

this issue

EMINENT SCIENTISTS VISIT IISER PUNE

IISER Pune saw a number of renowned personalities last month. We had visits by a physics Nobel laureate, a chemistry Nobel Laureate, an Abel Prize winner, a world famous physicist and a renowned neuroscientist. Their talks and interaction motivated and excited the students as well as the faculty.

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VENKATRAMAN RAMAKRISHNAN

Structural Biologist,
2009 Nobel Prize in Chemistry

Dr. Venkatraman Ramakrishnan is a structural biologist well known for his work on uncovering the structure and function of ribosome and macromolecular crystallography. He is also known for his work on the structure of the histone and chromatin.

His is a remarkable case where he transitioned from theoretical physics to biology and ended up winning the Nobel Prize in Chemistry in 2009 with Thomas A. Steitz and Ada E. Yonath "for studies of the structure and function of the ribosome".

He currently works in the Structural Studies Division of the MRC (Medical Research Council) Laboratory of Molecular Biology in Cambridge, England.

He visited IISER Pune for a short duration on the 18th of December last year. A special session was organized where he interacted with undergraduate as well as Ph.D. students of IISER Pune.

He also gave a lecture in NCL on the same day on 'The structural basis of tRNA selection by the ribosome' organized jointly by IISER Pune and NCL along with The Reliance LEAP (Leading Experts Access Programme).



SIR ROGER PENROSE

Mathematical physicist,
1988 Wolf Prize in Physics

Professor Roger Penrose, is a prominent mathematical physicist of our time. He has made great contributions to the fields of General Relativity and Cosmology. Moreover, as a recreational philosopher, he has also discussed physics and consciousness.

He has contributed a lot to science and has been honoured on numerous occasions. Some of the notable awards he has received are- The Eddington Medal (1975), the Wolf Prize (1988), the Dirac Medal (1989) and the Copley Medal (2008).

He is currently the *Emeritus* Rouse Ball Professor of Mathematics at the Mathematical Institute, University of Oxford and Emeritus Fellow of Wadham College.

He visited IISER Pune for 3 days from the 24th to the 26th of December 2010. He gave a public lecture at IUCAA on 24th December titled 'Seeing through the Big Bang into another World' followed by a lecture at IISER Pune on the same topic on 25th December.

On the 26th of December, he interacted with students for about 2 hours, which indeed was inspiring for all the students.



SRS VARADHAN

Renowned mathematician,
2007 Abel Prize winner

Professor SRS Varadhan is a renowned mathematician. He is a Fellow of the Royal Society and has won many awards for his work in Probability Theory.

He did his undergraduate studies at Presidency College, Madras and obtained his doctorate from the Indian Statistical Institute under the guidance of C R Rao in 1963.

He is known for his work with Daniel W Stroock on diffusion processes and for his work on large deviations with M. D. Donsker.

Some of the notable awards conferred upon him are: The Birkhoff prize in 1994, the Steele Prize in 1996 with Daniel W Stroock, the Abel Prize in 2007 for his work on large deviations, Fellow of Royal Society of London in 1998. The government of India honoured him in 2008 with a Padma Bhushan.

He is currently Professor, Mathematics Department at the prestigious Courant Institute of Mathematical Sciences at New York University.

He gave a seminar in IISER Pune titled 'Entropy, relative entropy and the study of rare events' on 4th January 2011. He also had an interaction session with the students on the same day.



SIR ANTHONY JAMES LEGGETT

Professor of Physics,
2003 Nobel Prize in Physics

Sir Anthony James Leggett visited IISER Pune among various other institutes during his 20 day long visit to India from 6th January 2011 to 1st February 2011.

He gave a public lecture at IUCAA on 12th January 2011 on the topic 'Why can't time run backwards?' followed by a talk in NCL on 13th January 2011, as a part of NCL Foundation Day on 'What can we do with a Quantum Liquid?'

He also attended a function in HR4 and talked about his life with students and faculty. He also gave away the prizes for academic excellence for Fall 2010 and Spring 2010. It was really a unique experience for the students.

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A chat with
Sir Anthony James Leggett

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MRIGANKA SUR

Neuroscientist,
Fellow of the Royal Society

Professor Mriganka Sur is a Fellow of the Royal Society and the Newton Professor & Head, Department of Brain and Cognitive Sciences, Massachusetts Institute of Technology, USA. His laboratory is renowned for its work on Neuroscience. Using experimental and theoretical approaches, it studies developmental plasticity and the dynamic changes in mature cortical networks during information processing, learning and memory.

He is a regular visitor to IISER Pune. He gave a special seminar to students and faculty on the 17th of January 2011 at 3 pm in HR4 on 'Brain Wiring and Brain Disorders'. The talk was thoroughly enjoyed by the audience.

