



Element

ONE
ISSUE XIV

Element

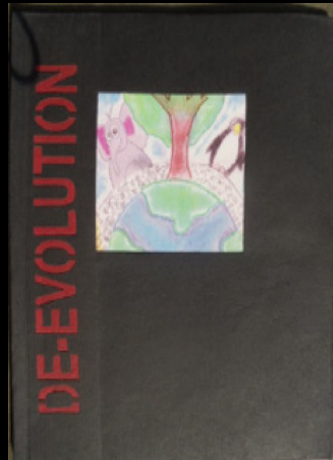
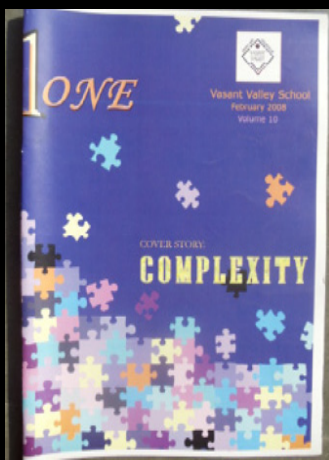
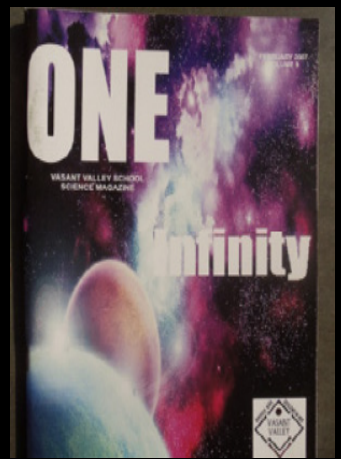
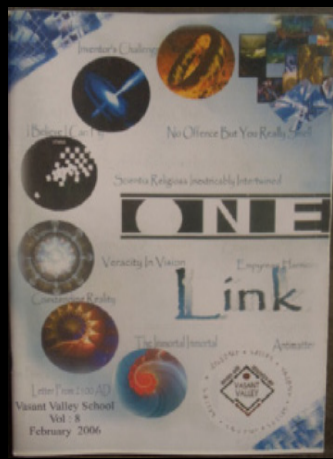
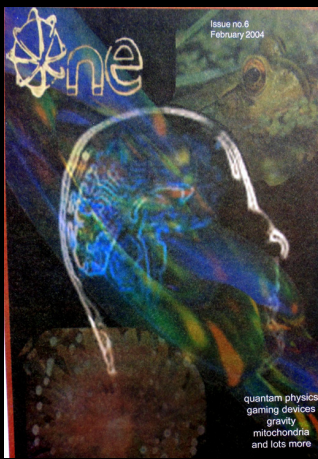
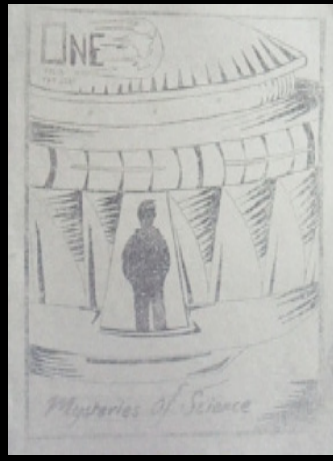
Agreed that one shouldn't judge a book by its cover, it is perceived to be a superficial manner of analyzing the actuality of content within; however on the other hand, one shouldn't underestimate the significance of the cover page either. Our title page too, has been selected via a painstaking process, so as to portray the entire science editorial board's vision.

Science, we believe, is the amalgamation of the five elements of life, namely air, water, fire, earth and spirit. These are the sole foundation of our existence. Their power, we feel, is the driving force behind every aspect of science. And thus this is what we intended to portray. The palette of colors, from the fierce dominating red, to the gently flowing blue, have come together to frame the portrait of the ever lasting balance of nature and science, which is what essentially maintains the equilibrium of life. The cover page is also pivotal in understanding the main aspect, what we as young students and lovers of science wanted to emphasize on- The abstractive, spontaneous and impulsive nature of science.

We wanted to try something new, by depicting our dynamic bilateral relationship with science as a colorful experience for our readers. Attempting to establish new genera's so as to capitulate a wide array of concepts, we have organized our magazine with the hope that each of our readers can find a medium of connect to one concept or another.

ONE

Through the Years...



one

**vasant valley school
science magazine
issue xiv**



CVRAMAN

By Shriya Gupta

Every child of Vasant Valley School, is well aware of the brilliance of that mastermind, in who's honor we come together every year to celebrate the bliss of science- Sir Chandrasekhara Venkata Raman.

A crowning jewel, Mr.Raman, was the first Indian scientist to receive Noble Prize for Physics in 1930 for his pioneering work related to the scattering of light, often regarded as the “Raman Effect”.

Born in the small town of Tiruchinapalli, Tamil Nadu, Raman had big dreams and these dreams were well nourished by the studious environment present at home. Studied in the Presidency College, Madras Raman, eventually passed his M.A. in 1907 with high distinction. Soon after he joined the Indian Finance Department. Fueled with high aims and aspirations, Raman didn't let office hours limit his cultivation of curiosity instead would strive for perfection well beyond his office. Professor of Physics at Calcutta University for 15 years, a member of Royal Society of London in 1924, followed by the knight-ship of the British Empire in 1929.

C.V. Raman was a truly inspirational figure.

This man is not only a name gilded in history but an epitome of perseverance and passion for the future generations to look up to. A scientist to some; a extraordinary to others; But a hero to all.

A Letter From The Editor

When we think of the word 'science', a number of images flash in our head. Diverse yet each captivating our curiosity, they could be wide ranging from celestial bodies to objects we encounter in our everyday life.

But what is science?

I would delineate it as the systematic study, which enriches our lives, expands our imagination and relieves us from ignorance and superstition. With research, Science has grown to an unimaginable extent. It is no longer a static entity but a mold which cultivates holistic growth. It has evolved into the essence which fuels humanity and the whole world has become fundamentally devoted to scientific aspects.

We, through the medium of our magazine have focused on the earth as it nears its end. Pertaining to the fact that scientific research of geosciences (an all-embracing term for the sciences related to the planet Earth) has become imperative and of utmost importance, it has become essential to defend the earth from threatening phenomena and in the survival of mankind. The solution we feel, is a re-analysis of the current route we are taking – by labeling science as a concrete structure and disregarding its innate impulsivity. During this great journey of creating the magazine, we have acquired an enormous

amount of scientific knowledge which has broadened our perspective. We have realized that although science has progressed in a major way in the past century, there are many negative aspects which have also been incorporated into its advance. Science has not only become extremely rigid and four cornered but its once valued spontaneity, free flowing quality has diminished rapidly. Men made restrictions have begun to bind science, and have made it excessively mechanical. Individuals no longer dare to question the unquestionable. They overlook the fact that true education occurs outside classrooms.

Although we might not realize it now, future generations rely on creativity and innovation. Rote memorization is gradually beginning to hamper and inhibit continually growing love for science. Thus we mustn't underestimate the importance of science to the human civilization, which continues to grow with each passing day. Interwoven with the threads of our lives, are the fibers of science.

Abhinav Rai

A Note From Last Year's Editor

Sitting before a troublesome creative writing assignment, finding effective ways to make a presentation, attempting to compose music for the first time, trying to get all members to work together as a team or figuring out how to save the earth- in one way or another everyone has wondered at some point of time "Where do good ideas come from?" This thought (also the title of a very interesting book by Steven Johnson) comes to the minds of the curious, the concerned and the desperate, and we often find ourselves in any one or all of these situations. As most would have guessed, there is no straightforward answer to this evergreen question. Age and wisdom seem to offer no balm to this dilemma, in fact, childish spontaneity may be closer to the answer than we think. However many have come to believe in the truth of the following words:

"If you want to create a space for innovation, you won't get far by cloistering yourself away from the world and waiting for inspiration to hit you. Chance favours the connected mind."

The science magazine, for us, was an opportunity to make our small contribution to making this connection. Yes, we live in the 21st century, the era of communication, but the closer we get, virtually, to peo-

ple from around the world the farther we get from ourselves and we disconnect from our own spontaneous process of innovation. Let's take a giant leap forward by looking within and looking around us to celebrate the little things and ideas that together create the big picture that is our world.

Ramya Ahuja



Inphinite, Last year's edition of the Vasant Valley Science Magazine

Editor: Abhinav Rai
Co-Editor: Shriya Gupta

Editorial Board

Akshat Arora
Ashna Satyajit
Gauri Khanna
Ishan Sardesai
Mehak Mann
Rishabh Prakash
Riyah Singh
Tushar Bhargava
Veer Gupta

Special Thanks!

Tushar Nath
Ms. Charu Johar
Anish Asthana
Mrs. Majumdar
Mrs. Banerjee

Contents

Life on Earth

2011: International Year of Forests Rishabh Chatterjee	1
The Copenhagen Interpretation Mehak Mann	3
Costa Rica Rhiddhima Yadav	5
The Success of the Cockroach Ishan Sardesai	7
What Makes Birds Fly? Riya Kothari	9
Existence Ananya Gupta	9
Solar Energy Sumer Grewal	10
How Do Owls Fly Silently? Indraneel Roy	11
Accidental Discoveries Riyah Singh	11
Hydrosols and Microbubbles Prithvi Raj Singh	13

If There Was No Friction! Kabir Singh	13
Solar Power Shiv Kapur	14
Bucket List of the Indian Tiger Divij Chandna	14

Reaching Beyond the Earth

The Accelerating Universe Tushar Bhargava	18
Supermassive Black Holes Akshat Singh Arora	20
Astrology and Science Veer Gupta	21
HD85512 B: A Possibility of Life? Ashna Satyajit	23
The Big Bang Anhad Arora	25
Dark Energy and Dark Matter Ishita Malhotra	28
Farewell Old Friend! Vani Mohindra	31
Antimatter : Destroyer or Saviour Nivedita Dwivedi	38

A Step into the Future

The Time Traveler Abhinav Rai	42
Faster Than the Speed of Light Dhruv Sagar	44
Lotions, Potions and Magic Solutions Devaki Divan	45
The Next Giant Leap for Mankind Pihu Yadav	46
It's 'Terrafugia'-cally Amazing! Aditi Banerjee	48
Harnessing Energy from our Roads Rishabh Prakash	50
Science of Tomorrow! Vandita Khanna	53
Automaton Nandini Agarwal	55
The Next Giant Leap for Mankind Ayush Sharma	58
Shaping the World Atom by Atom Dhruv Mishra	60
Time Travel: Fact or Fiction Ranjit Singh	63

Gadget Making: Water Weights-64 Malika Oak	64
Liquid Operated Batteries Mehr Mehra	65
Gadget Making: Ear Ring Popper Inhee Ji	66
The Future of Science Anjani Gupta	67
Nanorobotic Abhiveer Arjun	68
Stem Cells Treatment of Cancer Divya Shastri	71

Reality and Vitality

Designer Babies Shriya Gupta	74
Genes on SALE Gauri Khanna	77
Cloning Yashita jeet	80
A Brilliant Mind Pranav Khanna	81
Molecular Gastronomy Sanya Malhotra	82

The Mystery of the Fingerprints Ishita Malhotra	84
Medical Nanotechnology Priyanka Bhagat	87
Gymnastics: Through Newtons Eyes Tejasvini Puri	89
Further Evolution of Man Pia Kochar	91

The End.

Solar Flare or Despair-95 Sharanya Thakur	95
2012: Will the world really end?-96 Abhinav Rai and Akshat Singh Arora	96



Life on Earth

In all things of nature there is something
marvelous —Aristotle





2011: The International Year of Forests

Winner of the Science Essay Prize 2011

The United Nations General Assembly has declared 2011 as the International Year of Forests in order to raise awareness on sustainable management, conservation and sustainable development of all types of forests. An International Year of Forests 2011- logo has been designed to convey the theme of "Forests for People".

Forests are one of the precious natural resources on the earth. They provide us with various natural services and play an important role in economy of the nation. Forests provide shelter to people and habitat to biodiversity; they are a source of food, medicine and clean water; and play a vital role in maintaining a stable global climate and environment. Forests are vital to the survival and well being of people.

Forests are an integral part of global sustainable development. Forest-related economic activities affect livelihoods of 1.6 billion people worldwide; they provide socio-cultural benefits and are the foundation for indigenous knowledge; and as ecosystems, forests play a critical role in mitigating the effects of climate change and protecting biodiversity. Forests play a critical role in absorbing the greenhouse gases that have been attributed to climate change.

The forest resources of the world are under threat due to overexploitation, deforestation, urbanization, shifting cultivation practices, natural disasters etc. Considering the importance of forests, there is need to Protect and Conserve the Forest ecosystem. The International Year of the Forests provides an excellent platform to increase awareness of the connections between healthy forests, ecosystems, people and economies. Various activities will be organized all over the world to celebrate this International Year and foster knowledge exchange on practical strategies to promote sustainable forest management. Governments, regional and international organizations and civil society organizations are expected to create national





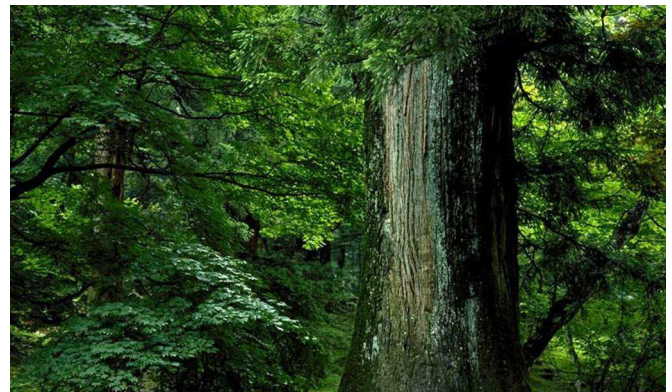
national committees and designate focal points in their respective countries to facilitate organization of activities in support of the International Year of Forests. The United Nations Forum on Forests Secretariat has been tasked with serving as the focal point for the implementation of the International Year of Forests.

A website for the International Year of Forests has been established by the United Nations:

www.un.org/en/events/iyof2011/

India is one of the countries with rich forest resource in the world. In India Forest is the second largest land use next to agriculture. The forests play vital role in harboring more than 45,000 floral and 81,000 faunal species of which 5150 floral and 1837 faunal species are endemic.

As per the India State of Forest Report, 2009, the total forest cover of the country is 690,899 km² constituting 21.02 % of the geographic area of the country. Madhya Pradesh has got the largest forest cover in the country followed by Arunachal Pradesh, Chhattisgarh, Maharashtra and Orissa. Mangrove cover in India accounts for 3 % of the world's mangrove vegetation and is spread over an area of 4,639 km² in the coastal States/UTs of the country. This accounts for 0.14% of the country's total geographic area.



Various measures are being taken up to conserve this forest resource. India's National Action Plan for Climate Change (NAPCC) includes National Mission for a Green India. This mission underlines the indispensable role of forests in the preservation of ecological balance, maintenance of biodiversity and as effective carbon sinks. It builds on the Prime Minister's Green India campaign for afforestation of 6 million hectares and the national target of increasing land area under forest cover to 33%. It is to be implemented on degraded forest land through Joint Forest Management Committees set up under State Departments of Forests.

India will also launch its own dedicated forestry satellite in 2013 to enable real-time monitoring of both deforestation and afforestation in the country.

All these efforts along with the effective public participation will definitely help to achieve the Sustainable management and conservation of forests in India.

Rishabh Chatterjee
IX B



The Copenhagen Interpretation

It is a widely held notion that seeing is believing, but that might not be true after all.

The Copenhagen Interpretation is one of the earliest and most commonly taught interpretations of quantum mechanics. This theory basically follows the principle: "What is observed certainly exists; about what is not observed we are still free to make suitable assumptions. We use that freedom to avoid paradoxes."

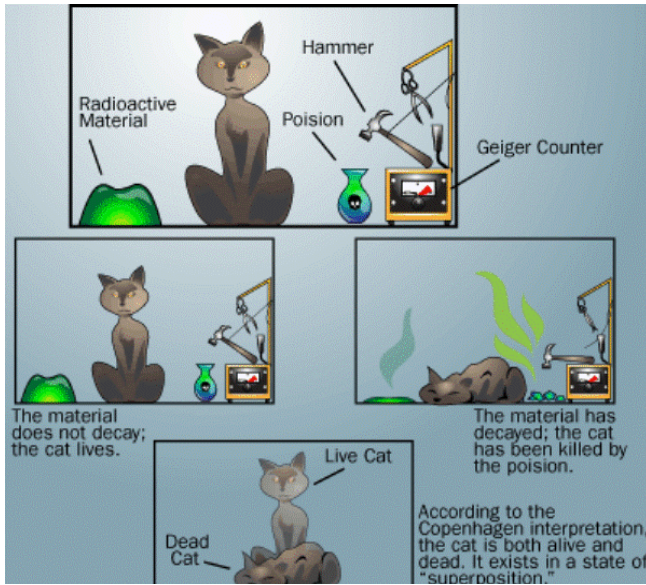
It came about in part to explain the infamous Double Slit Experiment. This experiment shows that an electron or any other subatomic particle, fired at a wall with two slits in it, will sometimes go through one, sometimes through the other, and sometimes it will go through both slits simultaneously (meaning, a single thing will be in two places at once). The twist is, if you try and observe the electron at the moment it passes through the slits, to figure out what is happening, the electron goes back to behaving like a normal electron, and innocently shoots through one of the slits, that is, randomly assumes only one of the possible exits. But how is this possible?

What the scientists of that time came up with is that all particles exist as waves of probability. From the observer's perspective, there is only a certain chance that a given



electron will either go through the left slit or the right slit. When you are not watching, it remains a cloud of probability and sort of does a little of everything. When you are watching, the mere act of observing it somehow causes the cloud to pick a side. So the next time you observe a particle, be warned: they know you're watching, and as soon as you stop, they're going to start a party.

But if you apply the Copenhagen Interpretation to bigger macroscopic objects, it gets even weirder. The infamous Schrodinger's Cat thought experiment, said that if you put a cat in a box and press a button that has a fifty percent chance of filling the box with poison gas, then until you go and look in the box, the cat exists as a cat-cloud which is simultaneously both alive and dead. Thus, a description of the cat during the course of the experiment becomes a "blur" of "living and dead cat." But this can't



Many physicists and philosophers have objected to the Copenhagen Interpretation, both on the grounds that it is non-deterministic and that it includes an undefined measurement process that converts probability functions into non-probabilistic measurements. Einstein's comments "I, at any rate, am convinced that He (God) does not throw dice." and "Do you really think the moon isn't there if you aren't looking at it?" exemplify this. Bohr, in response said, "Einstein, don't tell God what to do".

Mehak Mann
XII B

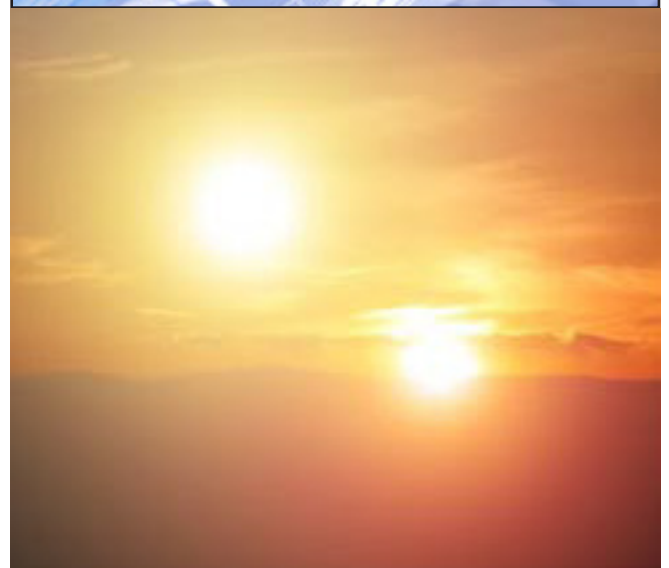
be correct because it implies that the cat is actually both dead and alive until the box is opened to check on it. But the cat, if he survives, will only remember being alive.

And there's more: if everything exists as a probability wave, then that means that technically, anything could happen at any time.

The Many Worlds Theory rejects The Copenhagen Interpretation's crazy idea that particles can change their behavior seemingly at will, and replaces it with the even crazier idea that the only reason we think particles are changing their behavior is that we are only seeing that particle's action in one universe, rather than the infinite number of universes that actually exist. So for every action you have ever taken, every movement you have ever made, even down to the atomic level, there is a parallel universe out there where you did something else instead.

DID YOU KNOW?

There could be two
suns visible on Earth
some time in 2012!





Costa Rica: A Summer Well Spent



Costa Rica, literally 'Rich Coast' is quite assuredly the world's greenest and the world's happiest country. And this summer, I happened to be there as part of a National Geographic Student Expedition, to give back to nature and to learn about the immense biodiversity our planet has to offer. What I didn't realize was what Costa Rica would give back to us. Our group of 30 was multicultural in its true sense. We had teenagers ranging from as far as Canada, to Taiwan and of course from India as well. Each one of us chose an On Assignment Project that ranged from Photography, to Community Service to Wildlife and conservation. I chose Wildlife and Conservation. What followed over a course of 15 days was exploration in its true sense.

We mapped the length and breadth of two Costa Rican areas, San Luis and Guanacaste. Our day in San Luis would begin at 6 a.m. with an early morning hike to spot the elusive bell bird or the agouti and

milk the cows. We would then come back to our base i.e. the Eco-lodge which was also the campus of the University of Georgia, have a traditional Costa Rican meal and head of into our subgroups according to our projects. For my group it included visiting the Monteverde Cloud Forest Reserve [home of the extinct Golden Toad], exploring the forest on horseback with naturalists at our call, visiting the animal rehabilitation centre to tend to injured snakes and spotting the green viper of South American forests on a night hike. Such was the biodiversity of this region that on the first day itself, I spotted 30 species of birds, plants and amphibians. They ranged from [note the names!] hot lips plant, Dracula orchid, dumb king plant which actually makes you dumb if you eat it, Swiss cheese plant and the rattle snake plant to name a few. We were joined by our Nat geo expert Taylor Edwards who is a conservation Geneticist. With him we worked on capturing footages of toucan birds, researching on our projects for which the university students gladly lent their extensive library! To reduce our carbon footprint we had created by traveling here, we left our imprints on Costa Rican soil in the form of 300 tender saplings. After spending a very eye opening week in San Luis we headed to Guanacaste which



is a beach area. There we presented our final on assignments projects which ranged from photography slideshows to podcasts to musicals, showcasing all that we had learnt. We spent the last day of our trip, learning to snorkel and surf. My instructors were Taylor- from Harvard University, Sam- a Costa Rican specialist from the University of Arizona and Lisa – a frequent traveler from IBEX Expeditions.

This was more or less skimming over the surface. Hard as it is to pack everything into a nutshell and present it to you, I have tried my best and now as I sit back on my flight back to New Delhi I have an epiphany. Over the last two weeks I have made some very good friends, I have learnt the true spirit of adventure and of being able to truly open up to the beauty of this world. I have learnt to ask questions and seek their answers within myself. I have learnt to connect the underlying and often obvious secrets in things. I have learnt the true essence of science.....

Pura Vida!

Riddhima Yadav
XII B

WHAT SHOULD WE DO WITH CRUDE OIL?

Teach it some manners of course!

Fungus which loves to eat Plastic!



Plastic encases our gadgets, helps keep our food fresh, holds our water, and carries our data. But chemical bonds in plastic are so strong it is very difficult for nature to degrade it. The end result is lots of waste for the next several generations. Students from Yale recently discovered a new type of fungus, called *Pestalotiopsis microspora*, while collecting microorganism and plant cell samples at a Rainforest Expedition and Laboratory trip to the Amazon rainforest. It was discovered this fungus loves eating plastic, specifically polyurethane, which we use millions of tons of every year. Popular uses include foam for inside furniture, building insulation and flooring. The fungus is grows on polyurethane in both aerobic and anaerobic environments. It breaks the plastic down into liquid or solid forms. It's also possible *Pestalotiopsis microspora* could work at biodegrading the plastic buried deep within our landfills around the world.



THE SUCCESS OF THE COCKROACH!

The cockroach is a fascinating insect belonging to phylum Arthropoda of kingdom Animalia.

This insect, which is found practically anywhere and everywhere (including school biology laboratories where they are dissected, studied and preserved, basements, small cracks and crevices, sewers, yards etc.) has been grubbing around all over the world since the time of the dinosaurs!

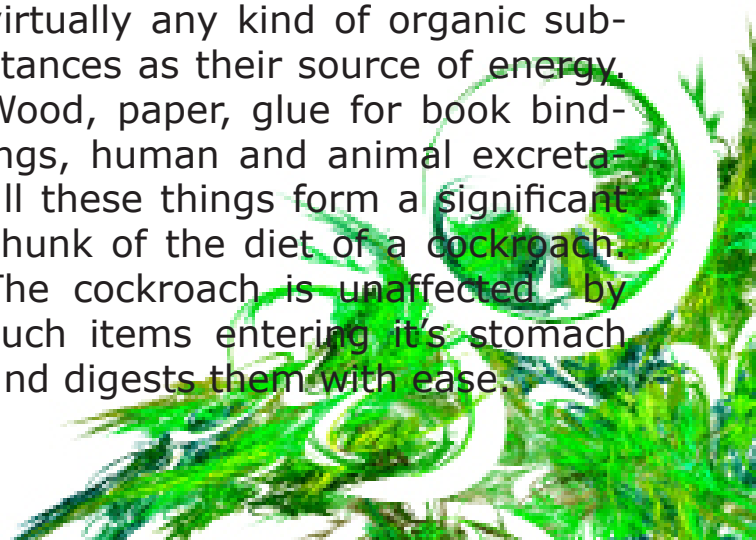
They like to get snug and comfortable in warm, moist and dark areas which implies that during the day time, the areas beneath refrigerators, doormats, cupboards etc. in our homes provide ideal conditions for this creature. The only areas devoid of this six legged, creepy crawly are the extremely cold regions of the world such as the polar ice caps.

This remarkable insect can live for almost a month without food and for about two weeks without water! Some female cockroaches only mate once and stay pregnant for life! A cockroach can live for up to one week without its head and it can hold its breath for up to 40 minutes. They can also run at a speed of 3 miles an hour! In fact, it has also famously been said that cockroaches can survive a nuclear attack. Now a nuclear attack may be too much for even a cockroach to handle if we consider the tem-

perature rise associated with such an attack but it is true that cockroaches are highly resistant to radiations; radiations which could cause severe damage to human beings. Clearly, it takes a lot of effort to finally see a cockroach on its back! Those sprays and insecticides just never seem to work with cockroaches. This explains why they are such troublesome, difficult and downright irritating house pests.

The cockroach is indeed a living fossil. It is one of the most successful life forms to have ever existed on earth. While all the massive dinosaurs disappeared, this freak of nature survived without undergoing any significant changes in its morphology. So what are the reasons for the great success of the cockroach?

All organisms need food to survive. The cockroach is no different. But cockroaches unlike most other 'normal' organisms, can consume virtually any kind of organic substances as their source of energy. Wood, paper, glue for book bindings, human and animal excreta—all these things form a significant chunk of the diet of a cockroach. The cockroach is unaffected by such items entering its stomach and digests them with ease.





As a result, cockroaches rarely face a lack of food. For these strange organisms, truly anything and everything is food. They are anything but fussy eaters!

Some cockroach species like the American Cockroach can live for up to 1 to 2 years. They live for much longer than other insects. They also reproduce quickly and can do so throughout their life. Most insects do not show parental care. But in cockroaches, some degree of parental care has also been seen which increases the survival rate of the offspring.

