 2008, this sci-fi drama received a lukewarm response from critics though it grew more favorable among them with subsequent seasons. Today it scores an 8.5/10 on IMDB, has been nominated multiple times for awards for its visual effects and has received awards for its cast (the 2011 Critics' Choice Television Awards for Best Supporting Actor –Drama series received by John Noble).

What interested me most is the show's knack for bringing forth the interesting nuances of science and its possibilities and giving life to its usually mundane theories. What it failed in, was letting the characters' emotions be the driving force of the show such as the relationship shared by Peter and Olivia. So if you are looking for a change from the conventional crime and macabre, this show is definitely a treat for sore eyes as it dangles between the real and unreal giving you, as put by the AV Club, "A rare blend of inventive ideas , wild ambition and unexpected soulfulness."

-Ishrat Hans

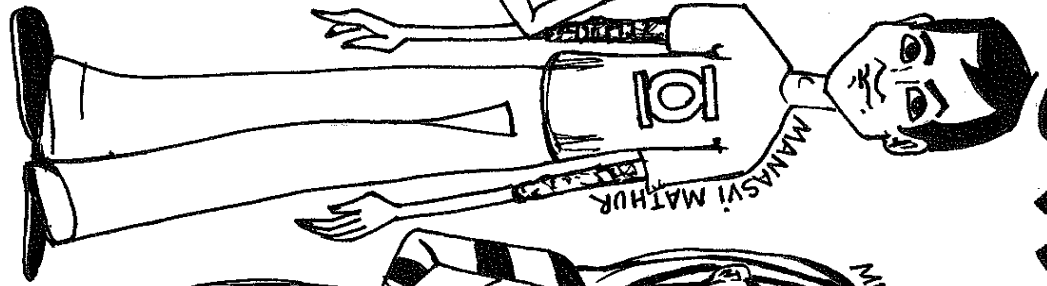
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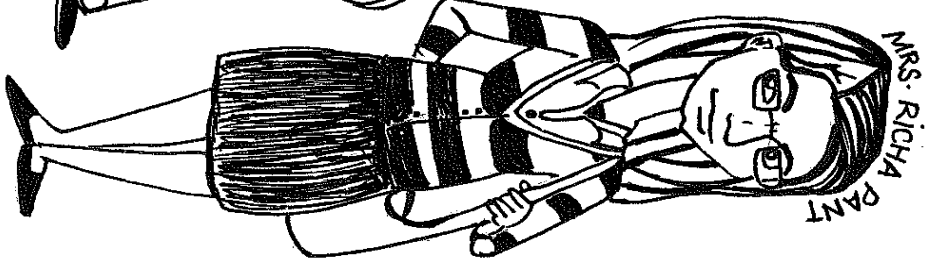
OJASVI PESHAWARIA



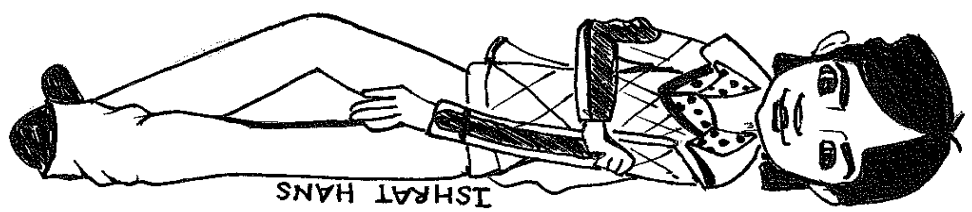
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