Academic Buzz AVANI

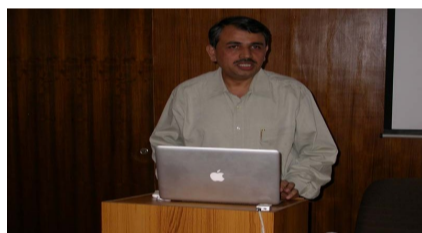
1. Laser Interferometer Gravitational Wave Observatory (LIGO) undergraduate summer programme. Last date for application:- 16th February 2011
Website:- www.ligo.caltech.edu/LIGO_web/students/undergrads.html

2. Centre for Astrophysics and Supercomputing (CAS) vacation research programme- For those interested in Astrophysics. For more details check website
Website:- astronomy.swin.edu.au/study/vacstudents.html

3. Ravi Sankaran Fellowship- For those interested in Ecology and Conservation
Website:- www.ravisankaran.org

4. Conference on Advances in Energy Research organized by ICAER.
Website:- www.ese.iitb.ac.in/~icaer2011/index.html

DR. L S SHASHIDHARA AWARDED
JC BOSE FELLOWSHIP



Dr. L S Shashidhara added another feather to his cap when he was awarded the prestigious J.C. Bose Fellowship of the Department of Science and Technology given to active scientists and engineers for their outstanding performance and contributions. The J.C. Bose National Fellowships are meant to recognize active, performing scientists and engineers in the country who are below the age of 60 years. .

A Chat With Sir Anthony James Leggett

For those of you, wannabe physicists, who sometimes think, "Oh! I should have paid more attention to high school mathematics. I can't learn all this advanced maths in such a short time!" Here's something that will give you a mental boost. I have recently had the privilege to interview Sir Anthony James Leggett, a theoretical physicist who shared the Nobel Prize in Physics for his pioneering work in He³ Superconductivity. You will be delighted to know that Sir Leggett has had no formal training in mathematics. He graduated in Classics (consists of subjects like philosophy) first and then he graduated for a second time in Physics. His autobiography is very fascinating indeed. You can look it up on <http://nobelprize.org>

Here are a few excerpts from the interview that will appear in whole in Kalpa.

Some of the interesting things that he said was how his course in philosophy

What's New In The Comp Lab

As many of you would have noticed, most of the computers in our computer lab are now running the latest Ubuntu (10.10). Along with that, we now have a new file server of 10TB capacity, and a lot of new software has been installed. Ouch! I sound like the annual report at some meeting. OK - what does this mean for us poor souls who depend on the lab for our computation, browsing and word processing?

First up, one bit of bad news - the panels (the bars on the top and the bottom) don't display properly in Ubuntu without some tweaking on your part. This is because they were configured by Red Hat 5 which was running a much (, much, much) older version of the software responsible for that. Hence the instructions in your home directory for displaying your panels sound medieval (Brutus: "I am not gamesome: I do lack some part. Of that quick spirit that is in Antony...") to the current panel software. To fix that, just remove the old configurations (.gnome2 and .gconf in your home) and your panels should

display right happily ever after - the details should have been sent to you by mail.

The good? Well there is a long list... First of all, the clients and the server are now using a more appropriate network file system, so no long waits while Firefox loads and OpenOffice.org doesn't crash left, right and centre or at least not as often. Both the browser and the Office suite are now running recent versions and that means a lot more cool features. There's a lot of other new software - the R statistical package, the PiTiVi video editor and so on. In this column, we hope to review software and discuss tips and tricks to making computer use more fun.

Geany: A light weight editor licensed under GPL - a wonderful little integrated development environment (IDE) true to its name. For those of you who are used to the interface of software like MATLAB and TurboC, this will be a relief from using gedit and the terminal. This sweet little package has many crea-

ture comforts for programming like auto indentation - automatic insertion of the right number of white spaces in the start of a line (makes Python so much easier); code folding - don't want to see the whole code of three nested loops and their if statements? Click on the little minus and hide them all in a single line till you need them; comment toggle - want to (un)comment a whole set of code? Select it and press Ctrl+E. These are just the features of the editor that I use most often. There are side panes where you can see the variables and functions, switch between documents and even an integrated terminal that you can use check your code. A thing that I assume a lot of people are not going to be able to get enough of is the ability to run code without using the terminal - press F5 and *voilà!* A new terminal opens running your code - nifty, though I still prefer using `./program` on the terminal.