They are also very clever and sneaky and at the sniff of any kind of danger like predators such as wasps and birds, they quickly hide in cracks and crevices for shelter and protection. They have well developed sensory and nervous systems which enable them to react quickly when faced with any kind of danger. They also possess high regenerative power. In case they lose a leg in an accident or attack, they can regenerate the whole leg quickly after just one molt. You iss-

on't see a cockroach with a missing leg too often!

Some other interesting facts about cockroaches are:

- Young cockroaches only need a crack about 0.5mm wide to crawl into your house. Adult males can squeeze into a space of 1.6mm.
- Male cockroaches transfer sperm to females in a package called a spermatophore. Some males cover the package in a protein-rich wrapping that the female can eat to obtain nutrients to raise her young.

• Have you ever wondered what the supposed purpose of having cockroaches on the planet at all is? Well try this handy example of a cockroach's supposed usefulness: Crushed cockroaches can be applied to a stinging wound to help relieve the pain.

So be like the cockroach. Think on your feet, learn to adapt and use your resources to your advantage and success will come to you!

Ishan Sardesai
XII B



What Makes a Bird Fly?

What makes a bird fly?
 What is the reason for a blue sky?
 What's the cause of a natural disaster?
 What can make us run faster?
 Science lies within you,
 There's no need to doubt, it's all true.
 It holds the answer to our life and death
 It holds the key to every single breath.
 It tells us why the earth is round,
 It tells us what makes which sound!
 It tells us how life began
 It tells us the evolution of man.
 It has the answer to your deepest question
 It holds the secret to digestion!
 Science, science. It's everywhere,
 It's in our blood. It's in the air.

Riya Kothari VIII B
 Nimran Kang VIII C

Did You Know?

Oysters can change between being female or male.



Existence

Science took us forward from the stone age,
 Today we stand at a modern stage,
 We have really evolved,
 and so many problems have been solved.

We have unraveled the mysteries of our minds,
 We humans are one of a kind,
 We contain the thirst to mature,
 As the discovery list grows by the score.

We have even reached the moon,
 Science and technology is a boon,
 We find and invent as well,
 It is really swell.

Do not restrain this rainbow of thought,
 Such knowledge isn't easily sought,
 Nature, space and earth are beautiful and fine,
 Answers to these are really divine.

Prevention is better than cure,
 About that I'm absolutely sure,
 Our skills and knowledge will reach
 Such a height,
 As science shows us the light.

Ananya Gupta
 IX A





Solar Energy

Alternate fuel of the Future

Today petroleum and coal are our main sources for creating electricity, providing heat and transport. But both these fossil fuels are finishing fast so I suggest we go in for solar energy as an alternate fuel because the sun provides enough energy that can be stored for use long after the sun sets and even during cloudy periods.

The Advantages of solar energy are many as it is free and clean. Firstly, it is a renewable source of energy as the sun will not lose its heat for many, many million years so there is no harm of destroying the environment. There is no emission of carbon dioxide or other toxic gases so no danger of global warming. It can be produced from remote places as the sun is available to all on this Earth unlike fossil fuels like petroleum and coal.

We can trap and store this energy with the help of solar panels on roofs of buildings that will first trap the energy and then use it to heat our houses, water etc. through water pipes. This way we can heat our homes, buildings and also get hot water. Solar energy can be stored in solar cells called photovoltaic, which convert sunlight directly into electricity through a chemical process.

These cells could be used in cars, trucks and buses to power them without polluting our environment. Coal too can be substituted by Solar Furnaces which use an enormous array of mirrors to concentrate the sunlight to a small location which produces very high temperature that can be as high as 33,000 degrees Celsius. The sun's reflected energy heats oil flowing through pipes and the heat energy is then used to generate electricity.

I imagine a world where the cars run on solar energy from panels on their roofs instead of petroleum, all the lighting is solar, homes are heated by solar panels or through electricity generated by solar turbines and solar furnaces are used in place of traditional coal furnaces!

Sumer Grewal





How Do Owls Fly Silently?

One of the many physical feats of the owl is its ability to fly silently. This is due to the design of the wings of several species of owls allowing them to fly in utmost silence. Various parts of the wings of the owl enable it to accomplish this.

All owls have broad wings with very large surface areas, allowing them to fly buoyantly and effortlessly, without too much flapping and loss of energy. Hence they are able to glide easily and fly slowly for long periods of time. The velvety down feathers on the wings and legs of the owl are brilliant absorbers of the sound frequencies in their wings. Another fantastic mechanism allowing owls their silent flight are their stabilizing serrated comb-like feathers and sound reducing fringe feathers. This silent flight is extremely helpful for owls while catching their prey at all times.

Indraneel Roy
IX B

Accidental Discoveries

The French scientist Louis Pasteur once famously said, "In the field of observation, chance favours only the prepared mind."

Some of the most important discoveries or inventions in science have been due to the most random accidents. Many of these accidents have led to great success in various fields of science. Some of the greatest scientists have also received the highest honours due to their fortunate accidents!

Louis Pasteur himself, in 1879, had been a victim of these fortunate accidents. He inoculated some chickens with cholera bacteria. It was supposed to kill them, but Pasteur or one of his assistants had accidentally used a culture from an old jar and the chickens merely got sick and recovered. Then Pasteur inoculated them again with poisonous fresh culture, and he observed that they didn't even fall sick this time. He researched a lot on this and finally concluded to his famous discovery of the principle of vaccination for disease prevention.

Biologist Sir Alexander Fleming was researching a strain of bacteria called staphylococci. In 1928 he had accidentally left out some of the culture dishes and went on a holiday. It was only when he returned that he noticed that they



had become contaminated with fungus and threw it away. Later he learnt that the staphylococcus bacteria were not able to grow in the area surrounding the fungal mould. He identified the mould as being from the Penicillium genus. He completely changed the treatment for bacterial infections in medicine forever by creating the first antibiotic. He later said "When I woke up just after dawn on September 28, 1928, I certainly didn't plan to revolutionise all medicine by discovering the world's first antibiotic, or bacteria killer, but I suppose that was exactly what I did."

Another amazing example would be that of Wilhelm Roentgen. He was exploring the path of electrical rays passing from an induction coil through a partially evacuated glass tube. Although the tube was covered in black paper and the room was completely dark, he noticed that a screen covered in fluorescent material was illuminated by the rays. He later realised that a number of objects could be passed through these rays, and that the projected image of his own hand showed a contrast between the opaque bones and the translucent flesh. He later used a photographic plate instead of a screen, and an image was captured. In this extraordinary accident a discovery had been made: that the internal structures of the body could be

made visible without the necessity of surgery - an XRay was made!

Smart Dust too was discovered this way. Smart Dust has the ability to determine the quality of drinking water; it can vet out hazardous chemicals in the air, locate and destroy tumours in the body. They were discovered by Jamie Link while she was working on her doctorate in chemistry at the University of California in San Diego when one of the silicon chips she was working with exploded. She found that the tiny pieces that resulted from the burst could still function as sensors.

In 1945 Percy Lebaron Spencer, an American engineer and inventor, was working on manufacturing magnetrons, the devices used to produce the microwave radio signals that were integral to early radar use. Radar was a very important innovation during the war, but microwave cooking was discovered purely by luck. While standing by a functioning magnetron, Spencer noticed that the chocolate bar in his pocket had melted. He figured out that it was the microwaves that had caused it, and later experimented with popcorn kernels and eventually, an egg, which exploded. The first microwave oven weighed about 750lbs and was about the size of a fridge.

Riyah Singh
XII C



Global Cooling

Hydrosols & Microbubbles

Using microbubbles to turn parts of the ocean white and thus reflect sunlight and cool down the Earth.. Air – water and water – air interfaces are equally refractive, cloud droplets and microbubbles dispersed in bodies of water reflect sunlight in much the same way. The lifetime of sunlight reflecting microbubbles, and hence the scale on which they may be applied, depends on Stokes Law and the influence of ambient or added surfactants. Small bubbles backscatter light more efficiently than large ones, opening the possibility of using highly dilute micron-radius hydrosols to substantially brighten surface waters. Such microbubbles can noticeably increase water surface reflectivity. If this is successful, we will be able to counter the effect of global warming by cooling the earth.

Prithvi Raaj Singh
XC

Did You Know?

The most dangerous animal in the world is the common housefly! Due to their habits of visiting animal waste, they transmit more diseases than any other animal!

**What did one quantum physicist say when he wanted to fight another quantum physicist?
Let me 'atom'**

If There Was No Friction!

Friction is a force,
Like a pull or a push,
Without it to stop us,
We would land up in a bush!
The world would be as slippery as soap,
For so many inventions, there would have been no hope.
Rubbing 2 stones wouldn't create fire,
Staying warm would've been our desire.
Tyres wouldn't grip the road,
They would skid and explode!
Sometimes we need to reduce friction too,
Then lubricants, grease are handy,
to name just a few.
Leonardo Da Vinci was the first to study friction,
He should get the credit for it,
that's my conviction!

Kabir Singh
VI A



Solar Power

Through the centuries, scientists have found innovative ways to harness the power of the sun — from magnifying glasses to steam engines. Converting more solar power into electricity is high on the political agenda in many countries, amid the push to find domestic energy sources that are less polluting than fossil fuels. In the last two years, China has emerged as the dominant player in green energy — especially in solar power. It accounted for at least half the world's production in 2010, and its market share is rising rapidly. China's Big Three solar power companies — Suntech Power, Yingli Green Energy and Trina Solar — all announced in August 2011 that their sales in the second quarter were up between 33 and 63 percent from a year earlier. But, analysts say, China has achieved this dominance through lavish government subsidies in its solar industry that are detrimental to American companies and other foreign competitors. While most U.S., Japanese and European companies still have a technological edge, China has a cost advantage, analysts say.

Shiv Kapur
XC

The Indian Tiger

I, the royal tiger, the national animal of India am often described as a particularly dangerous, sly and invincible predator. I am an integral part of the Indian heritage which is on the verge of extinction. I have a powerful body, large paws with very sharp claws, but no match for a gun. I am a total gentleman and not a blood thirsty killer. Surprising as it may sound, I don't kill for pleasure but for need. I kill only when I am hungry and don't want to kill humans. It is my inability to hunt that forces me to kill humans.

Today I would like to share with you my bucket list. A bucket list is a list of things one wants to before dying, it comes from the phrase 'kick the bucket'.

So here goes:

For starters I would like to live in a dense jungle, a lot of shade so that my den remains really cool, and I can sleep all day long, near a river where I can swim to my heart's content, for leisure & adventure. I don't live to eat but eat to live, so would like to get my daily share of meat to satisfy me.

We live in a fragile and remote world, a blue, white and green gem in the solar system. With the ever expanding human population and development in the name of consumerism, our delicate and unique planet is being depleted of its finite resources by pollution, poaching, habitat destruction and





Did You Know?

The number of tigers in India has reduced by half in the past century. There are less than 1411 tigers left in the country!

fragmentation and climate change. As people over-consume, animals and plants around the world are becoming extinct at an unprecedented rate. Unless significant steps are taken to prevent extinctions, one half of all species living on the planet today will be extinct within the next hundred years- including me, the Indian tiger. So in today's day and age my bucket list starts with the hope of consolidation of tiger reserves: there should be no construction of highways through our forests and an end to illegal mining and timber trade in forest areas (which is leading to erosion of forest corridors), villages should be relocated away from core critical tiger habitats but in a fair and voluntary manner so that there is no hostility towards us but they support the cause. I would like to have a Tiger Force Protecti-

on Force that checks poaching, where forest guards control and monitor our forests. These guards should be trained and provided with adequate equipment to tackle poachers. The poachers should be convicted with heavy fines and prosecution. Villages near our reserves should be offered employment for upkeep of our reserves; they should be offered compensation for loss of livestock so that they don't indulge in revenge killings. I wish more people would visit tiger sanctuaries and national parks and discover our country's natural heritage. But remember that the wilderness is to be experienced, not to be polluted. The Javan, Caspian and Bali species are already extinct; don't add me to this list.

Divij Chandna

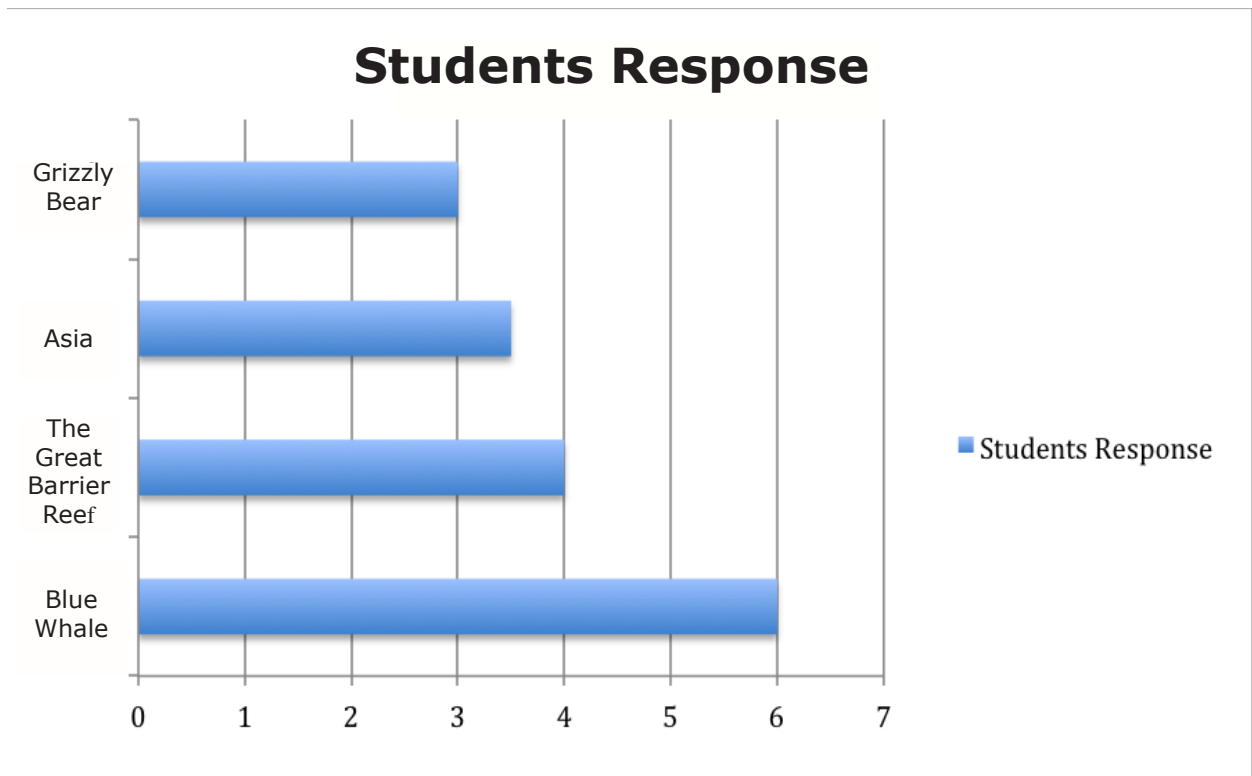
VI C



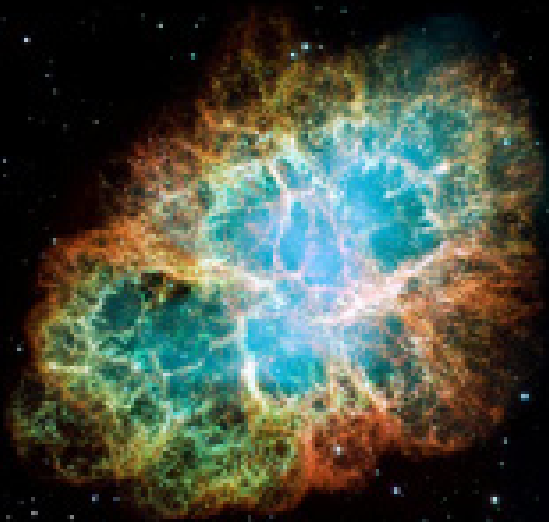
Ask the Students!



What is the **Largest living Structure on Earth?**



At over 2000 kilometers long, The Great Barrier Reef is the largest living structure on Earth.



Reaching Beyond the Earth

"All you really need to know for the moment is that the universe is a lot more complicated than you might think, even if you start from a position of thinking it's pretty damn complicated in the first place."

-Douglas Adams





The Accelerating Universe

" *Some say the world will end in
fire;
Some say in ice.....*"

- *Robert Frost,
Fire and Ice*

What will be the fate of our universe ? If we are to believe the Nobel Laureates of 2011, it will probably end in ice. After careful study of many exploding stars called supernovae, they have concluded that the expansion of the Universe is accelerating.

The World is Growing

The expansion of the universe began with the Big Bang 14 billion years ago, but it slowed down during the first several billion years. Eventually it started to accelerate. The driving force behind this acceleration is an unknown form of energy known as dark energy. This dark energy makes up a large part of the Universe nearly 75% and is one of the greatest mysteries in the world of physics today.

Two Rival Teams

Saul Perlmutter headed one of the two rival research teams - the Supernova Cosmology Project, which began in 1988. *Brian Schmidt* and *Adam Riess* the two other Nobel Prize winners were part of a *comp-*

eting project, the High-z Supernova Search Team. Both teams raced against each other, trying to find the most distant supernovae which would help them map the Universe and predict its fate.

This method of using supernovae to measure cosmic deceleration/acceleration relies on a simple principle, one that has been around for decades - to locate distant stars and to measure how they move. However, this is not as easy as it seems. For one these stars are billions of light years away and moreover the explosions of supernovae are brief. To look for such supernovae in the vast expanse of the universe can be thought of as the cosmic equivalent of searching for a needle in a haystack.

Chasing these supernovae proved to be a Herculean task that challenged the very limits of science and technology. Sophisticated telescopes, both on the ground and in space, powerful supercomputers helped to solve this cosmological puzzle.

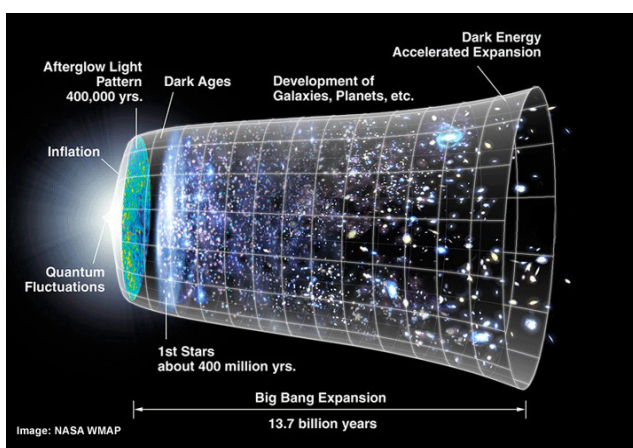
A Surprising Conclusion

After years of hard work and many pitfalls, both teams reached the same conclusion - the light from the supernovae seemed weaker than expected, they were fading as they were being carried faster



This simple statement has serious and complicated ramifications and poses a bevy of bewildering questions - What is the cause of this expansion? Dark energy, claim the scientists. Which invites the question - What is dark energy? Even the scientist don't know. Dark energy to date remains an enigma in the realm of physics. According to current consensus, about 75% of the Universe consists of dark energy. The rest is matter. However even out of that only 5% is matter as we know it. The remaining 20% is invisible dark matter (which is another riddle).

This discovery also forces us to reconsider our cosmic fate. The scientists had expected to find signs of the expansion of the Universe slowing down, which would lead to equilibrium between warmth and cold - fire and ice. However with the expansion of our Universe accelerating, all matter will get diluted in an ever large, ever more empty and ever colder space. The Universe may well end in ice.



Therefore the findings of the 2011 Nobel Laureates in Physics have opened a Pandora's box of unanswered questions and unsolved riddles and shown us the frontiers that science must conquer in the coming years.

Tushar Bhargava
XII C

Did You Know?

A space vehicle must move at a rate of 7 miles per second to escape the earth's Gravitational pull. This is equivalent to going from New York to Philadelphia in about twenty seconds.





Supermassive Black Holes!



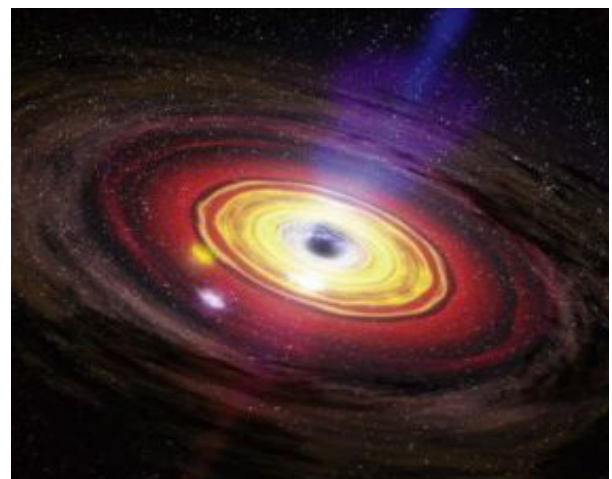
Take planet earth, and squeeze it down to the size of a marble. You'll create an object so dense that not even light, travelling at 1,86,000 miles/sec, can escape its extraordinary gravitational pull. Its name, a black hole.

Black holes are formed when a massive star dies. This usually occurs either because the star has too little "fuel" left to maintain its temperature through stellar nucleosynthesis (the collective term for the nuclear reactions taking place in stars to build the nuclei of the elements heavier than hydrogen), or because a star that would have been stable receives extra matter in a way that does not raise its core temperature. In either case the star's temperature is no longer high enough to prevent it from collapsing under its own weight. But Black Holes aren't

the end to this story!

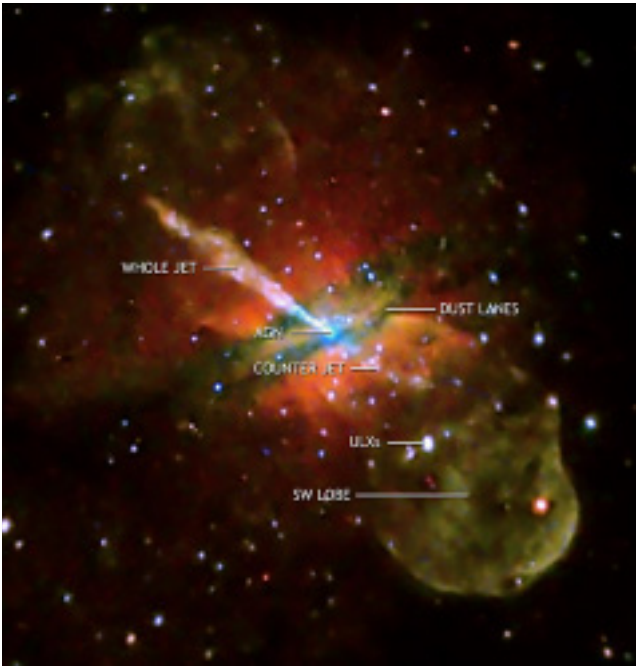
A few decades ago, 2 astronomers discovered something extraordinary and unusual, a discovery set to overturn our understanding of how the Universe formed. They discovered was a very simple relationship, a relationship between the galaxy we live in and the most destructive force in the Universe. What they found, were supermassive black holes.

Supermassive black holes are giant black holes of apocalyptic proportions. They are a million to a billion times the mass of a typical black hole. In fact, they are so large, they could fill an ENTIRE SOLAR SYSTEM! Frankly, a supermassive black hole is gravity gone mad! Anything that gets close to any of these, be it gas, stars or an entire solar system are sucked into oblivion. It even destroys the very fabric of the Universe. If you think of the Universe as a space-time web,





Astrology and Science



the gravity of ordinary stars and planets creates a dent in this web, but the immense gravity of a supermassive black hole is so destructive that it distorts space-time to breaking point.

At the heart of a supermassive black hole is one of the most mysterious occurrences in physics - the singularity, a point where space, time and all known laws of physics fall apart. It is as good as saying shown that the singular region contains all the mass of the black hole solution.

It so happens to be that one of these black holes is in the center of our Milky Way Galaxy. But its 30,000 light years away from us so there's nothing to worry about.... for the moment. Earth will eventually crash into mars, then again, that'll take about 3 billion years.

Akshat Arora
XII B

Human beings have always been curious to know their future. Whenever someone is in difficulty and cannot easily come out of it, he wants to know whether the days of his misery will come to an end at all.

There have always been people around who have successfully predicted future events. Their methods have been different - some people can simply look into the future, some use tarot cards, some draw up an astrological chart which we call horoscopes, some read the lines in the palms of people.

One cannot deny that future has been accurately predicted many a times and by many a people. Each successful prediction proves that it is indeed possible to correctly predict the future.

In the ancient times, astrologers were held to be in great esteem by the people. There was no difference between astronomers and astrologers. In fact, astronomy and Astrology were not considered to be different. Most of the renowned scientists of the past, including Sir Isaac Newton, were astrologers too. In ancient India Astrology was known as "Jyotish Shastra" which included predictive Astrology as well as what we know as Astronomy. Needless to say that the astrologers of that



era were all great mathematicians too.

It would perhaps not be an exaggeration to say that Astrology was considered to be the foremost branch of science.

But, over the years, astrology has lost its place in science as science in today's world is defined by three words-Physics, Chemistry and Biology.

What we, as a society do not understand is that science is a much broader term which not only is a systematic enterprise that builds and organizes knowledge, but is also about predictions and observations about the universe. Any theory which cannot be put to test cannot be called science but the fact that science works on observations cannot be denied.

Newton gave us the law of gravitation which tells us that an apple falls from the tree. It is a mere observation till this stage.

In modern education system astrology has not been given due attention it deserves because it's not considered to be a proven science but many psychological theories are also not proven but we all understand it. The main problem with astrology is ignorance.

Once someone asked Isaac Newton How can you believe in astrology? His reply was " because I studied it and you didn't". Thus, we must learn to not restrict science to a few branches but take a much broader view of it, under which astrology has an important role to



play, as astrology is all about predictions and observations of the universe, the part of the word "science" we tend to overlook.

Veer Gupta
XII B

Q: What do chemists call a benzene ring with iron atoms replacing the carbon atoms?

A: A ferrous wheel:





HD 85512 B: A Possibility of Life?

Every heard of HD 85512 b? I ensure you that it's fascinating, even scientist are bewildered by it. But first allow me clarify that HD 85512 b is not the new Harley Davidson Sportster. It's a super Earth.

A super Earth is an extrasolar planet with a mass higher than Earth's, but substantially below the mass of the Solar System's gas giants, viz. Jupiter, Saturn, Uranus and Neptune.

In general, super-Earths are defined exclusively by their mass, and the term does not imply temperatures, compositions, orbital properties, or environments similar to Earth's.

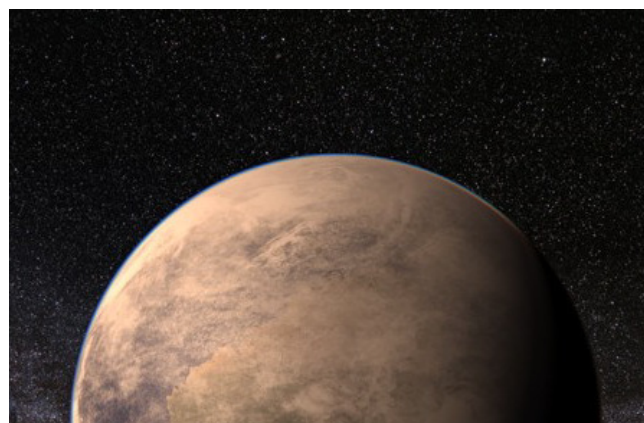
The first super-Earths were discovered by Aleksander Wolszczan and Dale Frail approx. 2000 light years away from the Sun in 1992. The planets have masses approximately 4 times Earth but are too small to be gas giants.