To run: Geany from the terminal, Applications->Programming->Geany from the menu, or Right-click->Open with-

K P Mohanan Joins IISER Pune

IISER Pune took a big stride towards its goal to combine Natural and Social Sciences as Professor KP Mohanan, earlier a Professor at the Department of English Language and Literature, National University of Singapore joined IISER Pune from January 2011 as a Professor at The Centre for Integrative Studies (CIS). It has given rise to a whole new department at IISER Pune viz. linguistics, a subject that defies classification into either social studies or science, but in reality incorporates elements from both of them. It aims at integrating all the basic sciences



as well as the social sciences which is the desired goal of the IISER model of education.

Currently Prof. Mohanan is coordinating

a course for the 2nd year students, named 'Investigating the past' which aims at reconstructing the Physical, Biological as well as Human past using the evidence we have at the present day.

He is also coordinating a course for the 1st year students named 'Scientific Inquiry through Language Structure' which seeks to explain the seemingly obvious things.

To know more about him and his research visit-<http://courses.nus.edu.sg/course/ellkpmoh/>

SHREYA RAY

actually helped him develop his... err... 'Nobel-Prize-winning' attitude; he said, "Philosophers by their nature are sceptical people. It is their business to query what everyone else takes for granted. So having had that experience, I do tend to query what everybody else takes for granted."

Hmm...perhaps we must pay some more attention to our HSS classes.

He also had some advice for those of us who often contemplate on the eternal conflict between ambition and love, with respect to a scientific career of course. "It was this long period in the history of the subject when the foundation of physics was just not a fashionable subject. Anyone who wanted to do it would do it in his spare time. A number of my colleagues who are now very distinguished experts in this area looked at the situation and said, "Okay, I am just not going to go to a major research

university where they would demand that I get grants all the time. I would rather go to a liberal arts college." And I found quite a few people in this category and they have all been very successful and they have done what they wanted to do..."

Sometimes in life, other people make decisions for us. Or, at least, tilt the balance. Put away the ego. Follow your instincts- even if you have to take the bait. You might never regret it. "I went across and had a really nice time. They showed me everything that was going on, and conceivably, things that I would be interested in, the Physics department oddly enough. In retrospect, they didn't think of showing me things happening in the other departments, which I might be interested in (laughs)... It certainly made a favourable impression..."

"...and my first reaction is, "No way, my good man. I am Sussex. I am good here. I am settled here"... I wasn't entirely

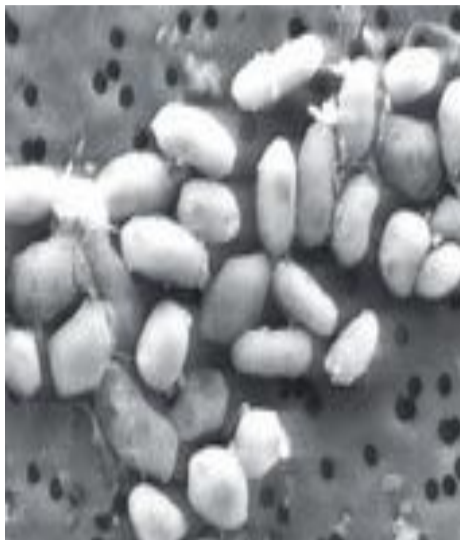
sure that I wanted to go. But one thing I knew for certain was that: if I do not go, and if I stay in Sussex, I would be so unsettled by the mere prospect of thinking about it that I would certainly want to be somewhere else in the next ten years and the odds of getting a job anything like that is almost zero..."

On a final note, he spoke about the future hotspots of Physics. "I suspect that in the next few decades, some of the most important applications of Physics are not going to be within what we traditionally regarded as the domain of Physics. I suspect that there may be very important applications of basic physical principles, for example, in neurophysiology...within what has been traditionally defined as the domain of physics, the area where I would regard as most probable for major revolution would be cosmology."

Arsenic Based DNA: A breakthrough

MONTU PATAR & APARNA

Life must be sweet, truth must be beautiful and "DNA must be made up of phosphorus". This has been man's understanding for a long time.



http://images.nationalgeographic.com/wpf/media-live/photos/000/297/cache/arsenic-microbes-life-detail_29774_200x150.jpg

But know what? ... NASA astrobiologist, Dr. Felisa Wolfe-Simon has got some sensational news to share with us which is going to change our perception of life, right away!!

Scientists have discovered the first organism to thrive using arsenic instead of phosphorus as one of its basic components of its DNA. This happened in California's Mono Lake, a super-salty, alkaline, arsenic-rich body of water which would be toxic to anything alive (at least that was what we thought till now!). It's called strain GFAJ-1, a member of a

common group of bacteria- gamma-proteobacteria.

Life, as we know it, is built with the fundamental elements viz. C, N, O, H, S and P. Specifically, phosphorus is vital for metabolism because it is linked with life's fundamental fuel- ATP. It also plays a very important role in the formation of phospholipids, which make cell walls and bones. On the other hand, arsenic, which shares the same group of the periodic table as phosphorus, is toxic and is comparatively more reactive than phosphorus.