Ever since the first discovery there have been plenty more super Earths that have emerged, each with it's own distinct mass circling in it's own orbit. Some of these exosolar planets are coated in lava, some have five suns, others have atmospheres made of organic compounds and one has found to have been almost as old as the Universe itself!

The reason these planets are not considered in the solar system is

because they are exosolar planets, as I mentioned before, and hence they lie a couple of light-years from our Solar System. The closest star known to host orbiting super Earths is Epsilon Eridani (which was discovered in 2000, in case you were wondering) and lies just over 10 lightyears away from our Solar System. The two super Earths orbiting it are Epsilon Eridani b and Epsilon Eridani c. (I wonder what happened to Epsilon Eridani a?)

Now coming to the most exciting super Earth discovered yet, HD 85512 b. It was discovered by a team of scientists lead by Stéphane Udry at University of Geneva, Switzerland. The discovery was carried out using HARPS (High Accuracy Radial Velocity Planet Researcher, aka "The Planet Hunter") which was first used back in 2003. Out of the 50 planets discovered recently, European astronomers announced that they have found 16 super-Earths that could potentially support life, as of





SPACE.COM www.space.com

Habitable Super-Earth?

The planet HD 85512 b orbits within its star's habitable zone. Liquid water, a vital requirement for life as we know it, could exist on its surface.

Distance from Earth: **35 light-years**

Mass: **3.6 times that of Earth**

Surface temperature: **77 degrees F (25 degrees C)**

ARTIST'S CONCEPTION OF HD 85512 b (CREDIT: M. KORNMESSER, EUROPEAN SOUTHERN OBSERVATORY)

HD 85512
Spectral type K5V

STAR'S HABITABLE ZONE

0.1 AU 0.5 AU 1.0 AU

RELATIVE DISTANCE OF PLANETS IN OUR SOLAR SYSTEM: MERCURY VENUS EARTH

September 2011. And from these 16 planets, HD 85512 b has captured the astronomers' attention as it orbits a star (similar to our Sun) around 35 lightyears away from Earth. With a temperature similar to summers in India, an orbit that lies at a perfect distance from its star and a gravitational pull which is 1.4 times Earths, HD 85512 b's conditions could be ripe enough to support life!The potential habitable super Earth has a mass 3.6 times the Earths and with the current information scientists are claiming that the chances of them finding some form of life present on the planet are quite likely. Considering the fact a year on HD 85512 b has only 60 days and the temperature is really hot, I don't suppose the kids there go to school much.

This rocky planet also serves as a sign of hope for all the astronomers that were disheartened as they found out the truth about Gliese 581 g in the beginning of 2011.

After investing a fair share of years researching on Gliese 581 (the first star with planets that had high chances of supporting life) they realised that they could receive a positive response from Gliese 581 d and Gliese 581 g. Out of these they were counting much more on Gliese 581 g as it proved to be almost 100% habitable. But all hopes came crashing down when The Planet Hunter showed no signs of it's existence! Even though they still had Gliese 581 d, which was a little less of a hope as compared to Gliese 581 g, it was a big disappointment.



And then came HD 85512 b! Establishing new hope and enthusiasm in the broken hearted astronomers. Lisa Kaltnegger, a study leader of the Harvard-Smithsonian Center for Astrophysics, stated "HD 85512 b is, with Gliese 581 d, the best candidate for exploring habitability to date, a planet on the edge of habitability."

(Personally I don't really trust Gliese 581 d, I mean it came from the same Solar System as Gliese 581 g. And all Gliese 581's are the same, look at how Gliese 581 g promised wonderful discoveries and then simply vanished. Now how can we say Gliese 581 d won't do the same?)

Astronomers first believed that Gliese 581 g, also known as "Goldilocks" (because the temperature on the planet was not too hot or not too cold, it was just right!), was the only habitable planet. But it so happens that our HD 85512 b falls in the "Goldilocks zone" as well. Recent discoveries show that it lies just a little closer to its star than Earth, making it a tad more hotter than our planet.

Even though with our current technologies it'll take a million years (without exaggeration) to reach HD 85512 b, or even Gliese 581 d for that matter, scientists have already attempted to contact Gliese 581 back in 2008 by sending high power transmission using a radio telescope.

The signals are predicted to reach the planet by 2029 and the earliest possible response we might



get is predicted to be in 2049.

Finally I'd like to say that our technology is advancing at a great pace. Scientists may actually invent a form of communication or contact before we receive the predicted response in 2049.

Who's to say it is impractical? The thought of a connection now seems unimaginable but a couple of generations ago so did traveling to the moon. Our exceptionally talented astronomers have invented impressive machines like the HARPS that have found super Earths and other Solar Systems that lie light years away. Who's to say that they won't be able to build a form of communication linking us to HD 85512 b soon?

On the other hand, by the time this article gets published even HD 85512 might have vanish.

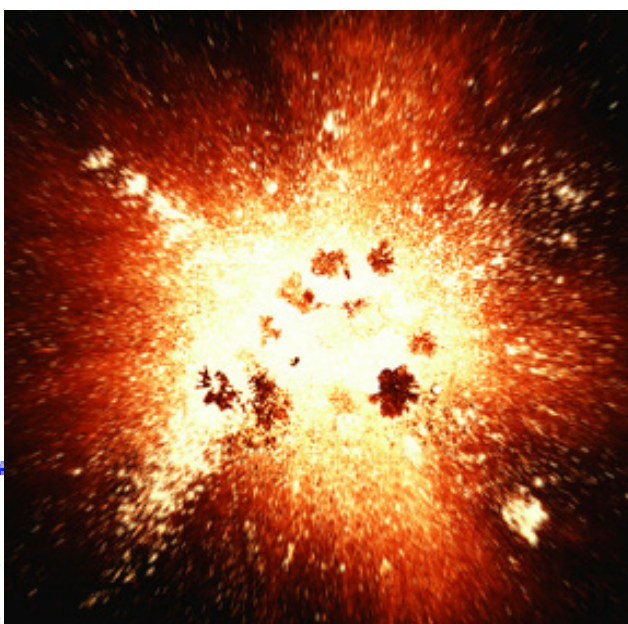
Ashna Satyajit
XII A



The Big Bang

The universe after the big bang. Although the big bang took place in just a fraction of a second , the explosion was strong enough to send energy and matter flying out at great speed in all directions .No one is able to explain yet what might , if anything have come before the big bang

1. At first the entire universe was a hot ball tinier than an atom and much hotter than any star. This swelled much, much faster than the speed of light. Growing to the size of a galaxy in just a tiny fraction of a second.



2. As the universe expanded, it began to cool and tiny particles of energy and matter, each of them much smaller than the atoms, began to form a thick , soup – like material .



4. Over time , as the young Universe grew larger , the gases . clumped into clouds .After several hundred million years , the clouds began to form stars and galaxies.,

3. After about three minutes gravity started to pull the particles together. Atoms joined together to make gases such as hydrogen and helium, and the thick " soup " began to clear and thin out . By the end of the third minute the matter that surrounds us today had been created.

Anhad Arora
VIII C

Did You Know?

Scientists believe that because both space and time began with the big bang, there may possibly be no " time " before it occurred





Sheldon: THERE, THERE, EVERYTHING IS GOING TO BE FINE....SHELDON'S HERE!

Sheldon: I'm not insane, my mother had me tested!

Sheldon: Why are you crying?

Penny: Because I'm stupid!

Sheldon: That's no reason to cry. one cries because one is sad. For example, I cry because others are stupid, and that makes me sad.

Sheldon: I made tea.

Leonard: I don't want tea.

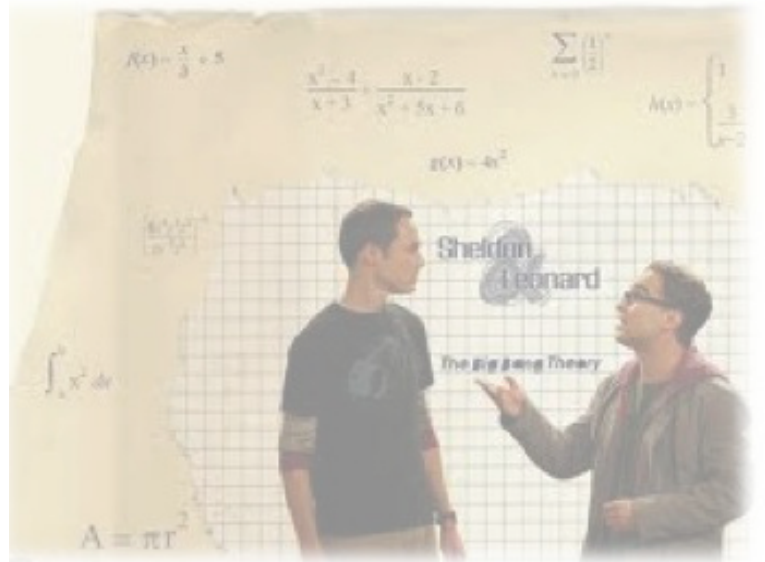
Sheldon: I didn't make tea for you. This is my tea.

Leonard: Then why are you telling me?

Sheldon: It's a conversation starter.

Leonard: That's a lousy conversation starter.

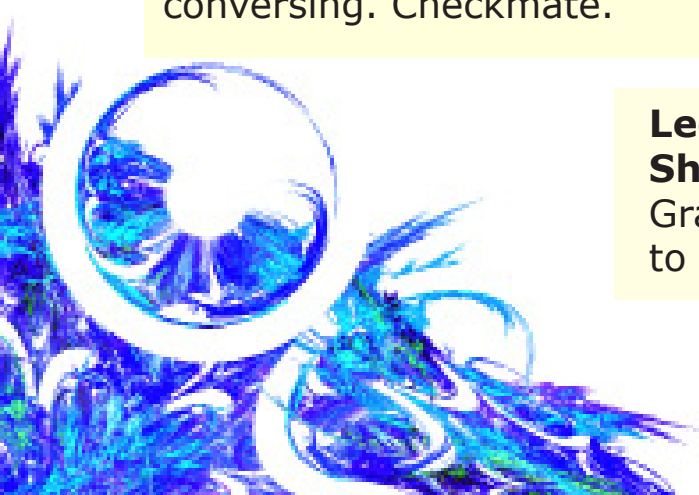
Sheldon: Oh, is it? We're conversing. Checkmate.



Leonard: You are not Isaac Newton.

Sheldon: No, no, that's true.

Gravity would have been apparent to me without the apple.





Dark Energy and Dark Matter

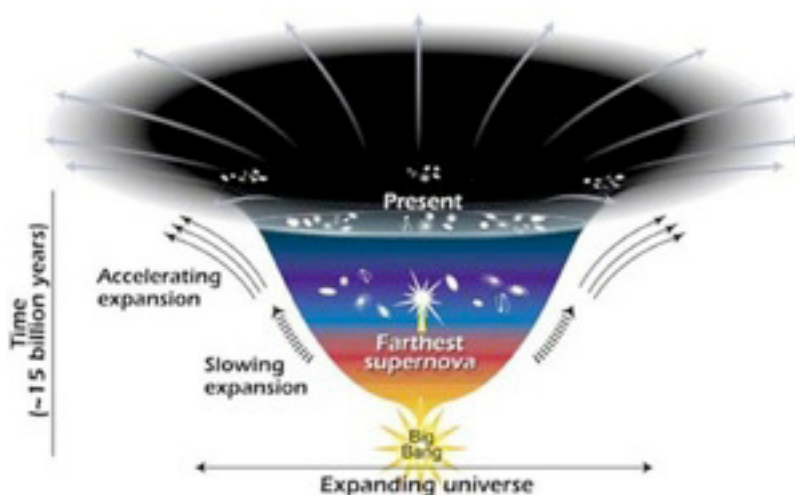
In the early 1990's, one thing was fairly certain about the expansion of the Universe. It might have enough energy density to stop its expansion and re-collapse, it might have so little energy density that it would never stop expanding, but gravity was certain to slow the expansion as time went on. Granted, the slowing had not been observed, but, theoretically, the Universe had to slow. The Universe is full of matter and the attractive force of gravity pulls all matter together. Then came 1998 and the Hubble Space Telescope (HST) observations of very distant supernovae that showed that, a long time ago, the Universe was actually expanding more slowly than it is today. So the expansion of the Universe has not been slowing due to gravity, as everyone thought, it has been accelerating. No one expected this, no one knew how to explain it. But something was causing it.

Universe Dark Energy-1 Expanding Universe

This diagram reveals changes in the rate of expansion since the universe's birth 15 billion years ago. The more shallow the curve, the faster the rate of expansion. The curve changes noticeably about 7.5 billion years ago, when objects in the universe began flying apart as a faster rate. Astronomers theorize that the faster expansion rate is due to a mysterious, dark force that is pulling galaxies apart.

What is Dark Energy?

More is unknown than is known. We know how much dark energy there is because we know how it affects the Universe's expansion. Other than that, it is a complete mystery. But it is an important mystery. It turns out that roughly 70% of the Universe is dark energy. Dark matter makes up about 25%. The rest - everything on





Earth, everything ever observed with all of our instruments, all normal matter - adds up to less than 5% of the Universe. Come to think of it, maybe it shouldn't be called "normal" matter at all, since it is such a small fraction of the Universe.

One explanation for dark energy is that it is a property of space. Albert Einstein was the first person to realize that empty space is not nothing. Space has amazing properties, many of which are just beginning to be understood. The first property that Einstein discovered is that it is possible for more space to come into existence. Then one version of Einstein's gravity theory, the version that contains a cosmological constant, makes a second prediction: "empty space" can possess its own energy. Because this energy is a property of space itself, it would not be diluted as space expands. As more space comes into existence, more of this energy-of-space would appear. As a result, this form of energy would cause the Universe to expand faster and faster. Unfortunately, no one understands why the cosmological constant should even be there, much less why it would have exactly the right value to cause the observed acceleration of the Universe.

Another explanation for how space acquires energy comes from the quantum theory of matter. In this theory, "empty space" is actually full of temporary ("virtual") part-

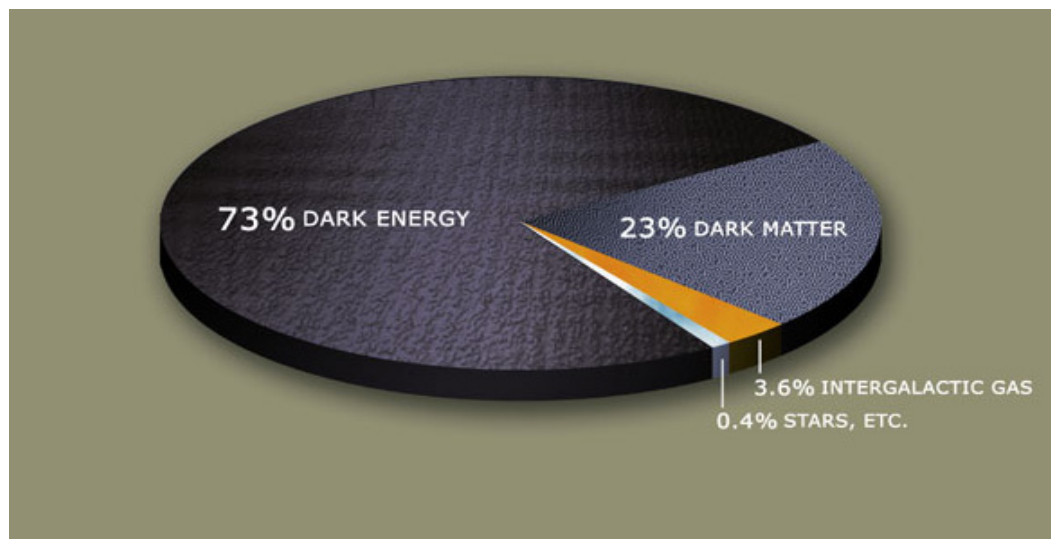
particles that continually form and then disappear. But when physicists tried to calculate how much energy this would give empty space, the answer came out wrong - wrong by a lot. The number came out 10¹²⁰ times too big. That's a 1 with 120 zeros after it. It's hard to get an answer that bad. So the mystery continues.

A last possibility is that Einstein's theory of gravity is not correct. That would not only affect the expansion of the Universe, but it would also affect the way that normal matter in galaxies and clusters of galaxies behaved. This fact would provide a way to decide if the solution to the dark energy problem is a new gravity theory or not: we could observe how galaxies come together in clusters. But if it does turn out that a new theory of gravity is needed, what kind of theory would it be? How could it correctly describe the motion of the bodies in the Solar System, as Einstein's theory is known to do, and still give us the different prediction for the Universe that we need? There are candidate theories, but none are compelling. So the mystery continues.

The thing that is needed to decide between dark energy possibilities - a property of space, a new dynamic fluid, or a new theory of gravity - is more data, better data.

What is Dark Matter?

By fitting a theoretical model of the composition of the Universe to



the combined set of cosmological observations, scientists have come up with the composition that we described above, $\sim 70\%$ dark energy, $\sim 25\%$ dark matter, $\sim 5\%$ normal matter. What is dark matter?

We are much more certain what dark matter is not than we are what it is. First, it is dark, meaning that it is not in the form of stars and planets that we see. Observations show that there is far too little visible matter in the Universe to make up the 25% required by the observations. Second, it is not in the form of dark clouds of normal matter, matter made up of particles called baryons. We know this because we would be able to detect baryonic clouds by their absorption of radiation passing through them. Third, dark matter is not antimatter, because we do not see the unique gamma rays that are produced when antimatter annihilates with matter. Finally, we can rule out large galaxy-sized black holes on the basis of how many gravitational lenses we see.

High concentrations of matter bend light passing near them from objects further away, but we do not see enough lensing events to suggest that such objects to make up the required 25% dark matter contribution. However, at this point, there are still a few dark matter possibilities that are viable. Baryonic matter could still make up the dark matter if it were all tied up in brown dwarfs or in small, dense chunks of heavy elements. These possibilities are known as massive compact halo objects, or "MACHOs". But the most common view is that dark matter is not baryonic at all, but that it is made up of other, more exotic particles like axions or WIMPS (Weakly Interacting Massive Particles)

Ishita Malhotra
VIC



Farewell Old Friend!

Ever since the beginning of humankind, and possibly much before, there has always been one entity accompanying our planet. Earth's lone natural satellite, the moon, has been a constant source of fascination for all beings. From a child's innocent questions about why the moon is following him or her to NASA scientists pondering over its decreased force of gravity, the moon has always been our gateway to the vast galaxy. It has been there from the start and many believed, would stay till the very end. However, this idealistic proposition is as far from the truth as it can get.

No one can pinpoint the exact date the moon was formed, or where it started out in relation to its distance from our Earth. All we know is that today, the moon is on average 385,000 kilometres away – a distance that it has gradually covered over billions of years. Though it might seem like one, it is not a myth that our only moon is drift-

ing away from us. Its passage is slow, but, whether we like it or not, it's steady.

This phenomenon has been occurring since the time the moon and earth were formed. Nevertheless, the reasoning behind it has only been discovered in the last hundred years. The tendency of the moon's orbit to increase (and hence, move farther away from earth) is related to tidal force. On the side of Earth nearest to the moon, the moon's gravity is the strongest, while on the side furthest from the moon, it's the weakest. This variation of gravity stretches the Earth, causing it to become a bit oblong. We call the parts that stick out "tidal bulges." Tidal bulges' most noticeable effect is that they cause tides on the earth's ocean. However, they are covertly instrumental in another process as well.

Every mass exerts a gravitational force. Therefore, the tidal bulges on the Earth exert a gravitational pull on the Moon. As the Earth rotates faster (once every 24 hours) than the Moon orbits (once every 27.3 days) the bulge tries to speed up the Moon, and pull it ahead in its orbit. Paradoxically, the Moon also pulls back on the tidal bulge of the Earth, slowing the Earth's rotation. Tidal friction, caused by the movement of the tidal bulge around the Earth, takes energy out of the Earth and puts it into





the Moon's orbit, making the Moon's orbit larger, but slower. Due to this, not only is the moon moving away from the Earth, but Earth's rotation is slowing down as well. One hundred years from now, the day will be 2 milliseconds longer than it is now. However, this is sadly not the most worrying consequence of this phenomenon. Even though the rate at which the moon orbit's is increasing is only around 4 centimeters per year, in the future, its rotation will increase by 40%. The moon will then take 47 days to complete one rotation. This will consequently have adverse effects on the earth itself, as the moon inadvertently stabilizes earth's orbit, and its weather. The Earth will end up with an unbalanced axis. Though this might seem extreme, this theory is still not the most distressing. The most bizarre theory is that the moon is destined to disintegrate. Logically, as the moon moves away from us, it also

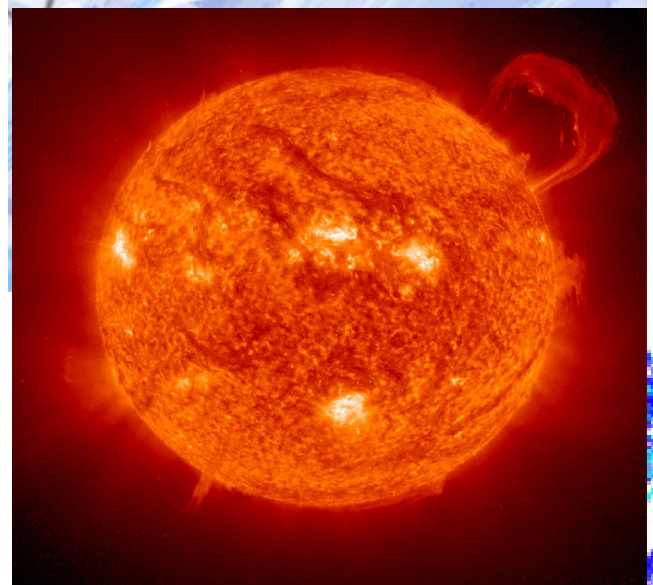
moves closer to the sun at some point on its orbit. Hence, when the sun enters its predicted red giant phase, and begins to literally engulf the solar system, the moon will be reduced to pieces first. The only ironic reassuring fact is that we will not have to live long without our moon, as the earth will be next.

These theories seem strange and implausible, but their occurrence in their future is almost certain. However, thankfully, the future I am talking about, is not tomorrow, next year, or ever in the next century. The future I am referring to is five billion years away - a time that we will never see.

Vani Mohindra
XII B

Did You Know?

99% of our solar systems mass is concentrated in the sun.





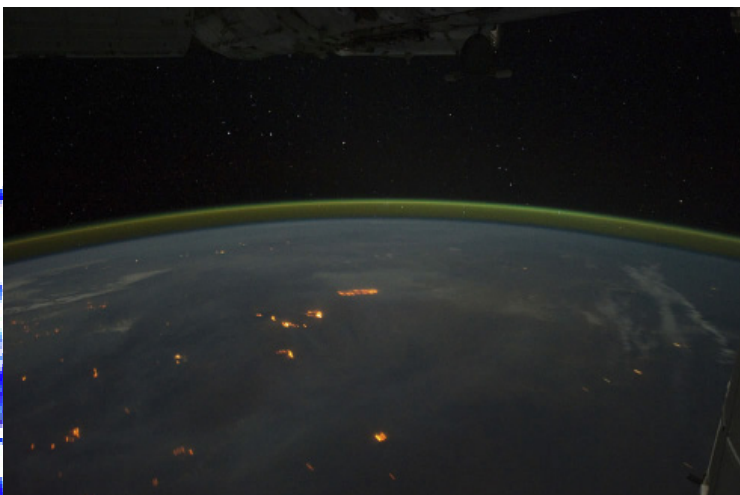
ISS Envy: Some Breathtaking Pictures of the Earth!

We envy the international Space Station astronauts with their window on the world offering breathtaking views of the Earth and of the universe as a whole. Outer space may become the next frontier for vacations. If that becomes a reality, and we can book a space hotel with an eye in the sky overlooking Earth . .



A Russian Soyuz spacecraft, docked to the International Space Station

Normally, we look up at amazing auroras, but the ISS crew is fortunate enough to have and captures auroras like this to give us an entirely different perspective of the phenomena.



Wildfires with smoke plumes faintly visible in the night sky of Australia. The gold / green halo is atmospheric airglow hanging above the horizon.



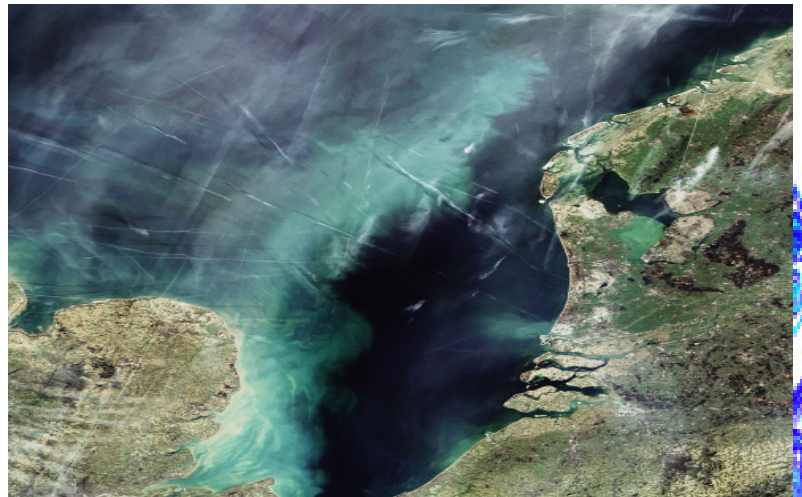
Eruption of Cleveland Volcano, Aleutian Islands

Durrat Al Bahrain photographed by an Expedition 26 crew member on the International Space Station.



ISS shot of Earth's Moon.

The Envisat MERIS image over the North Sea captures numerous aircraft condensation trails, or 'contrails'.





The Planets of Our Solar System

Interesting Facts!

Mercury

One year of Mercury is one and a half days long due to its proximity to the sun.

The asteroids hit the planet because it has almost no atmosphere to protect it. Because Mercury has almost no atmosphere, its temperature change from night to day is over 1,000 degrees.



Venus

Temperatures on Venus can rise to 460° C. And there are thick clouds of sulfur dioxide on Venus that rain down sulfuric acid.

It takes Venus 243 days to make a rotation, and 224 days for it to make a revolution around the Sun. That means a day is longer than a year on Venus!

Venus rotates backwards compared to other planets!



Earth

If you could evaporate all the water out of all the oceans and spread the resulting salt over all the land on Earth, you would have a five hundred-foot layer coating everything. Earth weighs about 6,588,000,000,000,000,000,000 tons





Mars

Mars appears red because it's covered in rust!

Mars has the tallest volcano in the Solar System, Olympus Mons, and it is 15 miles high, which is about three times the height of Mount Everest.



Jupiter

Jupiter technically has no surface as it is entirely made out of gas. Jupiter can be seen without a telescope because of its huge size.

The gravitational pull of the planet is so high that anything and everything that passes the planets gets pulled towards it.

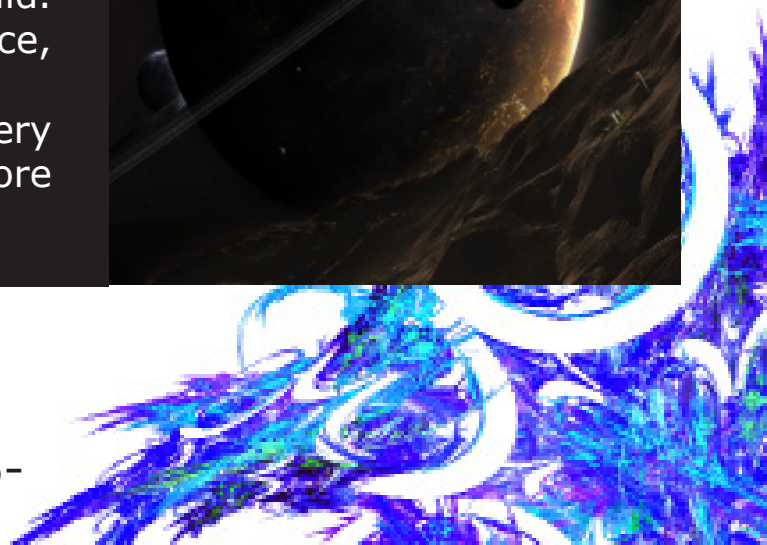
The planet has 63 moons and it is the fastest spinning planet of the solar system.

Saturn

You cannot stand on Saturn. It is not like Earth. Saturn is made mostly of gases. It has a lot of helium. This is the same kind of gas that you put in balloons.

Its beautiful rings are not solid. They are made up of bits of ice, dust and rock.

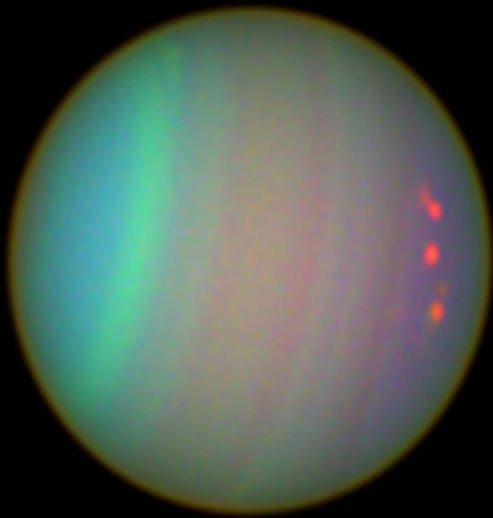
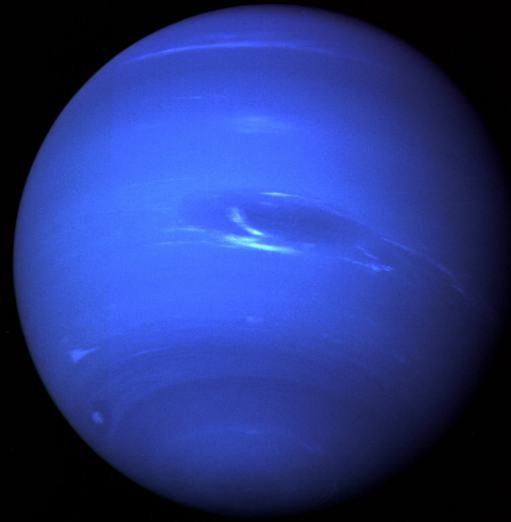
Saturn goes around the Sun very slowly. A year on Saturn is more than 29 Earth years.





Uranus

Uranus is the coldest planet in the Solar System. Summer on Uranus lasts one long day – 42 years. Uranus was the first planet discovered in the modern age. Only one spacecraft in the history of spaceflight has ever made a close approach to Uranus. NASA's Voyager 2 zipped past Uranus in January, 1986, coming within 81,000 km of the surface of Uranus.



Neptune

Scientists believe Neptune has a hot, rocky core about the size of Earth. It is covered with an ocean of water and other chemicals. The atmosphere is mainly hydrogen and helium. Neptune probably gets as much heat from its central core as it does from the Sun. However, the average surface temperature is only 355 degrees Fahrenheit. That is very cold.

Did You Know?

The Sun provides our planet with 126,000,000,000,000 horsepower of energy every day. This means that 54,000 horsepower is delivered to every man, woman and child on earth in each twenty four hour period. This amount of energy equals only about two billionths of the total energy broadcast into our solar system by the Sun each day.



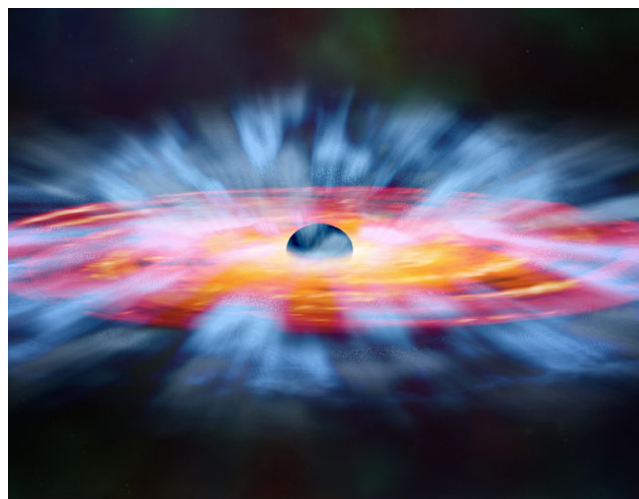
Antimatter: Destroyer or Saviour?

Antimatter is simply a form of matter in which each particle (electron/proton) has the opposite set of quantum properties than its counterpart. When such a particle meets its counterpart, they annihilate converting all of their rest mass into energy in line with: $E = mc^2$. As all the mass is converted into pure energy, its discovery led to fear of its consequences. Even though the quantities it is produced in in research institutes like CERN are meagre, its viability and application has been debated in the scientific community for long.

The scarcity of antimatter means that it is not readily available for use as fuel. However, it could be used in antimatter catalysed nuclear propulsion for space applications. The cost of antimatter is estimated at \$2.5 million/gram, making it a very cost-effective fuel as just one milligram is enough to propel a rocket to Pluto and back in a year. Furthermore, antimatter is routinely used in medicine to reveal the processes of the body at work in the form of positrons, which are produced by a tracer molecule introduced into the body which can highlight different metabolic processes and reveal location of tumours or molecular docking sites for messenger chemicals like serotonin and dopamine. The study of antiprotons reveals that one of the biggest evils: cancer

can be treated by antimatter. This is an encouraging result as it means that cancer patients treated with antiprotons would only need to receive a smaller dose of radiation.

However, the dark side to its use makes us question its viability. Due to the high energy released in matter-antimatter interactions, it might have military applications either as explosive or triggering nuclear fusion weapons. Quantities measured in grams will be required to achieve destructive effect comparable with conventional nuclear weapons; one gram of antimatter annihilating with one gram of matter produces 180 terajoules, the equivalent of 42.96 kilotons of TNT (approximately 3 times the bomb dropped on Hiroshima!) . Containment of such a weapon is of huge concern as any failure would immediately result in energy release, damaging the containment system and causing the weapon to explode at some very substantial fraction of





Containment of such a weapon is of huge concern as any failure would immediately result in energy release, damaging the containment system and causing the weapon to explode at some very substantial fraction of its full yield. Even though these weapons would lead to less long-term contamination, the technical barriers to producing and storing even small amounts of antimatter remain formidable. Like everything else, this revolutionary discovery also has its pros and cons. While its large energy release can power an average city for an extensive period of time, its explosion can lead to mass destruction, causing great loss to life and property. Given its various advantages, it can indeed prove to be a saviour if it is accompa-

nied with development in technologies of producing and storing it. Furthermore, it should fall only in good hands to ensure it is put in good use that benefits our society and environment sustainably.

Nivedita Dwivedi
XII B

When a third grader was asked to cite Newton's first law, she said, "Bodies in motion remain in motion, and bodies at rest stay in bed unless their mothers call them to get up."

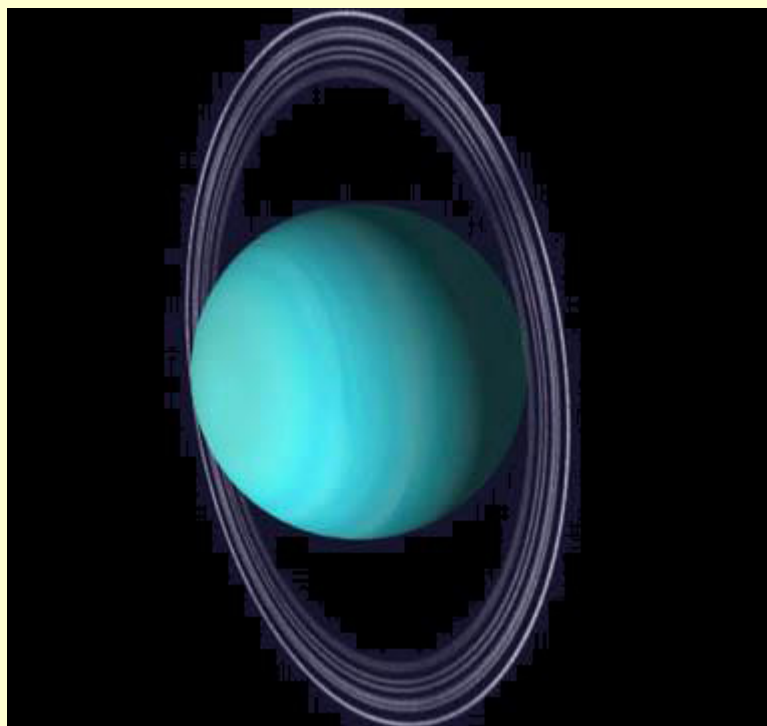
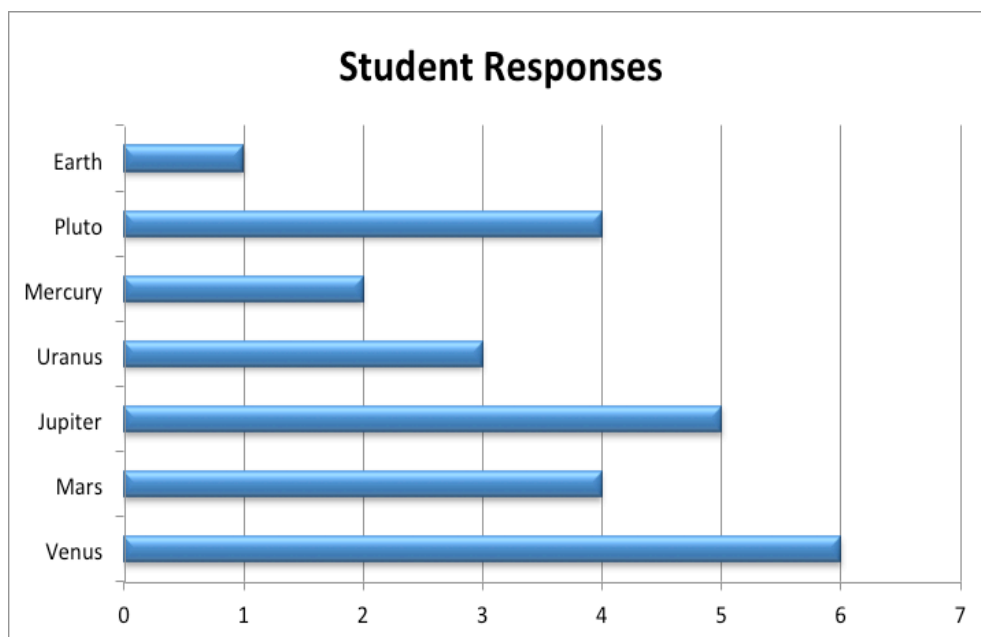




Ask the Students!



Which planet has actually flipped over on its side?



With an extremely strong rotational tilt – approximately 97.9° , Uranus is the only planet to rotate on its side. Uranus' unique tilt results in extreme seasonal changes. The planet goes through seasonal cycles of 21 years each. There are 21 years of a normal night and day cycle on Uranus, which is followed by 21 years of day in the Northern Hemisphere. After another normal 21-year period, there are 21 years of night in the Northern Hemisphere. Then the planet begins its cycle all over again.



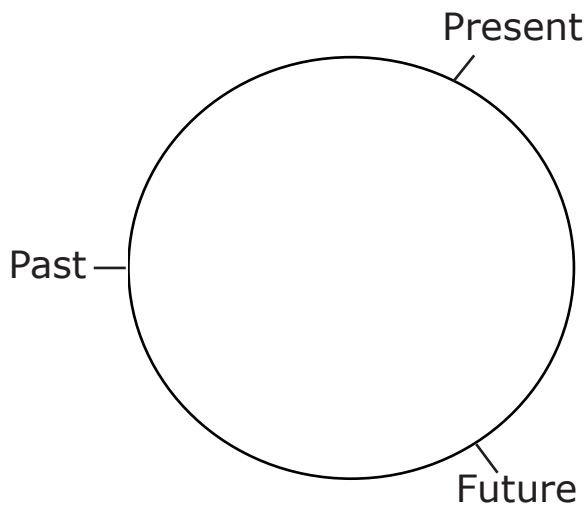
A Step into the **Future**

*I never think of the future - it comes soon
enough. -Albert Einstein*





me amount of gravity. Therefore a pathway for moving backwards and forwards through time is created.



Dr. Mallett studied black holes in great detail. Black holes are massive remnants of collapsed stars, which have an almost unmatched gravitational power which distort space and time, which is exactly what he required.

How would Dr. Mallett create something containing such an enormous amount of matter in a lab?

According to Einstein's theory of relativity " $E=mc^2$ ", matter and energy are just different forms of the same thing. Therefore light, which is a form of energy, should be able to warp space and time in the same way a gigantic object does. From Einstein's theories, one knows that light can create gravity and since gravity can warp space and time, light should also be able to warp space and time. This is what Dr. Mallett's work is based on. Hence he decided to use a circulating laser beam, a powerful form of light,



to follow through with his idea. Dr. Mallett's convincing project, now called The Space-time Twisting by Light (STL) project requires funding. The first time traveller will obviously have to be something much smaller than a human being so the project entails a devised experiment to observe a time traveling neutron in a circulating beam. The only drawback is that a body can only go back in time until the time machine's switched on, not before that. Although his team still requires funding for the project, Mallett clarifies that he will be able to determine the possibility of time travel using this method within a decade. Even though only small pieces of information will be able to be sent in the starting, you can imagine what it can facilitate. Dr. Mallett has written a book on



his life and work, called "Time Traveller", 'A scientist's personal mission to make time travel a reality' and a movie (documentary), which is already in the making.

Abhinav Rai
XII A

Did You Know?

Inventor, Dr. Jeffrey Olsen, has invented a technology for improving light amplification in our eyes. He uses nanotechnology to implant quantum dots into the retina, which makes images brighter and clear.

Faster Than the Speed of Light

One of the greatest physicists once stated that no object with a mass can travel faster than the speed of light. Albert Einstein in his theory of relativity proved this and stated that such an object needs infinite energy to accelerate to this speed. In recent studies and experiments however, it has been discovered that a subatomic particle like a neutrino can do so in a finite amount of energy. A neutrino is actually a very small piece of matter. It's so small that it wasn't even discovered until 1956. Neutrinos unlike protons, neutrons and electrons are not made up of Quarks, (which mainly make up most particles of matter) they fall under a category

called Leptons. Leptons and Quarks together then constitute matter. There are three 'flavors' of neutrinos: electron, muon and tau. Neutrinos are basically electrically neutral and weakly interacting subatomic particles with very minute non-zero mass. It is able to pass through ordinary matter almost unaffected and can therefore reach up to very high speeds. It was first assumed that neutrinos travelled at the speed of light and various theories suggested that a neutrino might have a tachyonic nature contradicting Einstein's theory. Neutrinos' speeds were first measured in the early 1980's using pulse pions which were produced by pulse proton beams hitting a target. Once the beams hit their target, the pions decayed producing several neutrinos and their interactions set them off at high speeds which changed their behavior making it distinct from the relativistic one allowing them to reach the speed of light at finite energy.





Recent experiments were repeated on a larger scale using neutrino oscillations rather than pion beams. These oscillations mainly work with 2 detectors and a Neutrino beam (which also produces pions). One detector is placed at close range whereas one is placed much further, usually in a different city. Once these beams are activated, the speed of the particles in oscillations is measured. The most recent experiment showed that the speed of neutrinos in these oscillations is 1.000051(29) times that of light. This was a huge discovery as it can now be proved that some particles can travel faster than the speed of light at finite energy. Theories of this result however have not been made yet so there is a possibility that this discovery might be completely wrong!

Dhruv Sagar
XA

Lotions, Potions and Magic Solutions

Lotions, Potions and Magic Solutions
Experiments with exotic lotions,
Test tubes and strange potions,
Go wrong and you may have explosions!
Magnifying glasses make amazing illusions,
Mirrors and mazes cause confusion,
Put on your thinking cap and find a solution.
Parts of an insect , parts of a tree,
Labelled diagrams made neatly.
Have you studied any of this, like me?
Join a science class- wait, watch and see.

Devaki Divan
VA

Plastic Bottle Light





The Next Giant Leap For Mankind

Winner of the Science Essay Prize 2011

Category 11-12

Dark matter is truly one of the very important topics that has had scientists minds' boggled for quite a while. This matter can play a huge role in helping us form the 'Theory of everything'. It can help us understand the Big Bang, the creation of the universe and many other things extremely important to science and technology, but first and foremost. What is Dark Matter?

Dark Matter is, unlike what its name suggests more than just matter that is dark. It is a type of matter that exists alongside ordinary matter but it neither reflects, refracts or scatters light and does not respond to electromagnetic radiation either. The existence of dark matter was prophesized by scientists when they realized that the mass of all the ordinary matter in the universe did not equal the calculated mass of the universe. In fact, ordinary matter accounts for only 17 per cent of all the matter in the universe.

If we look around us we realize that everything around us is made of matter, the books we read, the food we eat, the car we drive in, everything, including ourselves is matter. If we now consider that we are only being able to use 17 per cent of all the matter around us, it makes us wonder what kind of potential lies with the remaini-

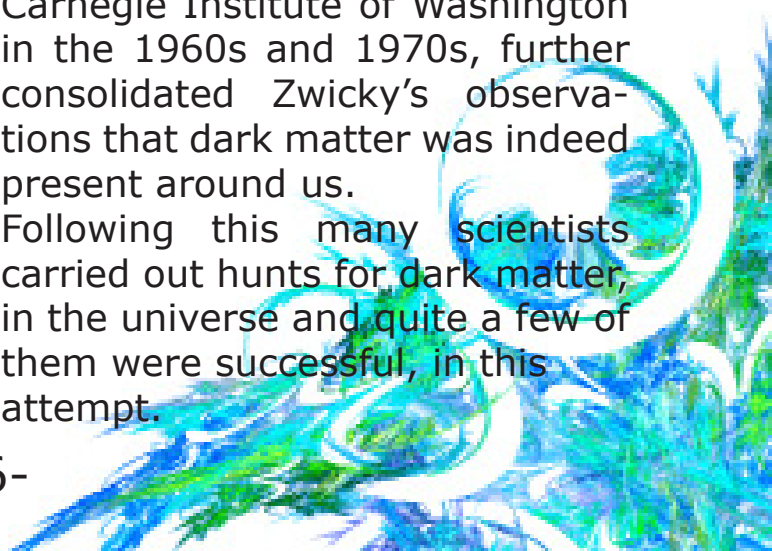
ng 83 per cent. Either by converting dark matter into matter or by understanding the properties of dark matter itself, the possibilities would be endless, which is why I feel that the understanding of dark matter would truly be the next giant leap for mankind.

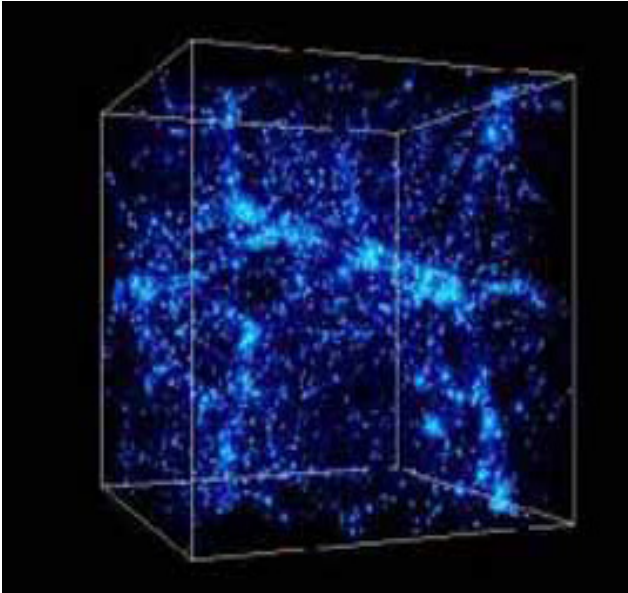
But to do so, we will have to understand how the theory of dark matter came about. Dark matter was discovered in 1934 by Fritz Zwicky.

Zwicky found that the speed of rotation of galaxies, caused due to gravitational forces within the galaxy, was not on terms with the amount of mass contained within the galaxy. Hence, either Newton's Gravitational Constant was not in fact constant at the galactic scale or there was more mass in the galaxy than what was visible. According to Zwicky, the dark halo at the centre of the galaxy was where most of this dark matter was concentrated.

A study by Vera Rubins at the Carnegie Institute of Washington in the 1960s and 1970s, further consolidated Zwicky's observations that dark matter was indeed present around us.

Following this many scientists carried out hunts for dark matter, in the universe and quite a few of them were successful, in this attempt.





They began to imagine the possibility of dark matter being tapped into as a potential resource. Many of them predicted the properties of dark matter through various findings. According to many scientists, dark matter could reduce our dependence on fossil fuels, as it had the potential to be used as a source of energy. Many even felt that dark matter could pave the way for intergalactic travel. All in all, scientists agreed that the remaining 83 per cent of the mass of the universe, essentially dark matter, could lead to huge advancements in science and technology, and may even be the biggest discovery, even in the history of mankind.

Despite all of this, dark matter had its fair share of skeptics who didn't believe that the 'missing mass' of galaxies could be attributed to dark matter. Some believed that the laws of gravitation were incorrect, while others felt that the difference was because of the fact that every object possesses more than 3 dimensions,

they predicted that the remaining mass was contained in the 4th or 5th dimension, that couldn't really be seen.

But one discovery astounded them all, that of Abell 2029, a galaxy that scientists calculated contained dark matter equal to the mass of 10¹⁴ suns. When they calculated the rotational velocity of the galaxy, they found that it held good with dark matter observations. This announced score one for dark matter and zero for skeptics.

Dark matter's existence has truly been proved, which makes us wonder at the immensity of the fact that matter equivalent to more than 7 times the matter visible around us may soon be available for use. The possibilities of such a situation, would truly be immense, almost endless, and would help us on the quest to etch our dominance over the other planets and galaxies. It would be a truly redefining moment in the history of our universe, that could have implications well beyond our wildest imaginations. Maybe even bring about an era of colonization of nearby planets and discovery of galaxies with life, like our own planet Earth. The understanding of Dark Matter would truly be a giant leap for mankind.

Pihu Yadav



It's 'Terrafugia'-cally Amazing!

"It's a car that flies."

"No way, get out of here! I don't believe you."

"I swear it's true!"

"Stop pulling my leg! It's not funny anymore."

"But it's true!"

And indeed it is. Terrafugia's award-winning MIT scientists have come up with technology that can now streamline one's flying experience with the revolutionary integration of personal land and air travel made possible by the Transition® Roadable Aircraft.



Priced at a base price of \$279,000, this technological marvel costs less than the new Lamborghini model. Its speed on terra firma reaches up to 65 miles per hour (105 km/hour), rivalling the Italian sports car. But the real excitement lies once you extend the vehicle's gull wings – you are requested to do this at an airport only – and experience the spectacular cruising flight speed of 105 miles per hour (172 km/hour) on unleaded gasoline for 500 miles.

Max, Vh:	100 kts (115 mph, 185 km/h)
Cruise, Vc:	93 kts (105 mph, 172 km/h)
Stall, Vs:	45 kts (51 mph, 83 km/h)
Range:	425 nmi (490 mi, 787 km)
Takeoff:	1700' (518 m) over 50' obstacle

Gross Take of Weight:	1430 lbs (650 kg)
Empty Weight:	970 lbs (440 kg)
Useful Load:	460 lbs (210 kg)
Fuel burn at cruise:	5 gph (18.9 L/h)
Useable Fuel:	23 gal (87L)
Mileage on road:	35 mpg (14.9 km/L)

- Rear wheel drive on the ground
- Automotive-style entry and exit
- Automated electromechanical folding wing
- No trailer or hangar needed, can fit in garage
- Cargo area holds golf clubs





Driving:

80" (2m) tall
90" (2.3m) wide
18' 9" (6m) long

Flying:

78" (2m) tall
26' 6" (8m) wingspan
19' 9" (6m) long

Cockpit:

48" at the shoulder
Carry-on luggage
Golf clubs
Two place, side-by-side



Safety

- Drive in case of inclement weather
- Proven 100 hp Rotax 912ULS engine
- Full vehicle parachute available
- Modern glass avionics
- Automotive crash safety features
- Training: Sports Pilot (in 20 hours of flight time) or higher

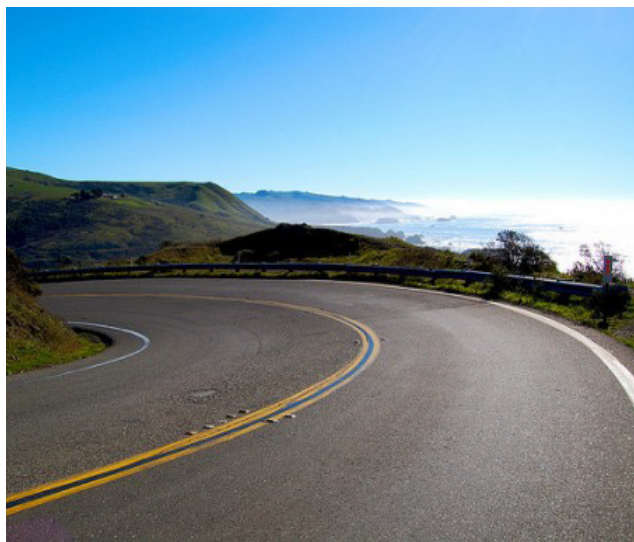
Who would've thought cars to be king of skies?
Who would've dared to find solutions to the 'Why's'?
Only with Science will the impossible become boring, (bring)
You never know when your dream might become the next big thing!

Aditi Banerjee
XII C





Harnessing Energy From Our Roads



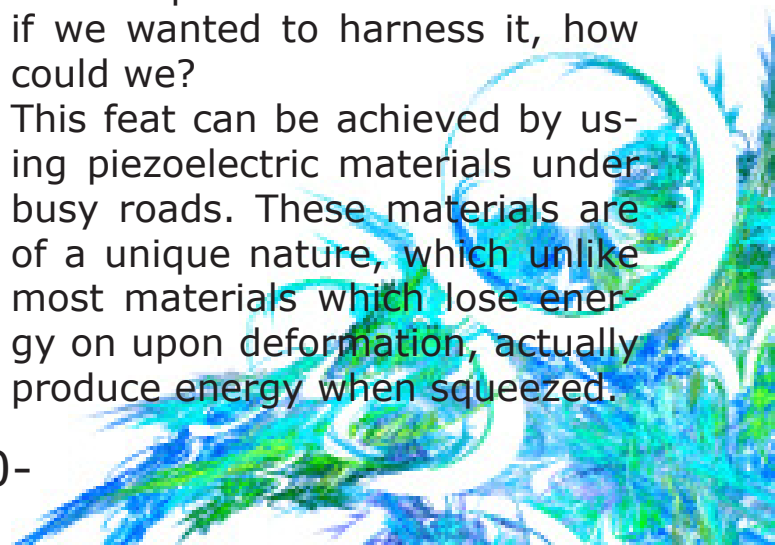
As humans take on the challenge of the impending global energy crisis, the great search for the holy grail of renewable energy is in the zenith of its existence. Scientists all over the world are contributing both wisdom and sweat to relieve our planet from the pressures our greedy and exponentially growing race puts on it, and contribute to a new generation of financially feasible, eco-friendly and universally accessible energy production technology.