This discovery expands the definition of life!! All this time we have been looking for some "weird" life forms on some unknown worlds when our own Nature chose to try arsenic in the place of phosphorus. This discovery has opened up new frontiers for research not only in cellular biology but also in our search for extraterrestrial intelligence!!

So, here we are- another paradigm shatters, some old questions hurl again, nagging doubts resurface...

...and the kindling fire of wonder lights up a new path!!

Suggested web links and references:-
1. www.gizmodo.com/5704158/nasa-finds-new-life
2. www.physorg.com/news/2010-12-nasa-discovery-element-life.html

A Bubble Called "The Bank"

AVANI

"Show me the money!" shouted Jerry Maguire (Tom Cruise) to his half naked, beer gurgling, football star. "Show me the money!"

An intrinsic part of life is interaction – give and take. The barter system has existed since the dawn of time. Goats were traded for grain; fish were traded for cows and so on, the cycle never ended. However, as cows and goats became rather inconvenient to stuff in wallets and purses, banking came into being.

The tall tale of banking begins like most of others. Once upon a time, there was a goldsmith (the Irish prefer to call him a Leprechaun but I will not delve into that right now). People swarmed to him to store their valuable gold for which he charged a small fee. Over time the goldsmith had pots of gold sitting pretty, gathering dust in his backyard. To exploit the gold for the betterment of man and country (or so he

tion of the money he issued notes for, but, people being what they are – cautious and apprehensive – reveling in the archaic 'save the money for the rainy day' philosophy never asked for the all their gold, all at once. The rains never came. Everyone was happy...

Even after his perfidy was discovered, such was man's greed for money, the goldsmith was allowed - also encouraged to continue as a banker, albeit with a few restrictions. And lo! The principles of modern banking were laid.

The fractional reserve banking system, on which all banks are based, says that the bank must have a small

Banks just do not transfer money, they conjure it out of thin air

justified), he started loaning out notes (coins of bronze and copper) - its value dependent on the gold in his bonnet - to the 'needy' and 'desperate', gathering new pots of gold as interest. As people became more ambitious, their businesses grew, and so did their pangs for higher capital. Outrageous loans were soon being borrowed from the goldsmith, now a Demigod, who minted money like no other. Truth be told, the goldsmith was a clever thief who barely had a small frac-

fraction of money that it loans out. As it goes, they do not need to have all the money, they just need to make people believe that they have it. Credit is the keystone on which this enterprise is built. And in the rare event that all the customers actually demand their money all at once (generally in the case of a mass panic), the bubble bursts, leading to a rare and a dramatic event like the collapse of a bank. Otherwise, life goes on, happy and gay. Banks just do not transfer

Technology Focus

Intel's latest Sandy Bridge Processors

SANDESH



Desktops as well as laptops available with the latest Core chips of Intel will be rolled out early next year. At the Intel Developer Forum, Intel is going to reveal all improvements in its next-generation Sandy Bridge micro architecture. Sandy Bridge is the codename for the processor micro architecture developed by Intel as the successor to Nehalem- which includes the present reigning processors such as i3,i5 and i7.

Development began in 2005. Sandy Bridge uses 32 nm manufacturing process as opposed to its previous 45 nm processing. This means a huge leap in performance even with existing chip architecture. It is set to be announced on 5th January during Consumer Electronics Show 2011, after which the first batch of mainstream processors will be launched.

With the help of new Core chips, laptops will get higher levels of power efficiency. According to principal analyst at Insight, Nathan Brookwood, the Sandy Bridge micro architecture is regarded as a technological tour-de-force.

With the new architecture consumers will be able to upgrade their PCs that are few years old. Processing cores might feature Hyper-threading and Turbo Boost Technology depending on market segment, as with current Core i-series. It will also feature an integrated graphics core running at 650 MHz to 850 MHz. With Turbo Boost Technology enabled, it can achieve up to 1350 MHz clock speed.

Also the processors graphic capabilities seem to be the first step by Intel in response to AMD's Bulldozer: a unified chip with all the features of Graphics card, Video card and sound card in it. Moreover, it would be interesting to see if graphics improvements of Sandy Bridge disrupt the growing shipments of discrete graphics cards.