As a budding enthusiast of both science and economics, I was very intrigued by the idea of new energy sources, which not only produced renewable energy, but also satisfied the criteria of economic feasibility. Not only does the technology have to be a good deal for our money, but it being ubiquitous is also essential to prevent worldwide disparities in energy availability if it is used in the future. In my constant quest

to read or surf the net and learn about new developments that were coming closer and closer to fulfilling these demands, one technology that really impressed me, and got me thinking, was Piezoelectric energy generation.

It's a known fact that massive amounts of mechanical energy go waste when millions of vehicles move on roads. In what way? The energy consumed by the vehicle (sourced in the fuel combustion) is utilized for a variety of applications; one of them is to overcome rolling resistance. A typical asphalt road can be described as a visco-elasto-plastic material, with elasticity being its dominant material characteristic. When a vehicle passes over a road, the road deflects vertically. This deflection is released as thermal energy. When we imagine the number of vehicles that pass over roads per day, especially in a growing country like ours, we can just imagine the massive amount of thermal energy going to waste in this phenomenon. But even if we wanted to harness it, how could we?

This feat can be achieved by using piezoelectric materials under busy roads. These materials are of a unique nature, which unlike most materials which lose energy on upon deformation, actually produce energy when squeezed.



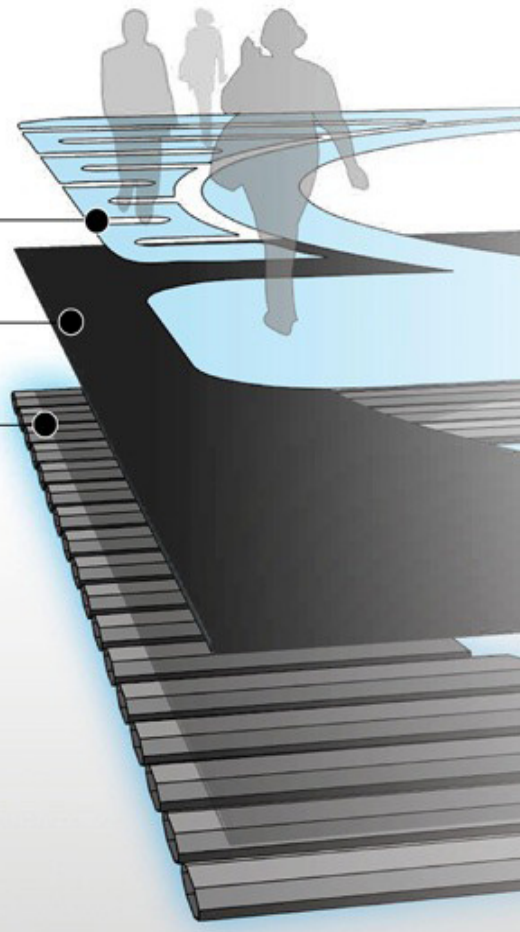
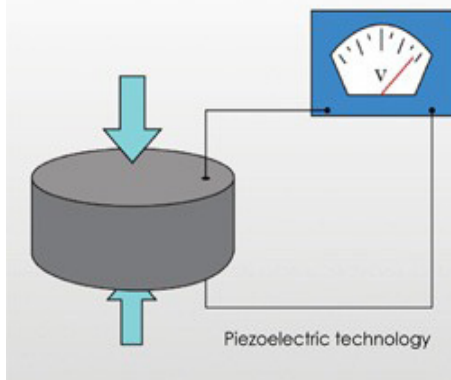


Layers Produce Electricity from movements and vibrations

Layer 1: GE Blue Romark Reflective Road Marking Tape marks the crosswalk.

Layer 2: A layer of hard rubber is sandwiched in between the tape and the charging panels

Layer 3: Piezoelectric Panels
Piezoelectric panels produce electricity from the movements and vibrations of pedestrians and cars rolling over the cross walk.



This property is aptly known as piezoelectricity and it's the ability to produce electric power in response to applied mechanical stress, and in this case this stress is the movement of vehicles on the roads.

For a road with embedded piezoelectric generators, part of the energy the vehicle expands on road deformation is transformed into electric energy (via direct piezoelectric effect) instead of being wasted as thermal energy (heat). The piezoelectric generators harvest that energy and save them in roadside batteries that can be used by people. This process is also known as Parasitic Energy harvesting, and may soon be a solution to our energy demands. This process is also known as Parasitic Energy harvesting, and may

soon be a solution to our energy demands. According to current research by Israeli scientists, who are playing a pivotal role in the development of this technology, the Piezo Electric Generator should be able to produce 200KWh in regular traffic conditions, while a four-lane highway would produce about 1MWh of electricity, per kilometer, enough to provide power to 2500 households. Considering that Israel has about 250 kilometers of roadways suitable for the technology, in terms of volumes of traffic, and the mass of vehicles taking the roads, you can very well imagine how much electricity can be produced. In a nation like India, whose roads are congested with traffic, the results will multiply exponentially. Implemented on airport runways and rail systems



The system has the capacity to deliver real-time data on the weight, frequency and speed of passing vehicles as well as the spacing between vehicles. It can not only be a useful energy source, but also a useful form of data collection and road analysis, and probably help to circumvent road crises in the future.

Summing it up, why is it a better option?

- Pure energy harvesting (parasitic energy only)
 - Proximity to consumer (no need in special and long transmission-lines)
 - Solution does not take up any public space
 - Functions in all weather conditions
 - Low maintenance after implementation
 - Data collection, e.g. "Smart Road," "Smart Railroad" and "Smart Airport"
 - Ability to provide electricity for areas remote from main electricity lines
 - Solution is integrated with infrastructure – theft and damage proof
 - Competitive advantage for road construction companies (e.g. tenders, municipal & enterprise contracts).
 - The technology is very low maintenance as there are no moving parts with the generators placed under asphalt or inside a rubber mat. They need to be repaired or replaced once every 30 years
- As far as I can see, this technol-

ogy is a one time investment with low maintenance cost, harbors feasible amounts of energy, and is also universally available. Not only does it have the potential to provide energy, but may also contribute to the development of smart road technology in the future as well. It seems to put a tick in all my boxes, and may be the energy of tomorrow.

Though the search still continues for the best sustainable energy generation technology, I definitely won't take my eyes off this one, and nor should you.

Rishabh Prakash
XII C

Compaq is considering changing the command 'Press any key' to 'Press Enter key' because of the flood of calls asking where is the 'Any' key.

Did You Know?

Solar paint could power our vehicles. A technological breakthrough in nanotechnology makes it possible for anything exposed to sunlight to be painted for power.



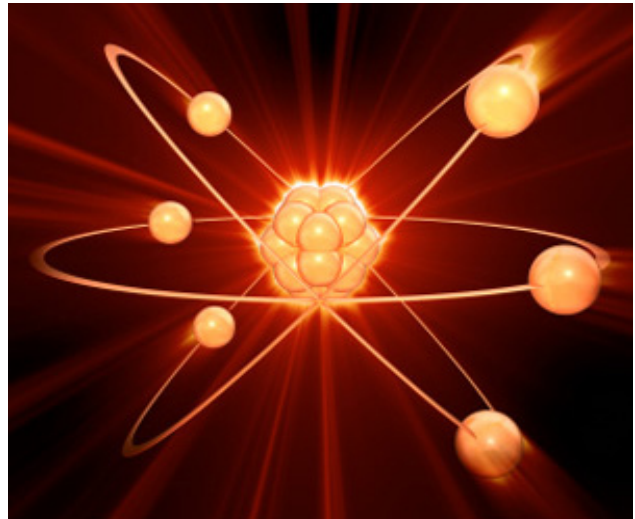
Science of Tomorrow!

Just before Sir Isaac Newton died, he described how humbled he felt by the thought that he had glimpsed only a fraction of the potential of the great scientific revolution he had helped to launch: "I seem to have been only like a boy playing on the seashore and diverting myself in now and then finding a smoother pebble or prettier shell than ordinary, while the great ocean of truth lay all undiscovered before me."

Today, three centuries hence, the great ocean doesn't seem like such an enigma anymore. The sole molecule of life, DNA has been unraveled, artificial intelligence has been granted the form of a computer, science is not merely being practiced or experimented with, but in fact, being mastered across the globe.

The imperative question remains: What is the scope of science in the future years? Scientists affirm that life changing scientific advances in the coming decades include cars that drive themselves, lab-grown human organs, robots that can perform household tasks, eye glasses that double as home-entertainment centers, the exploitation of genes that alter human ageing and the possibility of invisibility and forms of teleportation. Science, the mystery of yesterday, the puzzle of today, the master of tomorrow, will enable humans to animate the inanim-

animate. Ready or not, here comes the next Scientific Revolution-



Future of Physics

While quantum teleportation was attained 10 years ago, teleporting humans still entails many unanswered questions. The basis of teleportation being investigated is the transfer of information from system to another, which makes both sets of information identical. But what about humans who are made of matter, not information? What would they experience in the course of such a phenomena? On the other hand, biomedical engineers assert the plausibility of obtaining electricity from plants. They believe they can hijack the function of a particular protein that creates energy for the plant, called the photosystem, and thereby, produce solar electrical power. A cost-benefit analysis substantiates the economic benefits of such an alternative to regular silicon based sol-



ar panels in the future. Diverting to the power of atoms and nuclei, let's focus on nuclear energy, which according to prominent scientists, will facilitate the establishment of a fusion power station to generate electricity, a viable alternative to nuclear fission in the next 5 years. Scrutiny on more minute particles narrows the debate down to nanotechnology, a rapidly expansive field of science. Who ever conceived nanobots seeking and destroying adversaries on the battlefield? Futuristic Nanobots can enter an individual's bloodstream to repair a clogged blood vessel, or punch holes for a detrimental effect. Nevertheless, work in the embryonic stages today stirs adequate excitement for tomorrow. Eminent scientists perceive nanotechnology to be the greatest existential risk humanity has to confront in the coming decades.



Future of Biology

Enough about the physical manifestations of the universe; let's delve into the biological future that the scientific world entails

with it. Ambitious scientists reckon on the palpability of reprogramming biology away from cancer, heart diseases and all major epidemics in the next 10 to 15 years. Moreover, now that biotechnologists have recognized the ageing gene, they deem they might perhaps be able to generate an anti-ageing gene to prevent humans from growing old! For the first time, science is determined to examine not outward technology in the form of agriculture or space travel, but today, science is aiming to sculpt technology inwards, at modifying our minds, our memories, our metabolisms, our personalities and our kids. And this is not in some distant, science-fiction future – this is now. "What's shocking about this is that if you can do all that, you're talking about humans becoming the first species to take control of their own evolution" as stated by Joel Garreau, the author of Radical Evolution.



Future of Computing

Virtual reality pioneers have stirred hope in the technological advances of tomorrow by propo



sing a notion where virtual-reality interfaces might simply be integrated into the human body. We could have a display built into any of a number of layers within the eye, or into the optic track – or, indeed, into the brain itself. The magnitude of applications of Information and Technology forms the foundation for biological robots: robots with more biological components, and humans with more electric elements. The idea of superhumans on the other hand is refreshing and daunting at the same time. It is most palpable that machines will overtake us in the near or distant future. But what about the future of humans? Where does it leave us? Specialists in artificial intelligence have cautioned us time and again about the potential and desire of a created mind to self-improve or destroy intelligent life. After all, you've got to treat scientific inventions and developments as loaded guns!

The 21st century all in all, not only upholds the enthusiasm and capacity to change the future, but also holds with it, the weapon of science. The human race has undoubtedly transformed from mere passive observers of nature to its choreographers. In a nutshell, the future withholds the enigma of science, while science conceals the enigmatic future!

Vandita Khanna
XII A



Automaton

You make life easy,
do as i say,
I only use you,
to clear my way.

A tear rolls down,
when i feel pain,
You don't even frown,
when you're broken again.

I breathe to live,
you're greased to run,
I die someday,
you forever run.

I depend on you,
day and night,
Oh machine! Without you,
life would be a fight!

Nandini Agarwal
IV A



Doofenshmirtz' Best Inventions

What he meant to happen?

What actually happened!

I. The Deflate-inator



He creates a ray to deflate every inflatable in the Tri-State Area, but has the poor foresight to mount the machine in his blimp.

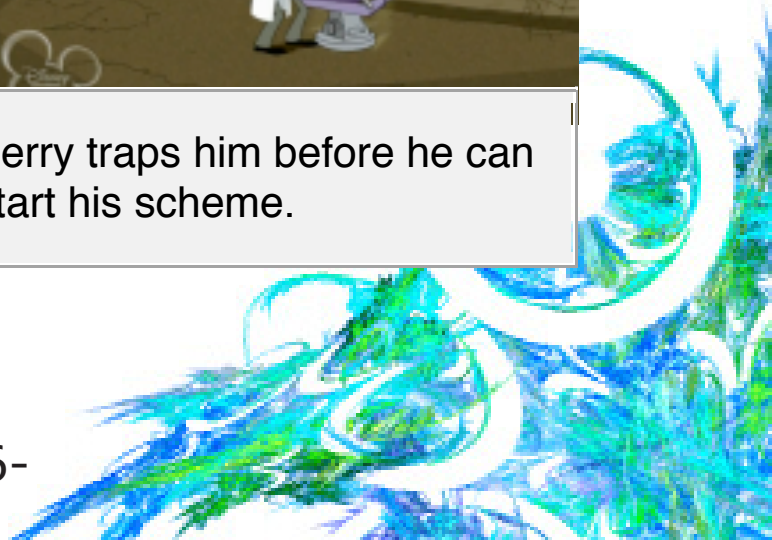
Doofenshmirtz shoots a mirror by accident and it deflects and deflates the blimp.

II. Make-up-your-Mind -inator



He wants to destroy anybody that can't make up their mind.

Perry traps him before he can start his scheme.





III. Poop-inator



He plans to ruin his brother's key-to-the-city ceremony by hypnotizing pigeons to defecate on him.

Perry turns the pigeons against Doof, and they finally end up doing their *business* on him.

IV. Copy and Paste-inator



He creates copies of himself to do all of his waiting in lines for him.

Doofenshmirtz accidentally presses the 'Delete All' button and all of his clones disappear.

V, Lunar Rotate-inator



Dr. Doofenshmirtz builds a machine that rotates the moon bringing the dark side facing earth.

The giant building knocks the machine over and crashes it to the ground.



The Next Giant Leap For Mankind

3rd Place in the Science Essay Prize 2011

Global Warming, deforestation, climate change, animal extinction, resource shortage, water shortage. These are just a few of the challenging problems the world faces today. In every country there are problems be it pollution, poverty, food shortage but one common problem being faced today almost everywhere across the planet is water shortage. Three fourths of the Earth might be covered by water but only 3 % of this water is drinkable and 1% of that water is accessible. Converting dirty or saline water into drinking water is a very expensive and complex operation. So the next giant leap for mankind would be to find a way to get cheap and clean water. This is exactly what is being done at an organization called DEKA.



DEKA is an organization based in New Hampshire, U.S.A. set up by famous inventor Dean Kamen in 1986 who also invented the revolutionary two wheeled vehicle, the segway.

Their latest project is the slingshot water purifier which can convert any type of water – be it saline, from a gutter or even the contents of a latrine- into pure, clean water at a very cheap cost. The slingshot water purifier is a small black box, as small as a mini-dormitory refrigerator. It needs to be plugged into a power source – be it a plug, a diesel generator or energy created from methane. A hose is needed to be put in a dirty source of water and another hose in an empty tank. All you need to do is press a button and in a minute clean H₂O comes out.



The slingshot water purifier works on the principle of compress vapor distillation. The water goes through a variety of steps to get distilled. First the water enters a chamber it is boiled and gets converted to a vapor form. Stones, dirt, and other bigger particles are left behind and drained out. The steam rises and enters another



her compartment where even smaller particles are drained out. Next the steam enters a purifier where the temperature is a little over a 100°C. Here spores, eggs, bacteria, etc. are hit. They do not rise with the steam and are pasteurized by the heat. The gaseous H₂O now enters a compressor where it is squeezed to take out contaminants like benzene which are vented out in their gaseous forms. The final stage is where the water vapor condensed on the cool walls of a condenser and drips down. The slingshot has another trick, to ensure that hot water doesn't come out the ingoing and outgoing streams of water are placed against water which makes evaporation of ingoing water easier and outgoing water cooler. This technique is known as counter flow heat exchange.

Even drug companies and the navy use the same technique for cleaning water but the apparatus involved is very big and consumes a lot of electricity. The slingshot is small and scrubs contaminants for almost free. It requires only 1 kilowatt of electricity which is around half the electricity a blow drier uses. To do this Dean Kamen brought in another one of his inventions into the water purifier, the sterling engine. This engine is also a generator. It moves 2 pistons to move spin a magnetic rotor which spins a coil generating electric current. The sterling generator doesn't re-



release any polluting gasses, the gas used stays inside the engine at all times. The pistons move due to the sterling cycle. The gas inside is heated at the left heat, increasing pressure and pushing the left piston down. The spreading of the gas causes it to cool down and more to cool to the cool piston and pushes it down. The gas is cooled so the piston moves up, compresses the gas and moves it back to the left piston. Then the cycle is repeated. Electricity is created this way in the sterling engine. The sterling engine can use cow dung, solar panels, etc. for heat and air, cool water, etc. for cooling.

The sterling engine and the slingshot work in perfect harmony. The excess heat created by the engine is used up by the water purifier for condensation. The heat is also used for creating an insulating jacket around the purifier. The slingshot water purifier is perfect for usage in villages and backward or developing areas. It can produce a 1000 liters of pure



water per day and is easy to operate and transport. Dean Kamen has shown many presentations where urine and even Doritos dumped in water have been purified to clean and transparent water.

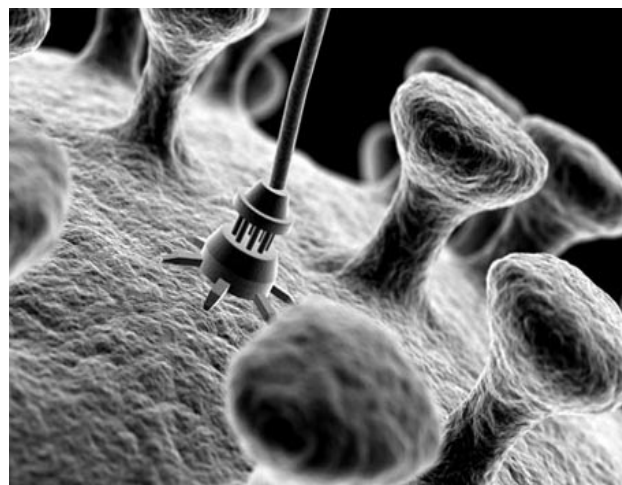
Before going to the moon, Neel Armstrong had said, "I think we are going to the moon because it is in the nature of humans to try and overcome challenges". This is what many people around the world like Dean Kamen are doing. The slingshot water purifier will be the next giant leap for mankind because it is cheap, environment friendly, resource friendly, makes clean water and in the end helps millions of people.

Only 42 percent of Nigerians have access to drinking water. The rest of the population must go directly to the source in rivers or natural storm-water reserves, which could be purified by the Slingshot.



Ayush Sharma
IX B

Shaping the World Atom by Atom



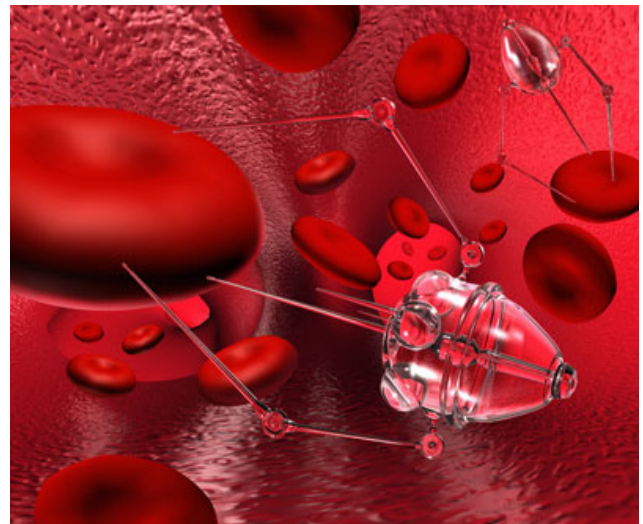
Nanotechnology is the study of manipulating matter on atomic and molecular scale. Generally, nanotechnology deals with developing materials, devices, or other structures possessing at least one dimension sized from 1 to 100 nanometres. Nanotechnology is very diverse, ranging from extensions of conventional device physics to completely new approaches based upon molecular self-assembly, from developing new materials with dimensions on the nanoscale to investigating whether we can directly control matter on the atomic scale. Nanotechnology entails the application of fields of science as diverse as surface science, organic chemistry, molecular biology, semiconductor physics, micro fabrication, etc. Nanotechnology was first popularized in the 1980's by Researcher K. Eric Drexler. He was a visionary and his vision was of creating a new world of miniscule



particles, that work together to serve a greater purpose. He wanted to use these particles for making robots, in medicine, computers and motors.

A nanometer is a strand of hair, sliced a 100 times. Then that slice is divided into 1000 slices. That one slice is a nanometer. Objects on the nanometer level tend to change color. For example, gold turns into a reddish color. Richard Feynman a 1965 physics Nobel laureate said in one of his conferences (Dec 29th, 1959) "There is plenty of space at the bottom, and I want to use it". He postulated nanotechnology even before it existed. Ever since people have been trying to use this "space".

Now in the 21st century, the reveries of both K. Eric Drexler and Richard Feynman are coming true. Nanotechnology has reached heights it never attained before. Now there are prototypes of high density recording devices. These are made by patterning recording media in nanoscale layers and dots. The stored information is a thousand times more than that on a C.D, and it is the size of a wristwatch. Bell Labs/Lucent Technologies are building an archetype microphone which the size of just 100 microns (0.1 mm). This can be used in stealth missions and sting tapes. Carbon filaments made on the nanoscale level too can be useful. Ongoing tests at NUS suggest that coating a car with this specially engineered carbon can make it scratch



free, and provide it with a hydrophobic surface. Water droplets form balls as soon as they touch the carbon and roll down, thus leaving the surface water free. Also, now gold Nano mites are used to reach places where to medicine can go. They travel through the body to the infected area and are exposed to infrared light to heat up and destroy the growths. This can be used in the case of tumors. Superior implants are another prodigious find of nanotech. In this procedure, nanoscale modifications are made to the bone like adding an artificial layer of nanoparticles that bond better with the bone around it. This makes the bone tighter than usual and avoids re-loosing of it. This is used in hip joint repairs in old people as their body can't heal very quickly. At this infinitesimal level of bits movement can be extremely strenuous. So optical tweezers are used to move one particle at a time. In this, a pair of lasers is concentrated at a point and the focus of the lights



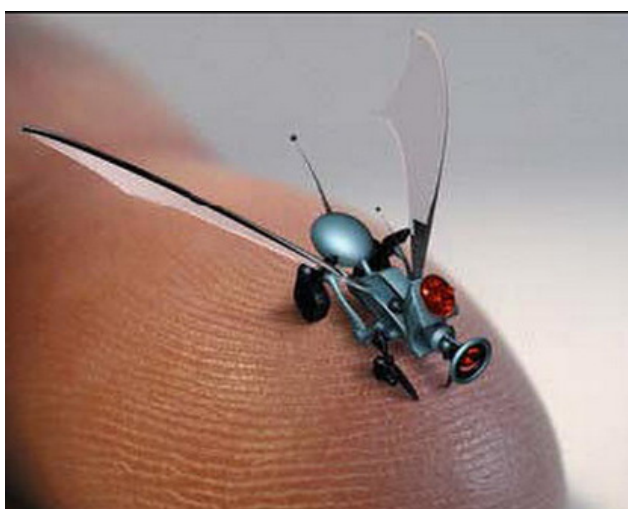
beams actually move, grab or pick up the particle.

But how can we move the particle without seeing? Seeing this microscopic particle is another problematic job. This is done through a SEM. A SEM is a Scanning Electron Microscope. It uses an electron gun to "see" the surface of the target. The electrons bounce off the object and form an image on the detector and amplifier plate, which magnifies the image and shows it on a screen. When the electron ray hits a sample, 5 types of rays are emitted. The X-rays, Auger electron, Secondary electron, Backscattered electron and Cathodoluminescence. These together form a vivid picture of the Nano particle. Carbon nanotubes are carpet like structures on the nanoscale level which can be cut to make designs not even visible to the human eye via a microscope. The Transmission Electron Microscope or the TEM is also used to visualize miniature particles. It works on the same principal as the SEM but the target is thin and allows a few rays to pass. The Scanning Tunnel Microscope is also another inordinate

invention in the field of nanotech. Gerd Binnig and Heinrich Rohrer got a Nobel Prize for this invention. A cone like structure moving along the contours of a nanoscale surface. The tip of the cone is a single atom. It can be used for imaging or for changing the shape of the surface. This way one atom at a time can be moved. Soon Britannica can be written on pin head.

We cannot estimate the impact of nanotechnology on the world. It is a field whose potential is yet to be tapped. If tapped properly, we can change the way the world looks, literally. You could save your wedding albums on your wedding rings. You can have your whole lives work written on a gold biscuit and keep that gold in your safe. You can write all your secret recipes on a spoon. As of now I am just scratching the surface. We can take this to interminable limits, we just have to imagine. The only thing that is constant in the world is change. And the change that is going to come is colossal. Ready or not, it's coming.

Dhruv Mishra
XC



Did You Know?

Scientists at the University of California can control flying beetles with implanted transmitters and cameras. The cyborg bugs could be used for surveillance and search operations.



Time Travel: Fact or Fiction

On Thursday Sep 22, 2011, research by physicists working on an experiment dubbed OPERA run jointly by the CERN particle research center near Geneva and the Gran Sasso Laboratory in central Italy recorded subatomic particles traveling faster than light -- a finding that could overturn one of Einstein's long-accepted fundamental laws of the universe.

Measurements taken over three years showed that neutrinos, electrically neutral, weakly interacting elementary subatomic particles with a small but non-zero mass, pumped from CERN near Geneva to Gran Sasso in Italy had arrived 60 nanoseconds quicker than light would have done. This discovery, if true, could prove Albert Einstein's theory of special relativity, stating that the speed of light is a "cosmic constant" and that nothing in the universe can travel faster, wrong.

This discovery is an important input to the standard model of physics, which attempts to describe the way the universe and everything in it works. A total of 15,000 beams of neutrinos were fired over a period of 3 years from CERN toward Gran Sasso 730 (500 miles) km away, where giant detectors picked them up. Light would have covered the distance in around 2.4 thousandths

of a second, but the neutrinos took 60 nanoseconds -- or 60 billionths of a second -- less than light beams would have taken.

Neutrinos can pass through most matter undetected, even over long distances, and without being affected. Millions pass through the human body every day, scientists say, and they are therefore often called ghost particles.

But the main question that seems to take birth in everyone's mind is, "Is time travel possible?" It is believed that if the light-speed barrier is overcome, then time travel may be possible. Professor Forshaw said, "If something travels faster than the cosmic speed limit, then it becomes possible to send information into the past - in other words, time travel into the past would become possible. That does not mean we'll be building time-machines anytime soon though - there is quite a gulf between a time-travelling neutrino to a time-travelling human."