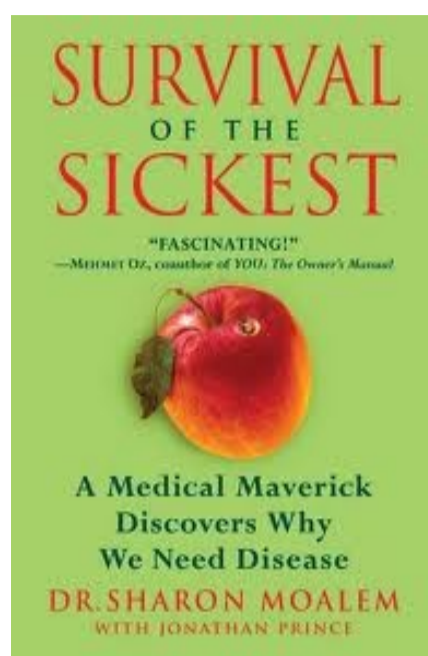
Sandy Bridge processors are expected to be followed by Ivy bridge series of processors. Ivy Bridge is the codename given to the 22 nm die shrink of the Sandy Bridge architecture. According to the keynote speech presented by Paul Otellini during the 2010 Intel Developer Forum, Ivy Bridge processors may be introduced as early as the second half of 2011. However, it now seems more likely that Ivy Bridge will be launched a year after Sandy Bridge, probably during CES 2012.



money; they conjure it out of thin air. No wonder running a bank is such a profitable business! Who says there is no honour among thieves?

Credits:-For those more interested can have a look at the video series named 'Money as Debt'.

Survival of the Sickest



An enchanting read for everyone who has an interest in biology, medicine or evolution. Dr. Moalem looks at evolution in a refreshing new light; He studies how diseases have evolved and how some of them may, ironically, ensure longevity!! And hence the title. He uses a smart, witty, humorous medium and the chapters are titled in Pun and light humor like "Hey, Bud! Can you do me a

fava?" and even "Why your iPod must die". He goes on to explain how ageing must be a natural preventive measure against cancer. The elegant blending of real-life characters, hard core molecular biology and the history of diseases all put in a clear, an informal, and a jargon-free language keeps you flipping. It is a welcome change from the formal and technical style of scientific writing. The theory of genes being switched on and off with the environment leading to a kind of Lamarckian evolution i.e. passing on of traits acquired during the lifetime of an individual is particularly intriguing! As the book unwinds, the reader comes across several controversial and bold theories which make this book a thought-provoking read for any aspiring scientist.

A Marvellous "Feet"

Very few men dare to come through the troubled waters, all by themselves, when once torn apart by the vagaries of time. Mafikul Islam is one such strong head from this minority.

A class VIII dropout, Mafikul (27), from West Bengal's Murshidabad district, earned around fifty rupees a day repairing bikes and taking up welding jobs. On a late evening of March 22 (2007), he kept awake for his chores at his workshop near NH-34.

While working over an oil leak of a truck, he misjudged the absence of petrol in the tank. This one slip of watchfulness, and his cherished dreams of his entire family (including his



younger brother (13) and sister (16)) were thrown asunder! In a trice, as soon as he put the welding equipment to the tank, there was a massive explosion; which finally resulted in the loss of his right leg. The moment he got to his senses and took a feel of reality in the hospital, he found himself completely at sea - trying aimlessly to grapple with his nagging anguish. "I didn't know how I would lead a normal life."

Now, a normal artificial foot (Jaipur foot) costs around one lakh rupees. This costly prosthesis was beyond his means, and thus his monetary insufficiency forced his family to look for newer means of livelihood; and surely, an early shift of responsibilities in his family. But

this lad had something else rather than a meek acceptance of ordained destiny. Soon, he began to closely observe his left leg - how it functions, how well-coordinated the whole mechanism is, and how in effect this beautiful piece of (nature's) engineering went unnoticed for all these years of life.

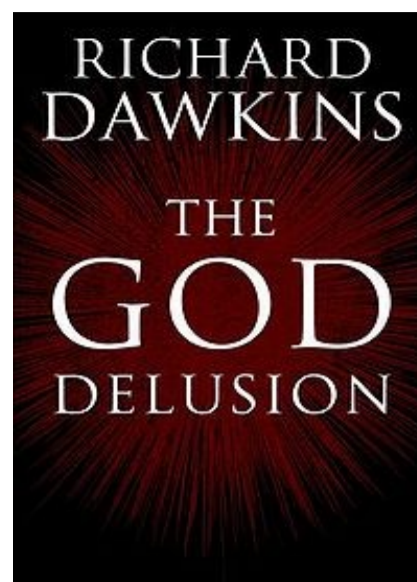
He not only meticulously observed his shin bone, toe, heel, and knee; but he also found some *analogies* (structural and functional) in *mere things* he could find around. He soon realized the need to give some well-monitorable movements to his ankle and knee for the artificial limb he was conceiving. He found the answer in the hydraulic spring of a two-wheeler. The move-

ment and much needed rotational ability of our knee could well be identified in a system of three bearings of a Chinese irrigation pump (for rotation) and a two-wheeler kicker springs (for appropriate balance). Finally, in his fourth attempt, with no more than some metal plates, rods, springs and some bits and pieces of a motor bike, he defied all odds; and there was a birth of this not-so-elite Jaipur foot.