So even though neutrinos have brought us closer to time travel, it still seems very farfetched. We have a long way to go before the butterfly effect becomes the next world crisis.

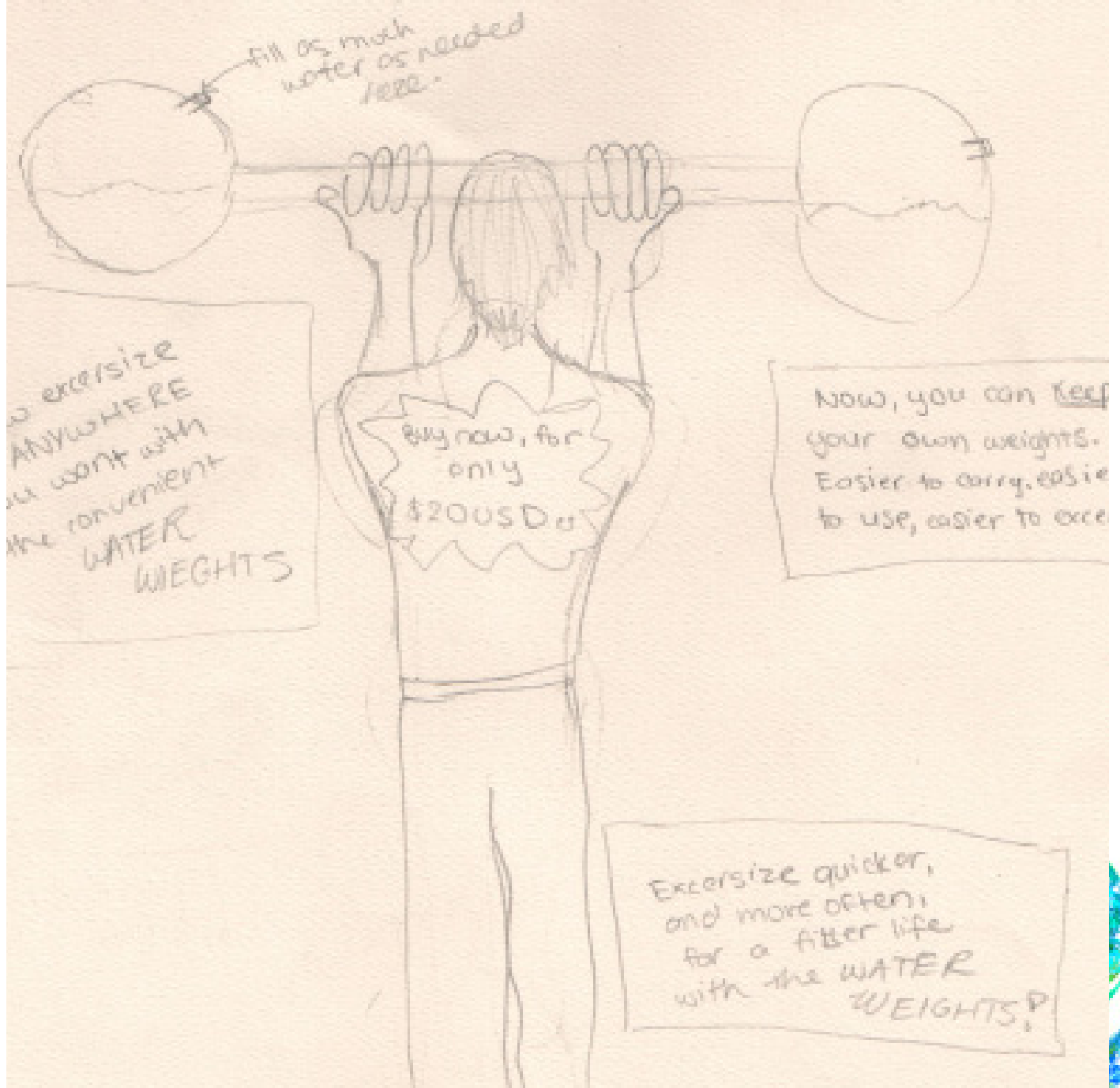
Ranjit Pratap Singh
XC



Water Weights

EXERCISE DIFFERENT

Malika Oak
IX C





Liquid Operated Batteries

Science has evolved so much since it was first found in a simple chemical compound such as H_2O . Now days we have television, cell phones, cameras all of which at some point were even hard to imagine. But now they exist. And now each and every few minutes new technologies are brought upon us. Such as batteries which operate when wet!!

Yes believe it or not, Chungpin Liao, a professor at the Graduate School of Electro-Optic and Material Science of National Formosa University in Taiwan has invented an organic battery that creates electricity when wet.

Liao received his degree in nuclear engineering from National Tsing Hua University in Hsinchu, Taiwan. He earned his Masters and PhD degrees in plasma science and fusion technology from the Massachusetts Institute of Technology in Cambridge, United States.

This "organic" battery created by this science mastermind it generates a charge within 10 seconds and will last anywhere from two days to a week depending on the liquid.



It works with any type of liquid whether it is water, or any other liquid.

Although it will only produce half the strength of traditional batteries we use in our regular battery operated appliances. The organic battery has a storage capacity greater than water-powered fuel cells and is extremely cheap to manufacture.

"Plus it contains no toxic substances and does not pose an environmental hazard" as said by Mr.Liao.

These batteries have so many more pros they can be used everywhere and in every minute of our daily life and batteries like this which need no energy of a particular sort and can be charged with something as common as liquids can be of great help to our environment.



Mehr Mehra
VIII C



GADGET MAKING

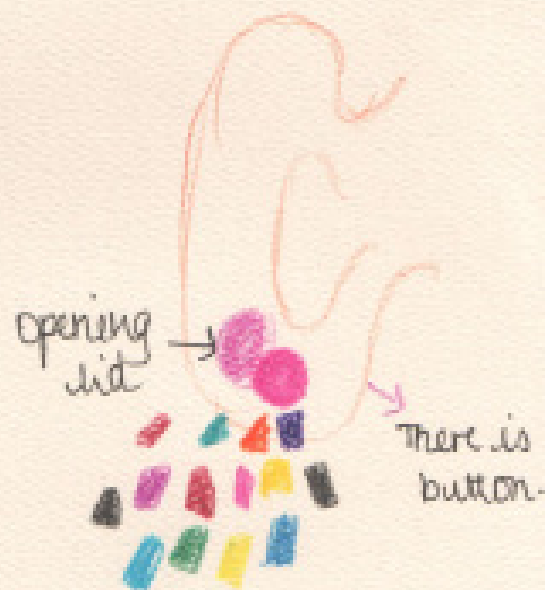
Ear Ring

Popper

Inhee Ji
IX A



An ordinary earring



Features

This is mostly for surprise party's so that when you ~~are~~ have a surprise party then it is easier for you to ~~push~~ push a button but most of the time the party popper happens after a long time. This is refillable and it is also fashionable for girls.



The Future of Science



Imagination is the mother of invention

We use the word 'science' every single day, study it hard one day before the exams and attend (or try to attend) science classes. Yet when asked to explain what it means, we can't help but feeling utterly lost. Formally defined, science is the systematic intellectual study encompassing the structure and behaviour of the physical and natural world. This definition is perhaps not only as baffling as the study, but also inadequate and misleading. For science is more than a bunch of complicated words and symbols written in our wonderful textbooks. Science is discovery and invention. Science is questioning the given, asking why, and being practical. It is driven by curiosity and inquisitiveness. What is invention? Invention is nothing but imagining, and turning one's imagination into reality. Einstein once said: Imagination is more important than knowledge.

Knowledge is limited but imagination encircles the world.

The modern world is an electrified world. The light bulb, in particular, profoundly changed human existence by illuminating the night and making it hospitable to a wide range of human activity. The electric light, one of the everyday conveniences that affects our lives most, was invented in 1879 by Thomas Alva Edison. The reason for the invention: plain and simple necessity. Relying on candles and oil lamps was unpredictable and inconvenient. So what did man do? He used his knowledge and intellect to create a luminous and heat giving device so as to illumine the dark as and when needed.

The various discoveries in the 19th and 20th centuries have resulted in technological advancements. This has enabled human beings an easier more convenient life. We have made so much progress, and yet we have a long way to go. For that is the essence of discovery: the never ending journey of science. Now necessity isn't the mother of invention, rather curiosity and endless imagination is. Science has a huge future and potential. Nano-technology, cloning, cars that drive themselves, lab-grown human organs, 3D television, robots that can perform household tasks, eye glasses that

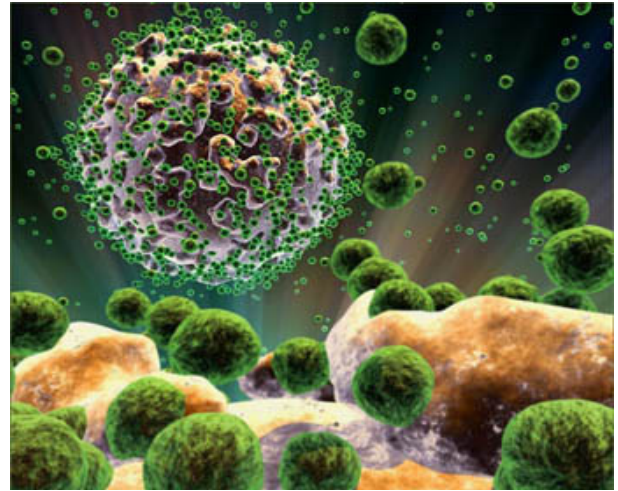


Science is a world of new thinking and endless possibilities. We need to become more fuel efficient, find a way of harnessing the enormous energy obtained by hydrolysis (splitting up of the water H_2O molecule) and using it in our lives. The splitting up of water molecule (hydrolysis) can generate enough energy to power New York City for an entire week. Computer biology is a potential success. Computer biology focuses on writing programmes to figure out what order of magnitude to manipulate organic molecules. The world of science is vast and inexhaustible. In the words of Newton: "I seem to have been only like a boy playing on the seashore and diverting myself in now and then finding a smoother pebble or prettier shell than ordinary, while the great ocean of truth lay all undiscovered before me."

Anjani Gupta
XB

Nanorobotics: Medicine of the Future

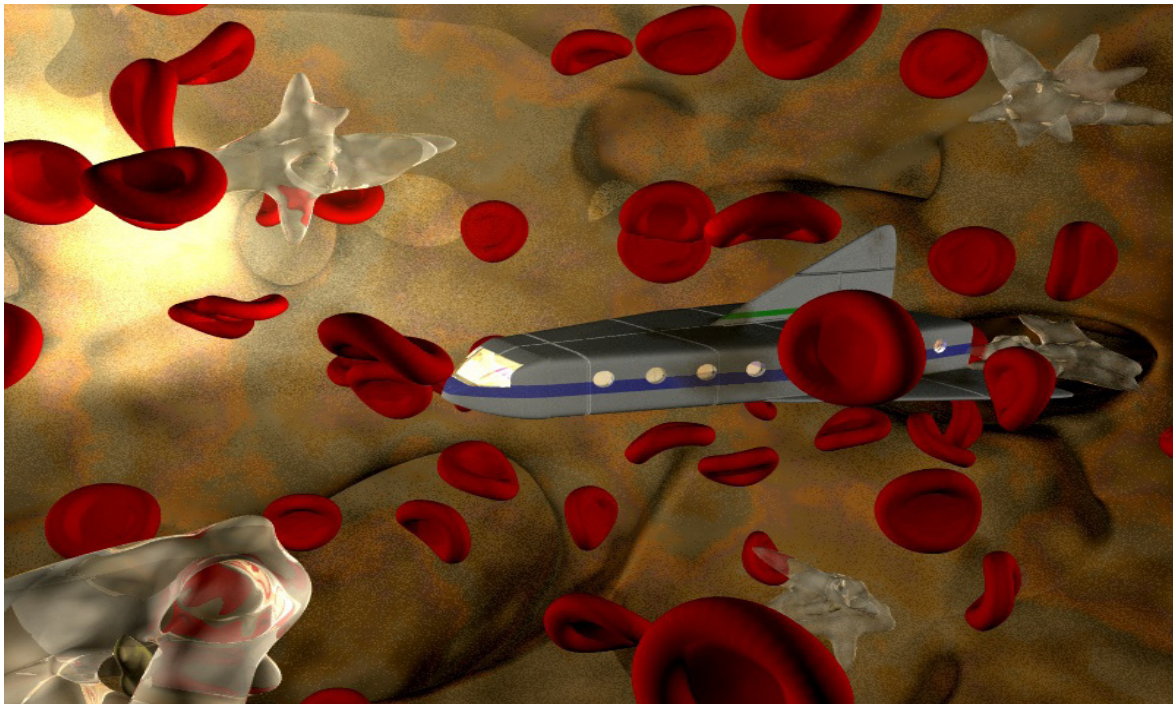
"Living organisms are naturally-existing, fabulously complex systems of molecular nanotechnology." - Dr. Gregory Fahy
The above statement raises the interesting possibility that machines constructed at the molecular level (nanomachines) may be used to cure the human body of its various ills. This application of nanotechnology to the field of



nanomedicine. This is achieved through nanotechnology.

Anything at the nano size means 1 billionth its size (10^{-9}). Coming from that usage of nano technology would mean manipulating matter on an atomic or molecular size. This kind of science has been widely spread over the globe and emerged in the forms of medicine, weapons, and higher molecular studies. The form most attractive and interesting to me is of nanorobotics.

Nanorobotics is a fast emerging field of technology of building of machines or robots at the nano size, beneficial to mankind in various ways. Nanorobotics also known as nanobots, nanoids, nanites, nanomachines or nanomites is the science of constructing robots at molecular component level which is currently under research and development. Since nanorobots would be microscopic in size, it would probably be necessary for very large numbers of them to work together to perform microscopic and macroscopic tasks. The tasks these nanorobots perform are in today's modern world used for medicine. These are dev-



ices, which will be used for maintaining and protecting the human body against pathogens. The main element used in this science for the construction of these bots, is diamond due to its strength and chemical inertness. Also, to avoid being attacked from the host's immune system diamond coating is the best coating. The smoother and more flawless the coating, the less is the reaction from the body's immune system. Such devices have been designed in recent years but no working model has been built so far. Thus nanorobotics requires high expenditure and is still under development to be more viably and economically usable. Many other light elements such as oxygen and nitrogen are used for these bots for special purposes as per requirements. These bots are then sent into the body, either eaten or put directly into the bloodstream for use as required. The powering of the nanorobots can be done by met-

metabolising local glucose and oxygen for energy. Other sources of energy within the body can also be used to supply the necessary energy for the devices. They will have simple onboard computers capable of performing around 1000 or fewer computations per second. Communication with the device can be achieved by broadcast-type acoustic signaling. Then these nanorobots will be able to distinguish between different cell types by checking their surface antigens (they are different for each type of cell). This is accomplished by the use of chemotactic sensors attached to the specific antigens on the target cells. When the job of the nanorobots is complete, they leave the body through the normal human excretory system. A use of this technology already being applied today is :To cure skin diseases, a cream containing nanorobots may be used. It could remove the right amount of dead skin, remove ex-



cess oils, add missing oils, apply the right amounts of natural moisturising compounds, and even achieve the elusive goal of 'deep pore cleaning' by actually reaching down into pores and cleaning them out.

Nanorobotics is the future of medicine, if used to its full potential and might hold the key or answer to many unsolved disease cures.

Abhiveer Arjun
XA

Did You Know?

Inventor and jet fighter pilot, Yves Rossy, flies over the Grand Canyon with small jet engines attached to a wing on his back. He flew at speeds of 205 mph (330 km) for eight minutes.

Liquipel: Save Your Smart Phone From Becoming a Dumb Phone

Decades ago, people dreamed of flying cars and robot housemaids, but Liquipel is a product that really shows off what "the future" can be. Liquipel is a "nano-coating" that aids in keeping your electronic devices safe in the event of accidental exposure to water or other liquids. It isn't a "case" but a "treatment" applied to your phone.

- 
For all of us.
 Maybe you're a little like us. Maybe you've had the untimely death of a device because of a little water. No more! Get Liquipel, get wet and keep going.
- 
Worry-free fun.
 It's surprising how much more you can do with your Liquipelled device. Talking in the rain; no problem. Unexpected water gun fight; no setback. Spilled wine on your phone or dropped it in the sink; grab it, wipe it off and keep going.
- 
Makes & models
 Apple, Samsung, HTC & Motorola are just a few of the makes we cover. Can your device be waterproofed? [View the full list of Liquipel approved devices.](#)



Stem Cell Treatment of Cancer

Stem cells are immature cells found in the bone marrow, blood stream, and in umbilical cords. Stem cells have the ability to regenerate and give rise to new cells. This allows the generation of tissues which can replace diseased and damaged body parts with minimal side effects.

Stem cell treatments are a type of intervention strategy that introduces new cells into damaged tissue in order to treat disease or injury. Many researchers believe that stem cell treatments are capable of changing the face of human disease and also help with alleviating pain. It is also being said that stem cell therapy may be a potential treatment method for cancer.

One of the interesting uses of stem cell treatments is in the treatment of intra-cranial tumours. This is a promising field in which there has been previous success. Harvard Medical School researchers transplanted neural stem cells into the brains of rodents that had intra-cranial tumours. The cells travelled into the cancerous area and in only a few days an enzyme known as cytosine deaminase was produced which converted a non-toxic pro-drug into a chemotherapeutic agent. This led to a reduction in the tumour mass by 81%. This is very encouraging

as conventional chemotherapy does not differentiate between malignant and good cells, killing them all. This method attacked diseased cells only.

Other cancer treatments using stem cells are also being explored and human trials are now taking place and research is being done to help the treatment of cancers such as Lymphoma. In addition, since stem cells can be damaged by certain cancer treatments, hospitals have developed techniques to add healthy stem cells back into your body after damaging treatments take place. Stem cells can be used in bone marrow transplantation and peripheral blood stem cell transplantation as well. Transplantation is done to restore stem cells that have been destroyed by high dose chemotherapy. These treatments using stem cells may also be used for patients who have had radiation treatment for their cancer. This replaces the patient's immune system, with one belonging to a healthy donor.

There is great potential in this area of research and treatment.

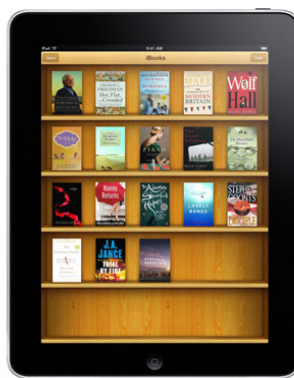
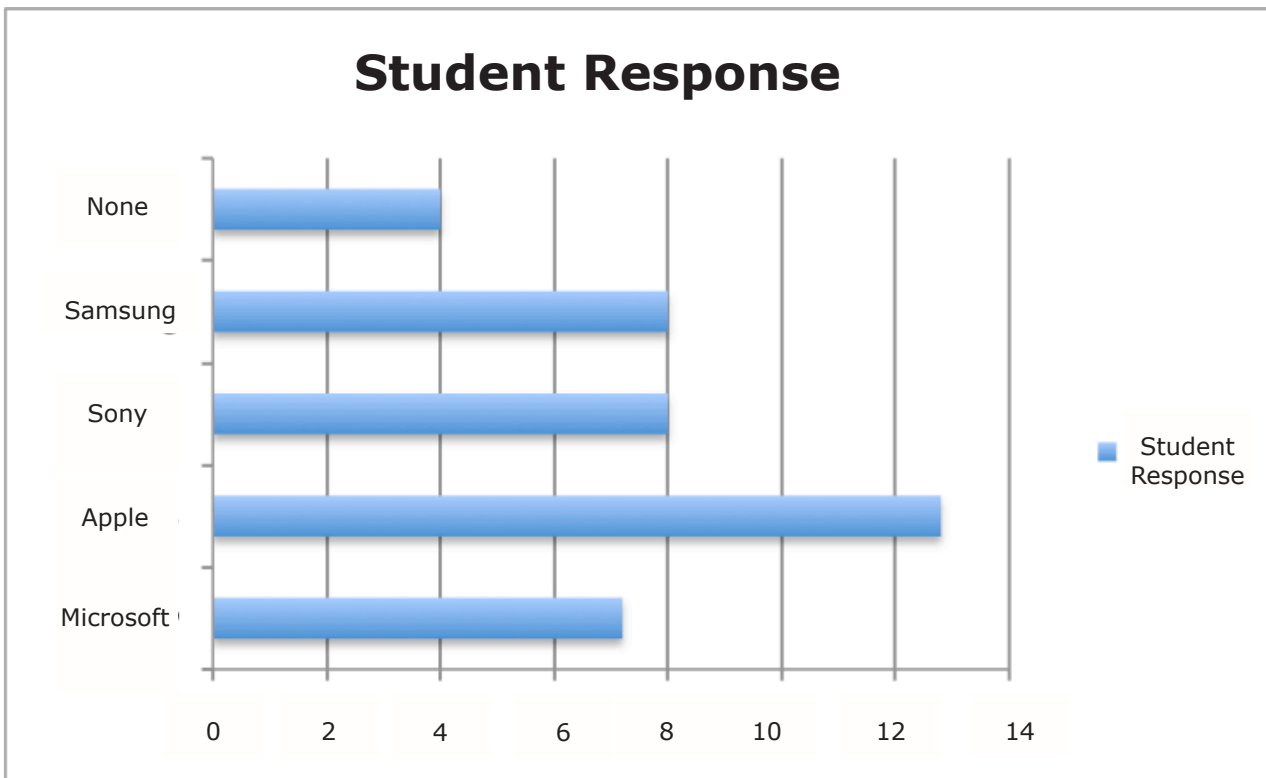
Divya Shastri
XA



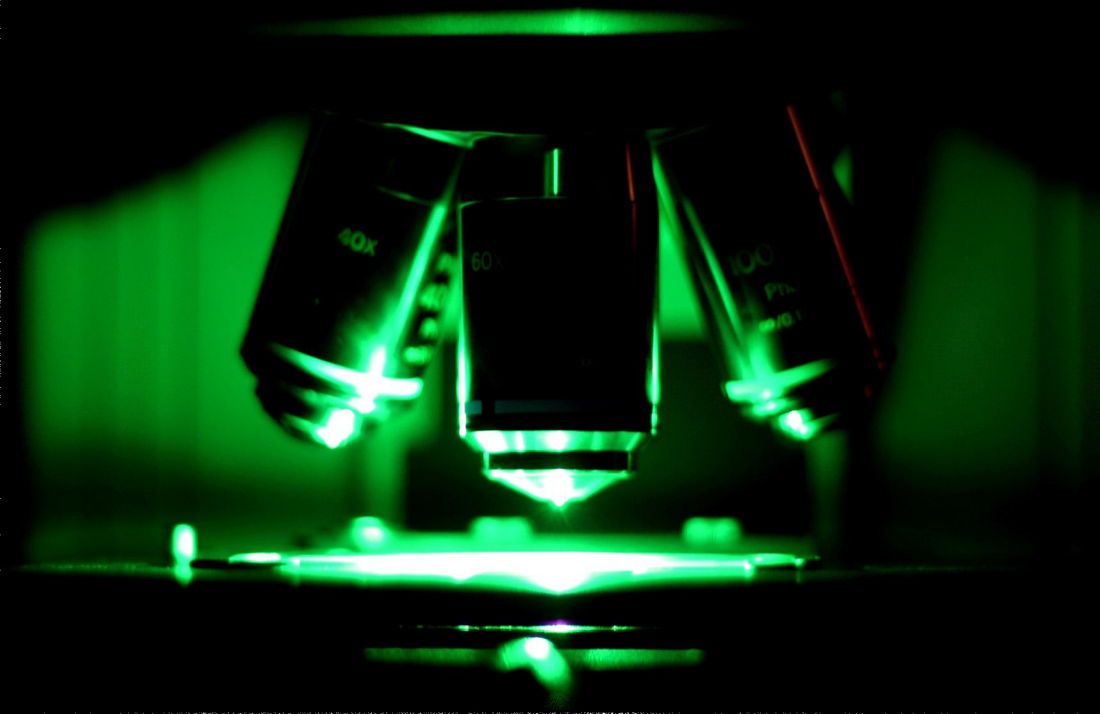
Ask the Students!



Which company do you think is making their own textbook application?



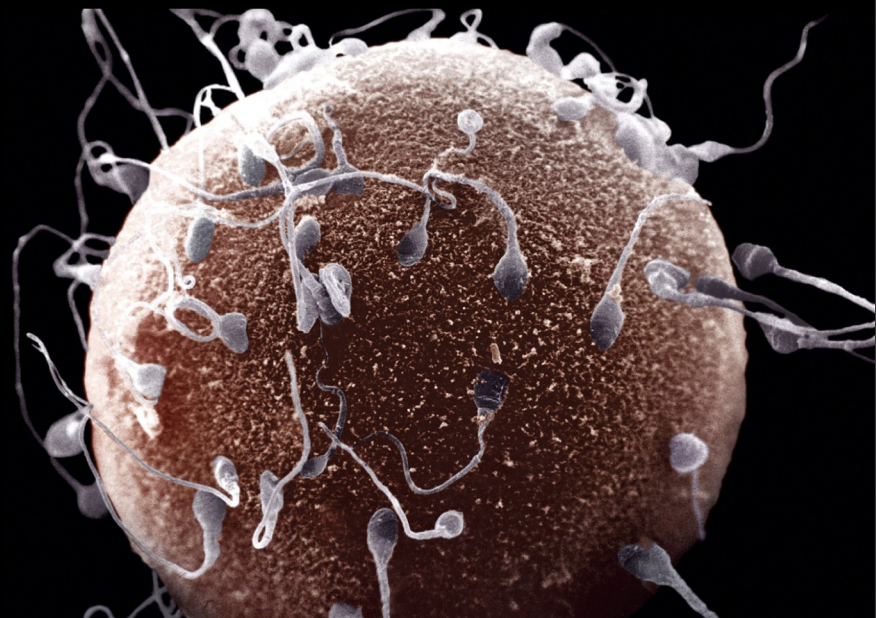
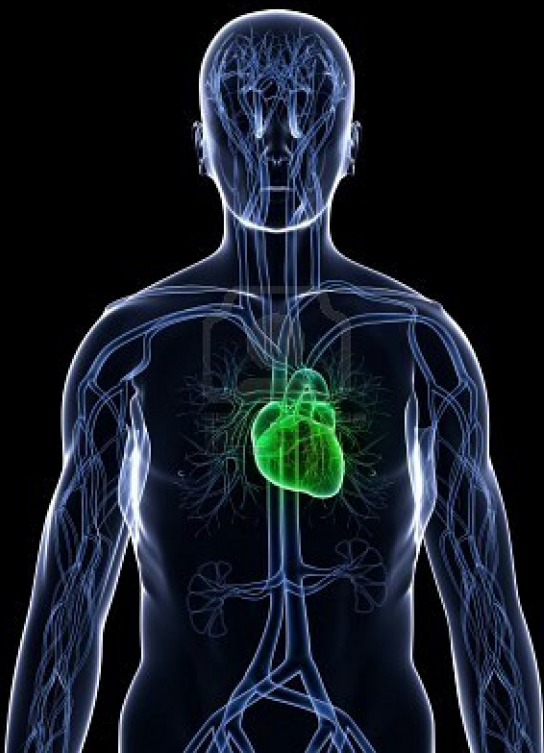
Apple declared its intention to be at the head of the class, with the unveiling of the iBooks 2 for iPad app and the iBooks textbooks that are the first to exploit the app.



Reality and Vitality

To keep the body in good health is a duty... otherwise we shall not be able to keep our mind strong and clear.

~ Buddha





DESIGNER BABIES

Can I have a blue eyed, blonde haired child please!

The colloquial term “designer baby” refers to a baby whose genetic makeup has been artificially selected by genetic engineering combined with in vitro fertilization to ensure the presence or absence of particular genes or characteristics. This process, amongst many others, is showcasing the leaps man is now making in the world of science. Gene manipulation however, is possible due to the following reasons-In Vitro Fertilization (IVF) technique involves the fertilization of the egg by the sperm in test tubes, outside the mother’s body. This allows doctors to screen the embryos. As well as, Human Germline Genetic Modification (HGGM) which refers to techniques that would attempt to create a permanent inheritable genetic change in offspring and future descendants by altering the genetic makeup of the human Germline; meaning eggs, sperm, the cells that give rise to eggs and sperm, or early human embryos. Infact, for many decades, it has been the technical barriers to HGGM, which have seemed insurmountable. However, Two recent advances in stem cell research suggest that the technological barriers may soon be overcome. Scientists recently have created genetically modified mice by genetically modifying the cells that give rise to sperm, and using the-



se resulting sperm for fertilization. In addition, scientists have genetically modified human embryonic stem cells as well. Looking at the concept of genetically modified babies through the lens of moral and ethical grounds, many see this entire process as a positive step. This is because, Designer Babies Genetic screening can reduce the baby’s chances of being born with several serious diseases like Down syndrome, Familial hypercholesterolemia, rare blood etc. hence will result in a healthier population. Genetic modification is also believed to be capable of altering the full range of biological traits, such as the gender, eye, skin and hair color of the baby. Various other physical traits such as intelligence, beauty, height, stopping a propensity towards obesity, freedom from mental illnesses, athletic ability, etc. can be also determined. This is one of the key reasons driving many to opt and support gene manipulation of children.



However like every coin, Genetic engineering has also a flip side. Many have a critical approach towards it, due to the fear of change. People with genetic defects will be socially rejected, as "gene poor" and will be separated from the society too. Today, people who have genetic defects are already treated, Designer babies concept, will lead to more discrimination on the basis of certain qualities or traits. Infact The process of genetic engineering is also very expensive and hence limited to only a few. Kids of rich families will receive genetic enhancement, leading to genetic aristocracy and others will be looked down upon. Thereby, creating a greater rift in society. Moreover, sex or gender determination of the baby could lead to gender discrimination across the globe. A phenomena very evident today as well!

Lastly, there is a large group of people who strongly believe that, Genetic engineering is not something to play with. Its complex, and any mistake can alter the lives of many generations. We never know when a particular mutation can lead to a new virus or disease. Thus in that case not only with genetic engineering not save lives, instead could be responsible for taking lives as well!

The pioneers of genetic engineering are well known today all over the world. Adam Nash was the worlds first known designer baby born by the revolutionary pre-implantation process in the year

2000. Scientists genetically selected his embryo so that he would possess the right cells to save his dying sister's life, who suffered from Fanconi's anemia (a blood disorder), ting that disorder was also very high, thus An embryo was chosen, which did not have Fanconi's anemia. Adam further became a donor to his sister, which doubled her chances of survival. These complex processes are infact an amalgamation of simple steps. In theory, there are several ways to modify a person's genome.

1. An entire gene or part of a gene could be inserted somewhere into the genome. This inserted DNA sequence, sometimes called a transgene, could be a normal copy of a resident gene. Introducing a normal copy of that gene could compensate for the nonfunctioning or malfunctioning resident gene. gene, a transgene could be a segment of DNA that affects the function of a resident gene to turn it on or off, as well.

3. Alternatively, the transgene could introduce a whole new, and previously non-existent gene function into the genome. An example of which is the gene for green fluorescent protein that has been introduced into a number of laboratory animals to make them glow. This however is the start. Future technology indicates a much higher level of development and growth. Due to genome sequencing, in the near future, there may be devices in each laboratory



"Congratulations, it's a Versace!"

and doctor's office that can sequence anyone's entire genome, so as to determine their chances of getting any diseases on the basis of their DNA pattern. Viral injection is another method, which uses gene implantation using viruses. Starting with a dead virus being injected with a specific gene that the scientist wants to be expressed this is usually followed by, another gene being attached to the desired one which can help determine if the cells took up the gene. Viral DNA places itself anywhere on any chromosome, which can lead to problems with the functioning of other genes, called insertional mutagenesis. Homologous recombination is the process of identifying, cutting out, and replacing a misspelled sequence of DNA letters occurs naturally in the cell. While homologous recombination avoids the problem of insertional mutagenesis, it is very inefficient, producing only about one out of a million cells that have actually taken up the new gene sequence.

Human artificial chromosome is a process, which showcases, another possibility in the use of human artificial chromosomes, or HACs. This involves adding a completely new chromosome to the forty-six others that we already have. The benefits are that the new genes on the HACs would not disrupt the existing genes. However this chromosome may be linked to a disease.

Thus, the entire concept of designer babies has resulted in a sense of evolvment of the human mind. It allows us to envision that horizon which was initially a mere target. Whether gene manipulation is ethical or not, can be left to an individuals discretion, however one thing which is certain is that, with these strides in science there is now no looking back. Knowledge is that key, which has unlocked many a treasures!

Shriya Gupta
XII B

Did You Know?

50,000 of the cells in your body will die and be replaced with new cells, all while you have been reading this sentence!



GENE'S on SALE !

What if, by altering your genetic makeup, you could design a baby of your dreams? Would you select your baby's features from a catalogue? Perhaps some blue eyes, a bit of curly hair, and why not make her tall, lean and purchase her a higher IQ.

Research in genetic engineering has been advancing at lightning speed. In 2004, the term "designer baby" has evolved from sci-fi movies and weblogs into the Oxford dictionary. A Designer baby is a baby whose genetic makeup has been artificially selected by genetic engineering combined with in-vitro fertilization to ensure the presence of, or absence of particular genes or characteristics." Ensuring the survival and advancement of Human race, Scientists have contentiously used animal testing, cloning and now debating Designer babies. Like most scientific endeavors, Designer babies have various pros and cons which are explored below.

From the beginning of mankind, Science has finally discovered how to rid deformities, by isolating defective genes, and eliminate life threatening diseases. Millions of lives have been lost agonizing and suffering due to birth anomalies with no cure. Designer babies began with sincere effort to eliminate defective genes in an embryo that cause serious health concerns and genetic diseases.

Millions of lives have been lost agonizing and suffering due to birth anomalies with no cure.

Designer babies began with sincere effort to eliminate defective genes in an embryo that cause serious health concerns and genetic diseases. Embryos are screened to check for the presence of any genetic disorders by means of a technology known as Pre-Implantation Genetic Diagnosis (PGD) and defective genes are replaced with healthy ones.

Earliest case study known is of Adam Nash, the world's first designer baby in 2000. Scientists genetically selected his embryo so that he would possess the relevant cells, doubling his dying sister's chance of survival. His sister suffered from Fanconi's anaemia (blood disorder). Arguably the probabilities of Adam getting this disorder were also very high. An embryo was chosen, which did not have Fanconi's anaemia.





Secondly, Knowledge of IVF cannot be suppressed. Embryo selection for gender choice and other non-medical reasons is banned in most countries. In the United States, it remains legal and unregulated. Banning this procedure will only Force PGD into the hands of shady, unqualified, unlicensed technicians. This encourages a black market. Organ trafficking is illegal but thrives in most third world countries today in the black market. Conversely, the ethical predicaments surrounding genetic engineering are complex, and profound

Our knowledge of genetic engineering is at infancy stage. This enables us to engineer our own genetic blueprints and create super humans that "seem" perfect. But what is perfect in Hitler's view, or our present knowledge, may not be empirically correct. As knowledge changes at an increasingly faster pace, we realize how much we don't know.

On one instance, a British couple gave birth to a genetically designed boy whose stem cells were used to treat a life threatening blood disorder in the older brother. The ethical issue was that the new-born baby himself had no dignity of life. The baby was conceived for the sole purpose of saving his older brother. Another issue- several human embryos were rejected before an accurate tissue is matched, causing "right to life" concerns by groups particularly Roman Catholics.



Throughout history and even today, we witness Gender and class discrimination; DESIGNER BABIES' debate raises the possibility of 'gene discrimination'. Dr. Mark Hughes, who helped pioneer the procedure a decade ago, says he developed it for one reason – to help root out disease and says "Your gender is not a disease... There's no pathology. There's no suffering. There's no illness." He fears that since Most parts of the world are still male dominated, and sex or gender determination of the baby can lead to gender discrimination across the globe. Specifically In India, Female foeticide is a result of pre-natal sex determination. IVF is exponentially increasing the divide resulting in 40 million females missing from the Indian population ! Children born naturally would be considered as social outcasts, called 'gene poor'. Each designer baby may cost \$18,000 which most cannot afford. Kids of wealthy families would receive genetic enhancement, leading to a genetic aristocracy, creating a greater rift in society.



In my opinion the benefits of IVF outstrip the negatives. We can't suppress acquired knowledge but should embrace it judiciously and balance the ethical concerns. Preventing genetic disorders and selecting characteristics of ones offspring improves the quality of Life. IVF has the potential to improve human condition and impact evolution.

Gauri Khanna
XII A

Genetics explain why you look like your father and if you don't why you should.



Hold That Sunscreen!

Nowadays the idea of sunscreen and sun consumption is on everyone's minds. But before smothering on all that sunscreen, here are a few things that you might like to take a note of . Sunlight, or more specifically the ultra-violet bandwidth of sunlight, is the human body's main source for vitamin-D. This vitamin is essential for our bodies' absorption of what might be the most important mineral that the human body requires, yes I'm talking about Calcium. Calcium is the most abundant mineral in the body as well as the most difficult to absorb. In order for this mineral to be reduced to an ionized state (the state in which the body can use it) several constituents need to be present. The first and most important is vitamin-D. The best and most efficient way for the body to take in this vitamin is from sun exposure, specifically the UV bandwidth. Conversely, putting on sunscreen stops about 95% of ultraviolet light from being absorbed into the skin and significantly hinders the body's ability to create Vitamin D. In order for the nervous system to fire and the body's cells to operate correctly, ionized calcium must be present in intracellular fluid. When the body does not have enough calcium it starts to significantly become more acidic; cellular operation starts to break down and this can eventually lead to disease conditions throughout the body like arthritis, asthma, hypertension and heart disease. In extreme cases it can possibly lead to the development of diabetes, cancer, and Alzheimer's.





CLONING

I am sure you all must have heard of the word “cloning”. Many times, we all do wish we can clone ourselves so that while we’re sitting and playing our clone can do our homework. Well, now you must have guessed that a form of cloning is basically making a replica of yourself. But how is it actually done? What is the science behind this magic?

Cloning is defined as the process of making a genetically identical organism through nonsexual means. It refers to processes used to create copies of DNA fragments (molecular cloning), cells (cell cloning), or organisms.

Cloning is done both for animals and human beings. It started with animal cloning. Animal cloning has been the subject of scientific experiments for years. It came to be widely known after the birth of the first cloned mammal in 1997, a sheep named Dolly. Since Dolly, several scientists have cloned other animals, including cows and mice.

Human cloning is also being done. It is the creation of a genetically identical copy of a human being. There are two commonly discussed types of human cloning: reproductive cloning and therapeutic cloning. Reproductive cloning is a technology used to generate an animal that has the same nuclear DNA as another currently

or previously existing animal. Dolly was created by reproductive cloning technology. In a process called “somatic cell nuclear transfer” (SCNT), scientists transfer genetic material from the nucleus of a donor adult cell to an egg whose nucleus, and its genetic material, has been removed. The reconstructed egg containing the DNA from a donor cell must be treated with chemicals or electric current in order to stimulate cell division. Once the cloned embryo reaches a suitable stage, it is transferred to the uterus of a female host where it continues to develop until birth.

Therapeutic cloning, also called “embryo cloning,” is the production of human embryos for use in research. This process is used not to create human beings, but instead to harvest stem cells that can be used to study human development and to treat disease.





Stem cells are important to biomedical researcher, because they can be used to generate virtually any type of specialized cell in the human body. Many researchers hope to use these cells to grow healthy tissue to replace injured or diseased tissues in the human body, and also to serve as replacement cells to treat heart disease, Alzheimer's, cancer and other diseases.

Cloning technology can be used in various ways. Reproductive cloning also could be used to repopulate endangered animals or animals that are difficult to breed. Much work still needs to be done before therapeutic cloning can become a realistic option for the treatment of disorders.

Yashita Jeet
XA

A Brilliant Mind

A brilliant mind, in 1913
With just some research, and a
passion keen,
Revolutionized the way all the
world thought,
The dawn of an era to atomic sci-
ence he brought.
Breaking the ice with a theory
unbeat,
Solving Rutherford's flaw, an ex-
traordinary feat
A whole new atom, he did pro-
claim,
Who was he? Neil Bohr, that's his
name.
With ingenious thought, he did
propose,
Two postulates, assumptions.
What were those?

Pranav Khanna
XB

Cookies?

Wait till they're baked. A new study says eating raw cookie dough has put many people in the hospital.

The investigation of a 2009 multi-state outbreak of Shiga toxin-producing *Escherichia coli* (STEC), an important cause of bacterial gastrointestinal illness, led to a new culprit: Don't eat prepackaged cookie dough before it's baked.





Molecular Gastronomy

A new term, "Molecular Gastronomy" has been causing confusion for quite a few years. The term "Molecular Gastronomy" was coined in 1988 by late oxford physicist Nicholas Kurti and Herve' This. We all know that there are many branches of food science, all of which study and analyze different aspects of, from microbiology to preservation and even physics and chemistry. No formal name was given to the scientific studying of the process involved in regular cooking in kitchens such as yours and mine or in a restaurant, until the advent of molecular gastronomy. There are many tools and techniques that can be used to master the art of molecular gastronomy, such as:

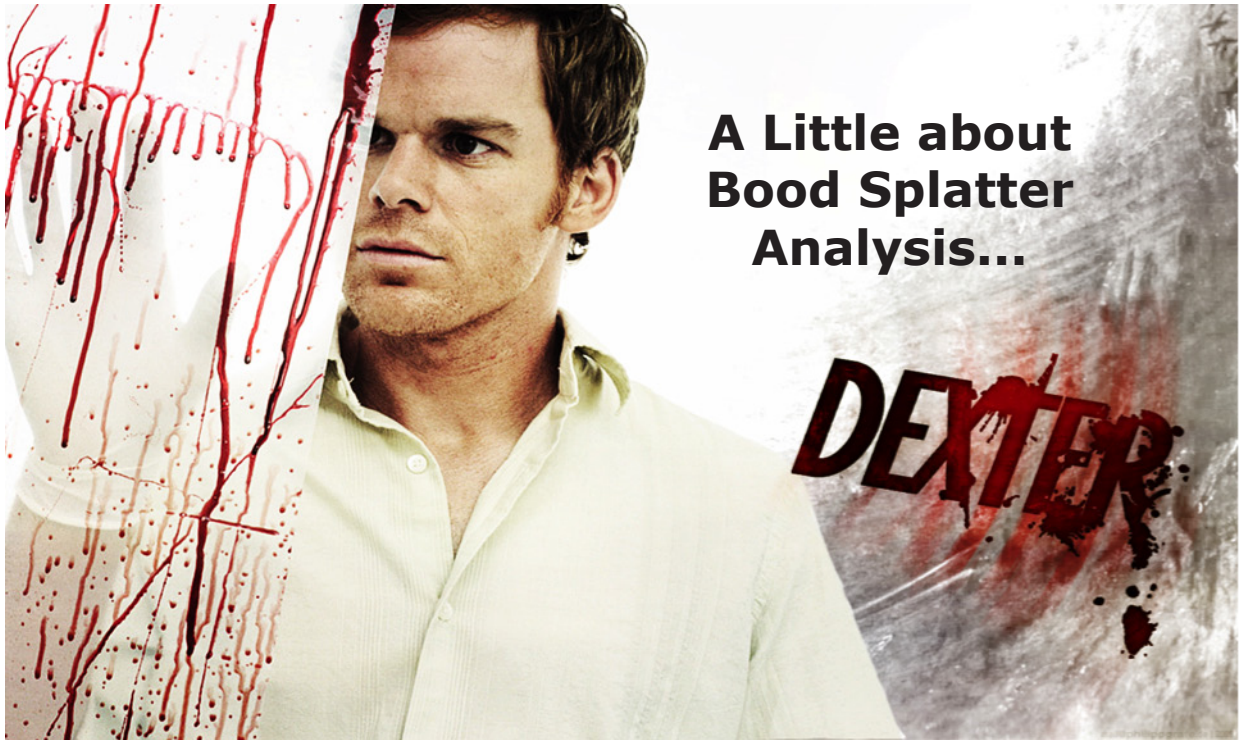
Liquid nitrogen - At a temperature of -321 degrees F (-196 degrees C), liquid nitrogen will flash freeze any food it touches. As it boils away, it gives off a dense nitrogen fog that can add atmosphere and drama to food preparation.

The Gastrovac. Manufactured by International Cooking Concepts, the Gastrovac is three tools in one: a Crock-pot, a vacuum pump and a heating plate. In its low-pressure, oxygen-free atmosphere, the Gastrovac cooks food faster at lower temperatures, which helps the food maintain its texture, colour and nutrients. Foams can also be made with an immersion blender.

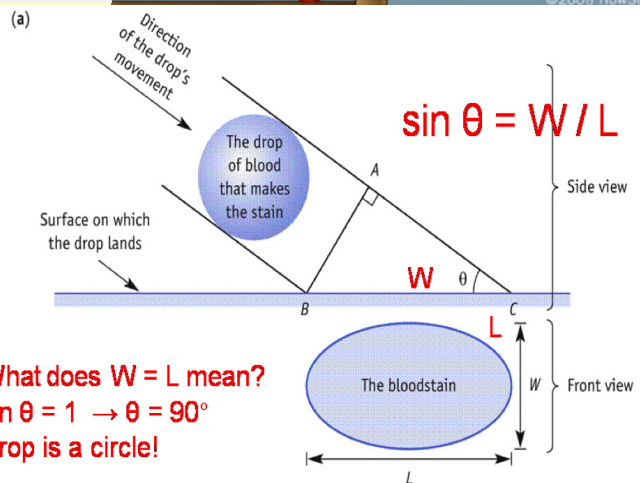
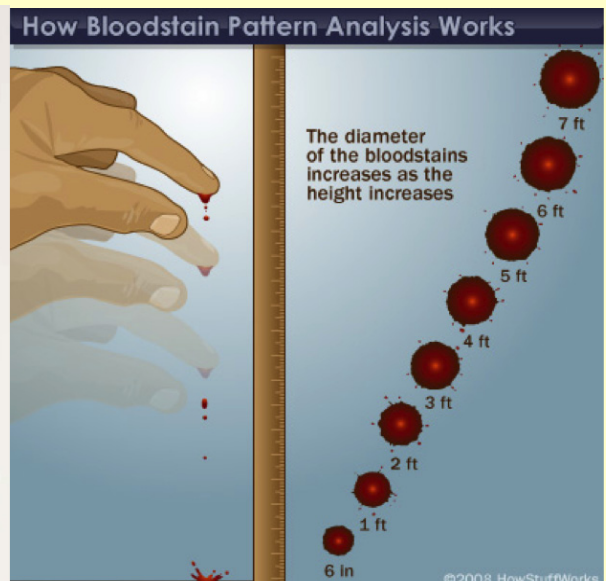


Carbon Dioxide is a source, for adding bubbles and making foams. Molecular gastronomy is a modern style of cooking, which is practiced by both scientists and food professionals in professional kitchens and labs and takes advantage of many technical innovations from the scientific disciplines. It is an art which combines science and food to create the perfect flavors, textures and colors. It also enables us to experiment with the two, as it involves many scientific principles. From the perfect French fry to liquid olives, molecular gastronomy lets are imagination run wild. It has provided a whole new dimension to the "Science of Food". It not only takes cooking, but also science to a whole new level, it opens the doors of experimentation not only for chefs but also for scientists.

Sanya Malhotra
XB



A Little about Blood Splatter Analysis...



What does $W = L$ mean?
 $\sin \theta = 1 \rightarrow \theta = 90^\circ$
 Drop is a circle!

Information from bloodstains obtainable by trigonometry



The Mystery of the Missing Fingerprints

In 2007, a Swiss woman in her late 20s had an unusually hard time crossing the U.S. border. Customs agents could not confirm her identity. The woman's passport picture matched her face just fine, but when the agents scanned her hands, they discovered something shocking: she had no fingerprints. The woman, it turns out, had an extremely rare condition known as Adermatoglyphia.

Peter Itin, a dermatologist at the University Hospital Basel in Switzerland, has dubbed it the "immigration delay disease" because sufferers have such a hard time entering foreign countries. In addition to smooth fingertips, they also produce less hand sweat than the average person. Yet scientists know very little about what causes the condition.

Since nine members of the woman's extended family also lacked fingerprints, Itin and his colleagues, including Eli Sprecher, a dermatologist at the Tel Aviv Sourasky Medical Center in Israel, suspected that the cause might be genetic. So they collected DNA from the family—one of only four ever documented with ADG—and compared the genomes of family members with ADG with those of members who had normal fingerprints. The researchers found differences in 17 regions that were close to genes. Then they sequen-

ced these genes, expecting to identify the culprit. But the researchers didn't find anything. At first, Sprecher suspected that either they had performed the genetic analysis incorrectly or the missing mutation was hiding in a noncoding or "junk" region of the genome. "Then came the trick," he says. When graduate student Janna Nousbeck sifted through online databases of rare DNA transcripts that came from the suspect regions, she noticed one very short sequence that overlapped with part of a gene called SMARCAD1. This gene seemed like a likely candidate for the mutation since it was only expressed in the skin.

Can You Lose Your Fingerprints?

A 62-year-old man from Singapore was traveling to the U.S. to see relatives last December and was detained after a routine fingerprint scan showed that he actually had none. So how did this happen?





The man, identified in a medical journal case report only as "Mr. S," had been on chemotherapy to keep his head and neck cancer in check. As it turns out, the drug, capecitabine (brand name, Xeloda) had given him a moderate case of something known as hand-foot syndrome (aka chemotherapy-induced acral erythema), which can cause swelling, pain and peeling on the palms and soles of the feet—and apparently, loss of fingerprints.

Mr. S's doctor, Eng-Huat Tan, a senior oncology consultant at the National Cancer Center in Singapore, described the incident in a letter published earlier this week in *Annals of Oncology* and recommended patients on that drug obtain letters from their doctors before traveling to the U.S.

Are all fingerprints truly unique?

Yes. It has to do with how the fingerprints form in the womb. During the first trimester, the fingerprints have already established their permanence and uniqueness.

Aside from forensics and travel, what else are fingerprint scans being used for these days?

More and more, fingerprints are being used in biometric devices to permit secure log-on, to open locks, and for access control in general. The biggest users of biometrics are corporate and private users,

but fingerprints also have a long history in the forensics world for criminal identification dating back over a century.

Are current scanners pretty reliable?

The exact rate of print rejection (those that can't be read) depends on the scanner. Ultrasound devices go beyond just the outer layer and capture part of the root system. On average, the rejection rate for fingerprints is about 1 to 2 percent.

The patient who was detained for lacking prints had hand-foot syndrome that was caused by his chemotherapy drug. What are some other ways that fingerprints can disappear?

The most prominent of those problems involve bricklayers- who wear down ridges on their prints handling heavy, rough materials frequently- or people who work with lime, because it's really basic and dissolves the top layers of the skin. The fingerprints tend to grow back over time. And surprisingly, secretaries, because they deal with paper all day. The constant handling of paper tends to wear down the ridge detail.

Also, the elasticity of skin decreases with age, so a lot of senior citizens have prints that that are difficult to capture. The ridges get thicker; the height between the top of the ridge and the bottom of the furrow gets narrow, so there's less prominence.



When the police finally caught up with him, Klutis went for his gun and the police returned fire, killing him. When they compared his postmortem fingerprints, police found that each of his prints had been cut by a knife, resulting in semicircular scars around each fingerprint. Although it was glorified in the media, it was an amateur job; the procedure left more than enough ridge detail to identify him.

Ishita Malhotra
VI C

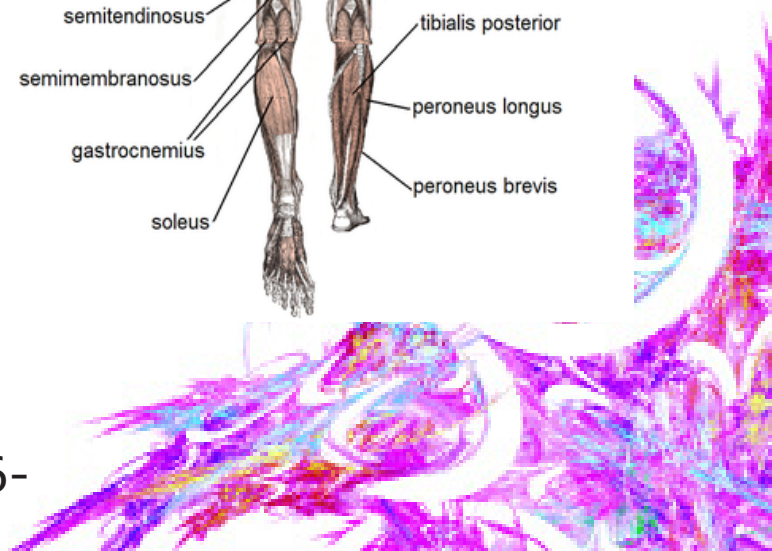
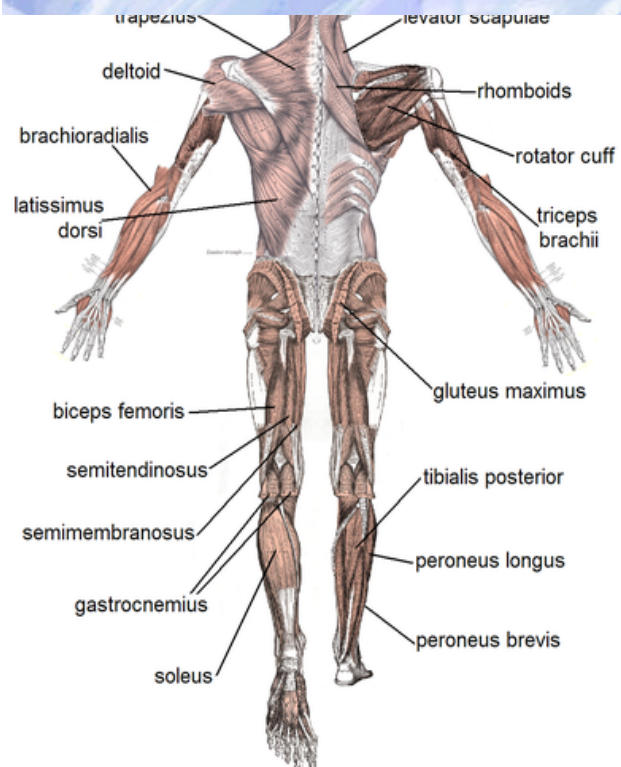
So if there's any pressure at all on the scanner, the print just tends to smear.

How have people intentionally changed or "disappeared" their fingerprints?

There are many documented cases of intentional fingerprint mutilation, but generally those involve pretty severe damage to the skin—more specifically between the generating layer, where the template of the fingerprint survives, and the upper layer, the epidermis.