Today Mafikul is keenly willing to provide his expertise for others, those not with heavy wallets, to have leg prosthesis for a nominal cost of three thousand rupees. Even local NGOs have shown interest in providing this prosthesis for the desperate and unprivileged.

SOMIL GUPTA

The God Delusion



A fundamental atheist wages open war on theism and denounces the existence of any form of superior authority. Dawkins alternates from mathematics to astrophysics to evolutionary biology in presenting well-laid-out arguments to establish the God 'delusion'. He expresses his ideas in powerful, convincing and sometimes spiteful (not uncalled for) words. If you have even the slightest doubts regarding the existence of a cosmic super power, this book will

undoubtedly put them to rest. Psychologically, he argues that faith in God is just a grown-up version of the childhood fantasy of an imaginary friend. Dawkins dismisses 'visions' as mere hallucinations!

This seemingly philosophical book, which is any atheist's Bible (forgive the irony), is peppered with humour and well-placed wit. According to him, the major faiths in the world are as nonsensical as worshipping a "flying spaghetti monster" (the faith IS real, by the way). It is evident how an omnipresent and omniscient authority is logically impossible! His battle against theists does not end there - he goes on to offer help and refuge to those on whom religion was forced upon. But after a few chapters, his criticism and denouncement of the Bible, especially the Old Testament stands out from everything else, almost like an atheist version of religious fundamentalism! This book is recommended for reading at your own risk - if you wish to retain your faith, avoid it!

RECENT ADVANCES IN PROSTHESIS

In the early months of 2009, under the Jaipur Knee Project, a research team at Stanford University (headed by Joel Sadler), successfully managed to make a prosthetic leg which costs only \$ 20. This reinvention draws inspiration from the high-end titanium knee joints (made up from oil-filled nylon polymers), which provides the brace with self-lubricancy and great flexibility.

Actually, it was in 2008 that they received a request from Bhagwan Viklang Sahayta Samiti (BMVSS), Jaipur, to consider the need of coming up with an affordable knee (compatible with the Jaipur foot which is centrally manufactured at Jaipur).

Joel & Eric first travelled to India to meet their "consumer". The very moving experience of what it means to be poor and disabled in such a depraving socio-economic milieu, profoundly impacted and triggered them in giving form to their ultimate design.

In April 2009, they presented the knee at the Stanford Cool Products Expo, and Stanford published a press release about it. The **Jaipur Knee** has been recognized by *Time* magazine as one of the "Top 50 inventions of 2009". Today, around 400 amputees in India are using these legs to walk, run, and direct themselves towards fulfilling and dignified lives.

Still, in some way, Mafikul's achievement cannot be overshadowed by just looking for market cost of both the prosthesis; but should also be looked under an inspiring light of what he *had*, what he *knew* and what he *could do*!!

References and Credits

1. "A leg up for prosthetics" by Rabi Banerjee, from "The Week", Jan 31, 2010.
2. <http://whatgives365.wordpress.com/2010/03/25/5-pieces-of-plastic-4-nuts-and-bolts-the-ability-to-walk-again/>
3. <http://dvice.com/archives/2009/04/stanford-studen.php>
4. http://www.oandp.com/articles/2010-02_03.asp

Suggested web links and articles

1. http://www.harmonyindia.org/hportal/VirtualPrintView.jsp?page_id=12554
2. San Francisco chronicle, November 25, 2009: Did Stanford knee project get a leg up? - John Wildermuth

Variation In Fundamental Constants

AVANI GOWARDHAN

Physicists seem to delight in nothing so much as upsetting the most commonly accepted beliefs of the world. One of the theories on which many hopes for a unified theory of physics are centered is string theory. It seems to suggest in most of its models (with the requisite 11-odd dimensions to make the mathematics work) that variation in the value

billions of years. So, we look at the light emitted from a distant quasar sometime in the past that we receive right now. This light passes through one of the clouds of dust in the universe on its way to our humble abode. Due to the presence of elements like silicon and carbon, which absorb specific wavelengths from this radiation, we get absorption dips in the spectrum. The wavelengths absorbed, which depend on the value of α at that time, would be very slightly off when compared to the wavelengths we observe in the lab nowadays. That slight difference is what we are looking for - makes looking for a needle in a haystack easy as 3.141592.....

$$\alpha = \frac{e^2}{\hbar c}$$

of α (fine structure constant), μ (proton-to-electron mass ratio) is necessary for the existence of extra compacted spatial dimensions whose sizes are related to the values of the fundamental constants. The time variation of the sizes of these compacted spatial dimensions thus manifests as variation in these fundamental constants.