Pretty much any cut or burn that goes deeper than the outer layer of the skin can affect the fingerprint pattern in a permanent way. But even with permanent scarring, the new scar becomes a unique aspect of that person's fingerprint.

The first case of documented fingerprint mutilation was in 1934, by Theodore "Handsome Jack" Klutis, who led a gang called the College Kidnappers.





MEDICAL NANOTECHNOLOGY

The word "nanotechnology" was introduced by Eric Drexler in his book "Engines of Creation" in 1986. It means something very specific: small precise machines built out of molecules, which could build more molecular machines and large efficient products.

Medical nanotechnology is a branch of nanotechnology which applies principles in this field to health care issues. Since nanotechnology operates on such a small scale, it is easier for scientists and doctors to operate with specific instruments. Nanotechnology in medicine involves applications of nanoparticles currently under development, as well as longer range research. The use of nanotechnology in the field of medicine could revolutionize the way we detect and treat damage to the human body and disease in the future.

Nanomedicine is the medical aspect or application of nanotechnology in which different approaches such as nanoelectronic biosensors, nonmaterial are used. Medical nanotechnology aims to provide cheaper yet good quality health and medical equipment, facilities, and treatment strategies. Though at first medical research and processes require very advanced and expensive equipment, once the equipment is fully developed,



nanotechnology will make its manufacturing both easier and cheaper. With just one laboratory test and technical computers, a detailed image of the body's system can be shown including the cause of the disease and its possible treatment. This will help to detect and prevent diseases easily.

The medical nanotechnology gives treatments to diseases which become easily curable; it gives a solution to almost every problem faced by the human body. I believe nanomedicine will change the lifestyle of the entire human population for the better.

Priyanka Bhagat
XA



C.I.D. is a series that airs on Sony Entertainment Television. It is about a team of detectives belonging to the Crime Investigation Department in Mumbai. The protagonist of the show is Shivaji Satam. C.I.D. is regarded as the longest running TV series in India.[1] ACP Pradyuman, Inspector Daya, Senior Inspector Abhijeet, Inspector Fredricks, Sub-Inspector Vivek, Sub-Inspector Nikhil, Sub-Inspector Kajal, Inspector Sachin, Dr Tarika and Dr Salunkhe are among the main characters. It is one of the leading forensic shows of India. Be sure to catch it some time on TV.





GYMNASTICS

Through Newton's eyes

The first time I watched a gymnast perform on the television, I was awestruck. I was amazed to see how a young girl who looked so small and delicate could gather the strength to pull off some of the most amazing maneuvers I had ever seen. It seemed nearly impossible to me back then, I never thought that one day I would be performing the same moves I thought were impossible.

Even then, as a gymnast, for a long time I didn't realize how much physics went into every motion, every back handspring, every mistake on the bars that I made. As a gymnast, I learnt the motions that were necessary to complete the tricks that I was working on, but I never truly understood why a particular angle gave me a better back handspring or why the angle that I hit a springboard at really mattered while completing the vault.

Thanks to Sir Isaac Newton, the physics of gymnastics can be broken down into simpler and hopefully, more manageable pieces. Here is a simplified explanation of Newton's three Laws of Motion and how they can be applied to gymnastics. Newton's first law of motion states that an object maintains its state of rest or uniform motion unless an external unbalanced force acts upon it. This means that an object at rest,

such as a gymnast, will stay at rest until another force (such as a swing on the high bar) gives it the force it needs to move.

The first law applies to gymnastics in some areas, particularly on the uneven bars. For example, on the bars when a gymnast performs a giant where she is doing complete revolutions around the high bar while keeping her body straight. In order to begin this skill she has to apply some force to get into the motion of the giant, generally, this is a big swing to get her body moving. Her body starts at rest and then the force is applied (the swing), and this gets her in motion. The gymnast gains enough momentum to keep swinging up and around the bar and she will then continue to do so until she applies another force to stop herself.

Newton's second law of motion states that the relationship between an object's mass m , its acceleration a and the applied force F is represented through the equation $F = ma$. Thus, the acceleration of an object depends on the force acting upon the object (directly) and the mass of the object (inversely). As the force acting upon the object increases, the speed of the object increases. Similarly, as the mass of the object increases the speed of the object decreases. This law of physics can be



seen constantly in gymnastics. You can look at it in comparison to a gymnast's mass (weight). If the gymnast has a very light mass she is able to accelerate at a faster rate as compared to a gymnast who has a greater mass even though they both might be applying the same amount of force. Let us take the example of the giant again. If the lighter gymnast is doing giants on the bar, she can reach a faster rotation as compared to the heavier gymnast who may be applying the same amount of force and is basically doing the same thing. The mass of the gymnast contributes to the overall performance of the gymnast on any apparatus, which is why eating disorders such as anorexia and bulimia are common to many gymnasts who are ready to subject themselves to such dangerous habits in order to reach the top. Newton's third law of motion states that for every action

there is an equal and opposite reaction. In gymnastics the third law applies in various ways. For example, as the gymnast performs her beam routine you will notice that she exerts lots of force onto the beam as she does leaps and flips across. The beam does not collapse or break because when she exerts a force down on it, it exerts an equal force back onto the gymnast. This is also the case on the vault. When the gymnast jumps on the springboard she exerts a certain amount of force in order to compress the board. This is the action force, then, as the board decompresses, it exerts a force up on the gymnast giving her momentum. This is the reaction force. Both the action force and reaction force are equal in strength but opposite in direction. This keeps the gymnast from going through the springboard. I have only barely scratched the surface of the different ways



in which physics can explain gymnastics; this is a great starting point though, and will hopefully, make watching those difficult moves seem a bit more reasonable.

Tejasvini Puri
XB

Further Evolution of Man

One of the most respected evolutionary biologists, Douglas J. Futuyma defined biological evolution as a change by saying that, "In the broadest sense, evolution is merely change, and so is all-pervasive; galaxies, languages, and political systems all evolve. Biological evolution ... is change in the properties of populations of organisms that transcend the lifetime of a single individual. The ontogeny of an individual is not considered evolution; individual organisms do not evolve. The changes in populations that are considered evolutionary are those that are inheritable via the genetic material from one generation to the next. Biological evolution may be slight or substantial; it embraces everything from slight changes in the proportion of different alleles within a population (such as those determining blood types) to the successive alterations that led from the earliest protoorganism to snails, bees, giraffes, and dandelions."

This means that evolution is a process that results in heritable changes in a population spread over many generations.

When asked about what future humans might look like, you may typically receive one of two answers.

The first stating, with no actual scientific proof, that humans will be big-brained with a high forehead and even higher intellect. The other suggests that humans will soon stop evolving physically—that technology will put an end to the brutal logic of natural selection and that evolution will be purely cultural. The big-brain vision has no real scientific basis. The fossil record of skull sizes over the past several thousand generations shows that our days of rapid increase in brain size are long over. Accordingly, most scientists a few years ago would have taken the view that human physical evolution has ceased. But DNA techniques, which probe genomes both present and past, have unleashed a revolution in studying evolution showing that the rate of human evolution may, if anything, have increased. In common with other organisms, humans underwent the most dramatic changes to the body shape when the species first appeared, but continue to show genetically induced changes to human physiology and perhaps behavior as well. Until fairly recently in our history, human races in various parts of the world were becoming



This means that evolution is a process that results in heritable changes in a population spread over many generations.

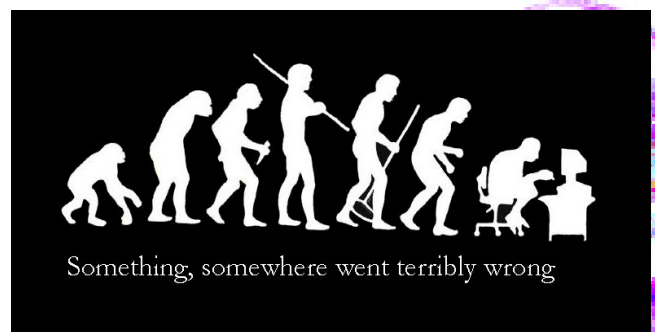
When asked about what future humans might look like, you may typically receive one of two answers.

The first stating, with no actual scientific proof, that humans will be big-brained with a high forehead and even higher intellect. The other suggests that humans will soon stop evolving physically—that technology will put an end to the brutal logic of natural selection and that evolution will be purely cultural. The big-brain vision has no real scientific basis. The fossil record of skull sizes over the past several thousand generations shows that our days of rapid increase in brain size are long over. Accordingly, most scientists a few years ago would have taken the view that human physical evolution has ceased. But DNA techniques, which probe genomes both present and past, have unleashed a revolution in studying evolution showing that the rate of human evolution may, if anything, have increased. In common with other organisms, humans underwent the most dramatic changes to the body shape when the species first appeared, but continue to show genetically induced changes to human physiology and perhaps behavior as well. Until fairly recently in our history, human races in various parts of the world were becoming

more, rather than less, distinct. Even today the conditions of modern life could be driving changes to genes for certain behavioral traits. Stuart Pimm, an expert on biodiversity at Duke University, agrees with the thought that the evolutionary trend may well be accelerating. "The big thing that people overlook when speculating about human evolution is that the raw matter for evolution is variation," he said. "We are going to lose that variability very quickly, and the reason is not quite a genetic argument, but it's close. At the moment we humans speak something on the order of 6,500 languages. If we look at the number of languages we will likely pass on to our children, that number is 600."

"The genetic variability that we have protects us against suffering from massive harm when some bug comes along," Pimm said. "This idea of breeding the super-race (termed the 'Unihuman'), like breeding the super-race of corn or rice or whatever — the long-term consequences of that could be quite scary."

Pia Kochar
XA



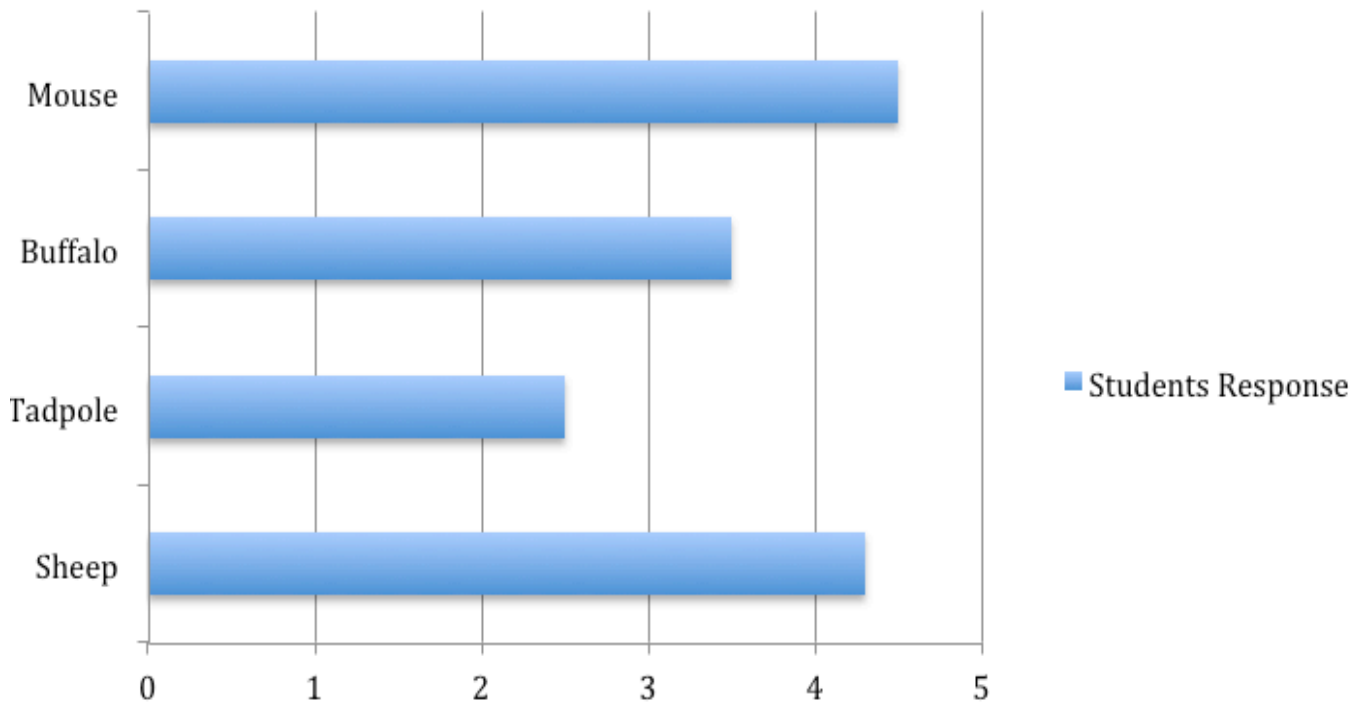


Ask the Students!



What was the first animal to be cloned?

Students Response



The first cloned animal was a tiny tadpole in 1952 by Robert Briggs and Thomas King. They used cells from a tadpole embryo to create identical ones. None of these tadpoles survived to reach adulthood.

The END.

"It's not the pace of life that concerns me. It's the sudden stop at the end." -Charles Darwin



Solar Flare or Despair?

The "Apocalypse" is considered to be the end of the world, as we know it. It is said to be the ultimate revelation, or, Biblically, it is said to be Judgement day. Scientifically, it is not a definite concept, but an abstract idea and estimation of a period during which the earth will come to its definite or indefinite end.

Over the past few years, NASA have predicted that a solar flare, which is the sudden and extreme brightening of the sun, resulting in excessive release of energy (about 6×10^{25} joules of energy per second). The solar flare will result in emission of clouds of photonic ions, electrons and atoms into space, which will reach the earth two days after the flare. Unfortunately, this solar flare is estimated to take place in 2012, and its magnitude, which is a somewhat empirical quantity, will be large enough to cause mass destruction on earth.

Every 11 years, the sun completes a cycle known as the Solar Maximum. During this cycle, the magnetic lines of the solar field are facilitated around the solar body by differential rotation. The equator at this point, spins faster than the magnetic poles and this rapid rotation of the equator results in energy build up, which causes the large photonic emissions of ions, atoms, electrons mentioned earlier. After it completes this cycle,

it reaches its 'peak', which results in the sun's magnetism undergoing polarity changes.

However, it is not like the earth has no defence mechanism. The Earth has evolved in a highly radioactive environment. The Sun constantly fires high-energy particles from its magnetically dominated surface as the solar wind. It consists of a magnetosphere around it, which helps block most of these harmful solar winds from harming the earth. But, despite this, there is still potential for mass destruction.

The magnetosphere has been deteriorating and its reach has shortened. Hence its ability to protect the earth has weakened. Along with this, another problem being faced is that the intensity of the flare is estimated to be 30% to 50% stronger than the one in 1859.

So, how will this affect the average earthling?





The worst case scenario highlights the solar particles boosting the gravitational pull of the earth which might result in satellites crashing. Long distance communication, television and internet might completely crash. Infrastructural facilities such as crashing of power grids, access to potable water and homelessness for about 150 million people in the United States alone are some of the chaos caused by this solar magma. Some also believe that solar storms could result in magnetic poles of the earth to reverse, causing widespread geological turmoil.

So the question that remains is... were the Mayans right? Could it have been that even during the most primitive and substantial era, the Mayans tallied the dates of the solar cycle, and predicted the end?

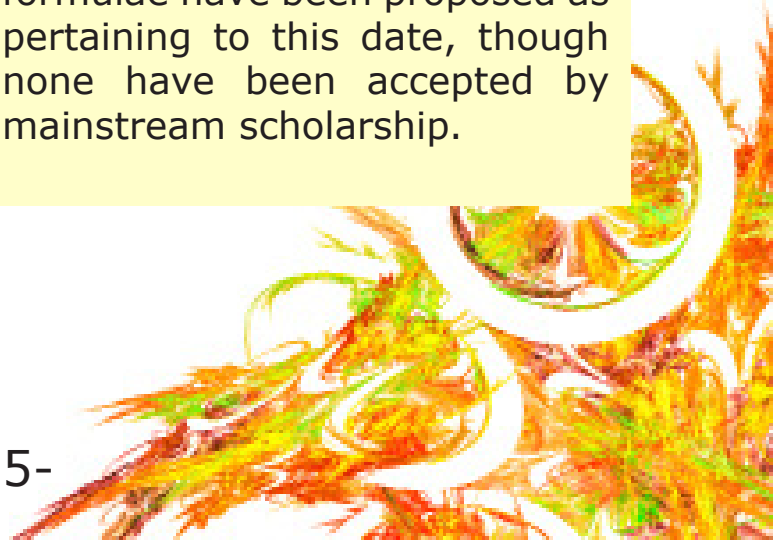
Will this be a mere mass, but temporary global destruction? Or a definite end to that of the world as we know it?

Sharanya Thakur
XB

The END of the Mayan Calendar



The 2012 phenomenon comprises a range of eschatological beliefs according to which cataclysmic or transformative events will occur on December 21, 2012. This date is regarded as the end-date of a 5,125-year-long cycle in the Mesoamerican Long Count calendar. Various astronomical alignments and numerological formulae have been proposed as pertaining to this date, though none have been accepted by mainstream scholarship.





2012: Will the World Really End?

December 21st 2012, fire pours down from the sky. Oceans reap up and swallow the land. Continents rip themselves apart. Mother Nature turned executioner. This is when and how the world will end, if you believe in prophecies. If you listen to all of these threats, the earth has a big bulls eye on it and any number of darts are about to hit us around 2012, the question is, is any of that really going to happen? What are 2012's most plausible planetary disasters? And is the end of life on earth, lurking just around the corner?

On Friday, December 21, 2012, the sun will rise like it does every other day, but, on this solstice; it will align itself right between the earth and the center of our galaxy. Welcome to the end of the world.

By the end of the day, the world will be blanketed in ash, once busy city streets will churn with rivers of lava, massive earthquakes would have brought tall cities crashing to the ground, and enormous oceans waves will be rushing in to wash us away. This is just one version of an apocalypse that some expect to see in our lifetimes.

Why are so many convinced that the end of the world won't happen randomly, but precisely on December 21st 2012?

This date is considered to be really important for these doomsday scenarios because the Mayan Calendar runs out on December 21st 2012.





Their very first calendar was about the human cycle, the first cycle that they could observe was from conception to birth. It's a count of 260 days. Eventually, they started farming, and they tracked the sun through its 365 days. Other cycles yielded even more calendars. The Long Count; one of their longest calendars, tracks a period of 5126 years. Experts believe that the current Long Count probably began in 3114 B.C. and will end on the solstice, December 21st, 2012.

Some say that this will coincide with the sun dramatically eclipsing the center of the Milky Way. When it does, they say we will be cut off from the vital cosmic energy emanating by the black hole believed to be our galaxy's beating heart.

Some believe the life on earth will be thrown into upheaval or wiped away entirely, others disagree. They say there is no any kind of energy that can be blocked from our galaxy. In fact the actual perfect alignment had happened in 1998 and the world didn't be end, so there is on any particular reason that can be making us to believe that the alignment in 2012 will bring any destruction.

But that doesn't mean that when December 21st 2012 rolls around, that you expect to casually go about your last minute holiday shopping. Every 11 years, the sun reaches the maximum level of activity, and it can averagely fire off 2 or 3 Solar Flares every single

day, and the end of 2012 is expected to be getting itself ready to enter the next solar maximum, and unfortunately even our scientists are not sure what is the next Solar Flare will be like, it may gave us some surprises in 2012.

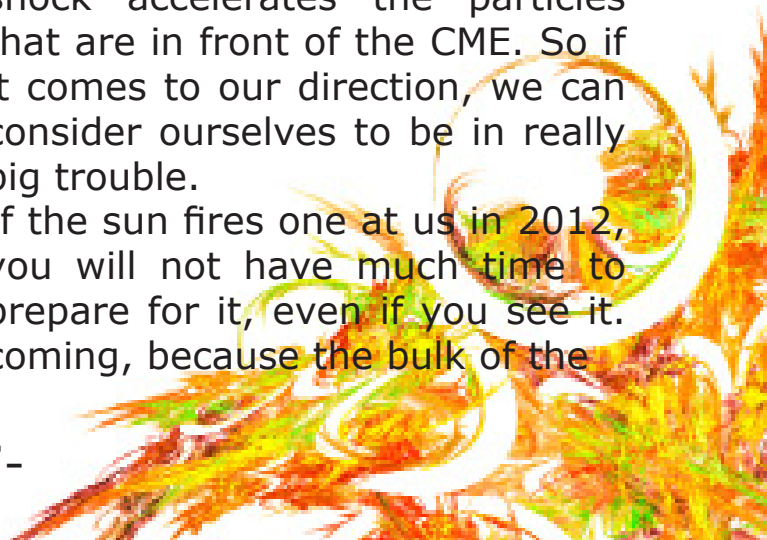
So what is going to happen if it does gave us some surprises in 2012? The consequences could be much more far than any disasters that had happened to us.

The Solar Flares are massive explosions of great energy, and it is like millions of hydrogen bombs explode all at same time, but as powerful these explosions of radiation are, it is sometimes just the beginning of a solar temper-tantrum.

After that, there also is material that is rushing out from the sun is called 'Coronal Mass Ejections'. It will be pushed away with billions of billions of ton hot gas, and it travels at speeds of a millions or so miles per hour.

The environment around the sun is filled with the Solar wind that the particles of the sun's atmosphere that are streaming away, then the CME (Coronal Mass Ejections) goes into this material and creates a shock wave, and the shock accelerates the particles that are in front of the CME. So if it comes to our direction, we can consider ourselves to be in really big trouble.

If the sun fires one at us in 2012, you will not have much time to prepare for it, even if you see it. coming, because the bulk of the





CME will reach us in just a few days, their speed is almost reaching to the speed of light.

So what will happen when the particles reach earth?

Firstly, the shock wave of energized particles will slam into our satellites orbit, shorting out their electronics. The consequences will be much worse than losing your satellite television.

Planes that were looking to come in for landing might suddenly realize that their GPS has stopped working. At the wrong time, that could cost people their lives. But losing the satellite network could be just a beginning of the real bad day. Once the shock wave has been passed, the bulk of CME will crash into the earth's magnetic field.

The Earth's Magnetic field is a kind of power that shields us from the CME's attacking.

This natural barrier normally prevents the charged particles from reaching the surface by deflecting them around the earth, but as the CME is big enough, our planetary protection could come at a high cost. When charged particles from

solar storm hit the earth's magnetosphere, they can become trapped in this field. We can see this phenomenon as aurora, or northern lights, but if you see nature's light show in your neighborhood, it could be a warning sign of eminent catastrophe.

If the charged particles are too strong, that even the magnetosphere can't handle them, it causes a shift in our magnetic field, and that, in turn, will cause electric currents on the ground, and these currents can cause power fluctuations, and transformers to be shorted out. This would bring down the power grid and cause blackouts. But this won't be any minor temporary power outage. The power lines in every country are much more interconnected than they used to be. So if we have been hit by a solar blast that powerful enough, cascading failures in power system could fry the electric grid the world over. Rolling blackouts could sweep over entire continents. People might say "I've survived blackouts before, and I can do it again", but this will be different. According to a recent report issued by the National Academy of Sciences, full recovery could take 4 to 10 years. If entire countries fall victim to an unrecoverable blackout, the consequences could be devastating. If you find that a solar storm that struck in the dead of winter, people could suddenly find themselves freezing to death. Modern civilization could be hurled back



, and the result could be anarchy. But actually it only gets worse from here. As our magnetic field shifts, it causes our land to move too, causing great landmasses to collide. As they crash, earthquakes, volcanic eruptions, tsunamis, and Lava Rivers would come for us, wiping us out.

But that doesn't mean humanity has to just sit around and wait for the sun to char and blister the world that we created. But still, everything mentioned are just the predictions from our scientists, and the likelihood of these happening in 2012 are really low and with further research and greater studies, chances of these catastrophes might even go lower. So quit your job and blow your life savings on one last wild party just yet. Scientists seem to agree that you have the same odds of seeing the world end tomorrow or on any other day as on December 21st 2012. But the experts could be wrong. And if the doomsday pro-

phets are proven right the living may envy the dead in 2013, and as the world comes to an end, there will be no denying this one simple truth, WE WERE WARNED.....

Akshat Singh Arora
&
Abhinav Rai

But you never know...



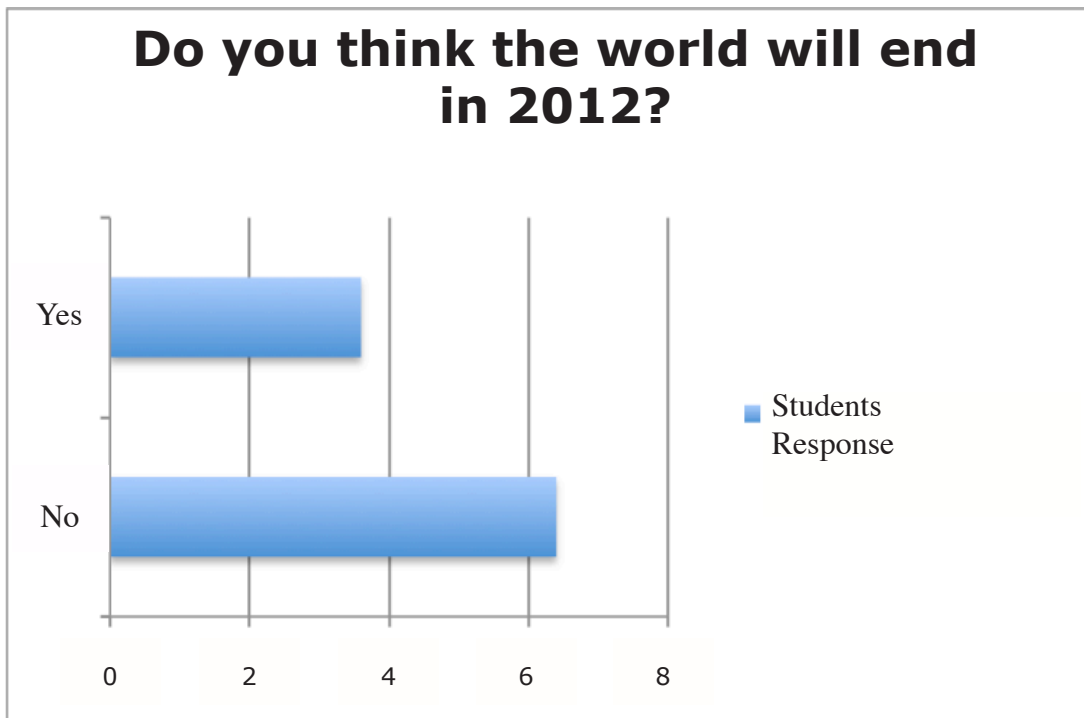
Would you imagine some fool confusing the end of this calendar with the end of the world?



Do you think the world will end in 2012?



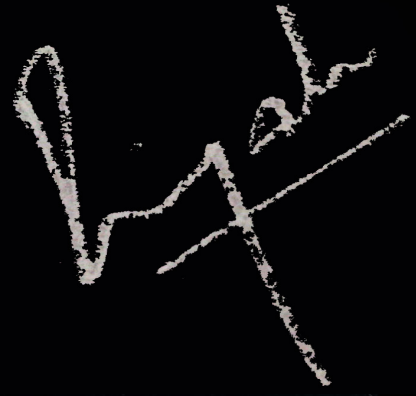
At last, the mystery of the Mayan calendar revealed.



We'll find out soon enough...

The Science Magazine Editorial Board

Abhinav Rai



Ashna

Akshat Singh Arora

Veer Gupta

Darshini

Mehak

Shriya Gupta

Gauri

Tushar B

2012