It is arguably one of the most difficult challenges of current physics. The experiments for the observation of changes in constants like α and μ range from observing an atomic clock for a number of years, to observing light from the most distant objects in the galaxy. The former will give us an extremely fine picture, over very small time scales. The latter will tell us its variation over

The importance of that needle is that these values will actually constrain the models. These are among the few low-energy and testable predictions that we get. Most of the other predictions are on energy scales of 10^{19} GeV, far beyond the reaches of foreseeable technology. There is no expected value of the variation of these constants. Rather, each model predicts very different variations for them. Out of the hundreds of equally credible models, fundamental constant variation is our best hope for judging their credibility. This is, of course, an idealistic viewpoint. It is highly unlikely that any value calculated will be accepted in the near future without blood being spilled. There is a blatant disagreement between the values obtained by different groups - even those working on the same data



sets. Using one analysis, a group (let us call them group W; I like to avoid lawsuits) found the first quantitative value for $\Delta\alpha / \alpha = (-0.57 \pm 0.11) \times 10^{-5}$. Another group (group C) claimed in a follow-up paper that they had gravely underestimated their errors. The uncertainty that W claimed was lesser than the minimum possible with the equipment. Using the same spectrum, a student group at NCRA recently calculated it to be $(1.01 \pm .99) \times 10^{-5}$ with the uncertainty nearly 10 times smaller. As is fairly obvious, the effects of systematic errors (instrumentation) will have to be greatly reduced before we can make any definitive statement about these constants. For a look at $\Delta\alpha$ closer to home, we can look at atomic clocks. Since they depend on hyperfine transitions in alkali metal atoms having different dependence on α and seem simpler than noisy QSO (Quasi-Stellar Object) spectra, it might be hoped they are more resolute. But no, they do not help resolve the

controversy. In most of the experiments, since nothing definitive was observed, an upper limit was claimed for $\Delta\alpha / \alpha$ (based on the maximum resolution of the setup). Typical scientific optimism... An easy way out of this is, since we have no idea how α changes, it is not completely fair to compare values from billions of years ago and now. It would have been too simple to have a linear relationship. Basically, as of now, we have very little conclusive evidence about whether or how these so called constants vary. All we can do is hope that they do so in a relatively simple pattern with space and time that we can decipher.

References:-
 1. "Probing fundamental constant evolution with astronomical spectroscopy" by N.Kanekar, NCRA

The Art Of Polage

NEHA



Living in Harmony

by
Austine Wood-Comarow

Central figure is the polage without a filter, and the other two at different orientations through a polarizing filter.

A few months back while surfing through the channels on the TV, hardly anything interesting was being aired, and I was almost about to give up when I came across this interesting art form called polage.

Ever heard of it? No? Neither had I, but I was stumped by the sheer beauty of the creations. Polage which stands for polarize-collage was founded by Austine Comarow. Sadly, it has not yet been absorbed into the mainstream art media, possibly because it is an art form which needs to be done in a physics lab. Unfortunately, she remains the only

...stained glass meets the video screen

practitioner till date. Polage requires birefringent material, i.e. materials which have the ability to split a light ray into two depending on the polarization of the wave. The humble cellophane is a good example. The colourless cellophane has to be stuck on to a polarizing filter. Different thickness of the cellophane produces different colours. Since these are a result of refraction as opposed to reflections from paintings, they seem more vibrant. The plane, which looks like etched glass, comes to life when covered with a polarizing filter.

Comarow's masterpieces are usually displayed in a motorized light box in which the art is rotated. This motion brings out wonders as one impression morphs into another like a pupa into a butterfly. To make the paintings more interactive, she sometimes provides it with individual filters and the viewer has to go around the 'cellulose sandwich' to experience the artistic marvel. To put it in the artist's words - "The finished Polage is alive. It glows and the colors appear to flow as it cycles through its multiple views. It is moving, changing

stained glass. Polage is a medium for the 21st Century: stained glass meets the video screen."

Check out these links

1. Artist website
<http://www.austine.com/>
2. Making of a Polage
<http://goo.gl/JhKVR>



←
If you are too lazy, point your phone(with a QR reader) here.

gene EXPRESSION



The students' corner

I'll finish it by tomorrow yaar.....

"That's cool!"
"Me too!"
"I'm up for anything new!"

These phrases happened to follow the mention of a daily game of football. Scholars, all wrapped up in blankets, fervently discussed and almost fixed the timings of the games and the teams involved, while the winds continued to ruffle the pages of books lying open on the bed.

"So we start tomorrow?"

Interestingly, all 'good' things in life always start tomorrow, or they will be accomplished by tomorrow. And "tomorrow" seems to have attained a broader meaning than its dictionary definition, broad in terms of the number of days included. Procrastination, the anthem of student life, is here to stay. And after putting aside my incomplete Physics record, I wonder: Why?

Why didn't I buy a refill today? It's alright, I'll buy it tomorrow, and the shop is so close-by I can buy it anytime.
I should have recharged my phone today but

I can't. The shop is so damn far away!
Shall I read the chapter Sir has taught us today? Or I'll read it tomorrow, its better I read the chapter entirely after it's completed in the class.

Oh! I remember I have to give in an article for the magazine. I'll do it by tomorrow, for sure.

My sister gave me some very good movies, I must watch them someday.

The people outside are calling me to play but I am too busy. I have to do some Math. I suck at Math.

Hey, I see her coming. I must ask her...

"Hi! I was looking for you. Could you lend me that book of yours? Thanks. Hey, don't you think Natural selection is not a scientific theory because it is not falsifiable? Never mind. Tell me what exactly did that guy say to that girl that day?"

This is the sad story of a student – sad - not because something tragic has happened but because nothing ever happens. And we come back to our question: why?

When I was a kid, my grandfather used to tell me a story about a rabbit and a tortoise. I'm sure everyone has heard of it,

where the rabbit quickly reaches near the finishing line of the sprinting race and then becomes lax and decides to take a short nap. The tortoise in the meantime slowly crosses the finishing line and thus unexpectedly wins the race. So have we all become overconfident like the rabbit?

Paulo Coelho, the philosopher, says that when we get too close to our goals or dreams or whatever, a fear of realizing that dream arises within us. We suddenly start feeling guilty and forget all our hard work of the past. We commit a series of blunders and lose it all.

My dear friends let me tell you, this is all nonsense. Our problem is that we are just plain lazy. And the sad part is that we revel in it. It's the best excuse: Sorry, I'm lazy. What can I do? God made me that way.

I should not ask a student to go against his nature, but if you are not counting this as a solution, there is none. Blame God or blame your fickle teenage hormones. If you are happy with your life, that's good enough. Or else, it's only you who can do something about it. Think again.

SHREYA RAY

Foodie Corner

Aashay

For a foodie like myself, eating daily in the mess is out of the question. So finding new places to eat at is one of my top priorities! This place, called **Mainland China** is a haven for authentic Chinese food. It is perhaps the only Chinese restaurant in Pune which serves 'non-Indianised' Chinese food. Try the 'Dim Sums' here and don't forget the special Chinese tea. The ambience is also awesome. Although it is a bit pricey, it's worth the money. The per head expenditure will come to around 350 rupees. Mainland China has two branches in Pune - one at ICC Tech Park, Pyramid Mall, Senapati Bapat Road and the other at City Point, Dhole Patil Road. Do visit at least once.

RESTAURANT OPERATING HOURS

LUNCH SESSION 1200 - 1530
DINNER SESSION 1900 - 2330

CONTACT

Web: www.mainlandchina.com

Tel:

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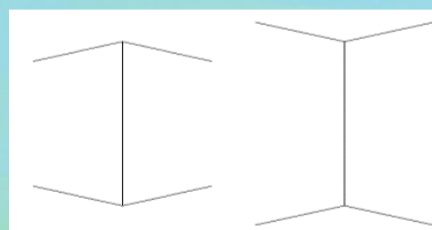
Your suggestions and criticisms are most valuable to us.

Do feel free to send them to us at: sentience.iiserpune@gmail.com or leave comments on our website.

Get involved!

SOMIL & SHREYA

Hey guys, thought you might just like to put on your thinking hat (for a change?). Can you figure out which of the two adjacent vertical lines is actually lengthier?



Most of you might answer: obviously the second one! Or you might not answer it yet, thinking surely it cannot be so obvious. But, then what else can it be? Much to your surprise (if you haven't come across this before), it's none.

Both the vertical lines are of equal length!

Then why does this happen? Why do we feel that the second line is longer? We know it's got to do with those differently oriented V-shaped branches on the ends of the lines. But why exactly?

It's one of the very famous visual illusions, called the Muller-Lyer illusion. Here, we are basically fooled in estimating their length to be unequal because of something called as "depth perception". Our brain is accustomed to give a dimension of depth to the world we interact with. Thus, we interpret the line with outward branches as if it is something farther away (as it were a far corner of a room), and the one whose tails are inward appear to be like a near-end of a room. And from experience, we do know that a far-away object is actually much bigger than it looks. So here's the illusion! Well, this one is one of the many proposed and plausible explanations.



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