

# CONTENTS

## COLUMNS

---

Editorial	2
Events	3
Guest Lectures	6

## ARTICLES

---

<b>7</b>	<b>Our Cyborg Future</b> The article discusses breakthrough in robotics... <b>Prof. Kevin Warwick</b>
----------	---

<b>9</b>	<b>Data Storage: A Nanotechnologist's Perspective</b> Encounter the Technology behind nano iPods... <b>Dhishan Kande</b>
----------	--

<b>12</b>	<b>The exciting world of engineering</b> Engineering is an addiction not a passion... <b>Shivam Srivastava</b>
-----------	--



<b>18</b>	<b>The Code Breakers...</b> Decipher the cryptography... <b>Deepanshu Shukla</b>
-----------	--

<b>20</b>	<b>What next???</b> Explore the future options... <b>Animesh Pathak</b>
-----------	---

<b>21</b>	<b>Story of stars</b> See the stars in a different perspective... <b>Prof D.C.V. Malik</b>
-----------	--

<b>INTERVIEWS</b>	
<b>15</b>	<b>Oscar winner of Laser Industry- ITBHU alumnus</b> <b>Manick Sorcar</b>

<b>SPECIALS</b>	
<b>5</b>	<b>Pronites</b>

# TECHNEX 08



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## FROM THE EDITOR

Where technology will take us in the next millennium or perhaps the next century itself, is anyone's guess. At the begin of the twentieth century anyone could have hardly imagined that a hundred years later: moving images would be transmitted into homes all over the world from satellites in the sky; that bombs of unimaginable power would threaten the existence of mankind; that millions of people would take to the air every hour in aircraft capable of taking off and landing without human touch; that one could cross the Atlantic at two thousand miles an hour; that humankind would travel to the moon, and then lose interest; that people would carry telephones weighing a few ounces, and speak anywhere in the world without wires; or that most of these miracles would depend on devices the size of a postage stamp which operated because of a new theory called quantum mechanics; he would almost certainly have pronounced you mad.. Most of the people of that age had thought that all that could have been invented had been invented. But just like none can reach the horizon, so also nobody can reach the point where no more technological progress is possible. It is to celebrate this dynamic march of innovation that Institute of Technology Banaras Hindu University celebrates the Annual All India Technical Festival TECHNEX'08.

TECHNEX'08, proved to be a resounding success. Presence of over one thousand outstation participants, prizes worth around five lacs, guest lectures, workshops, mega shows etc. made Technex'08 , a trend for the future events. In the following pages I will take you on a brief journey through TECHNEX'08.

**-KARAN GUPTA**

**MODEX***The Model Exhibition*

MODEX provides the platform to foster imagination so that technical brilliance can shape reality. Here we invite people with ideas which have the caliber to increase the human expectations from the free mind. This MODEL MAKING CONTEST is the 'Soul of Technex.'

**BYTE THE BITS***The Software Arena*

TECHNEX presents the software arena in association with *Mentor Graphics, Google, GE* to acknowledge amazing miracle and honor the greatest exponents of the field with an amazing array of events. Five events were organized under this event:

1. Eniac
2. Code Warriors
3. Night Shift
4. Endeavour
5. Soft Lounge

**XTREME ENGINEERING***Creating Possibilities*

The ideal engineer is a composite ... He is not a scientist, he is not a mathematician, he is not a sociologist or a writer; but he may use the knowledge and techniques of any or all of these disciplines in solving engineering problems.

**EVENTS**

Xtreme engineering deals with practical engineering problems from six engineering branches. Events under this banner:

1. ChemoFlaze
2. I-Struct
3. Em-Powered
4. Electronica (*in association with Cadence*)
5. Mechaniche
6. MetaMorphous

**ROBOTRIX***The next small BIG thing*

Extreme precision, intelligent design, encompassing, sufficient maneuverability, smooth controls, and applicability to a wide range of tasks are the essential features of the robots.

Face the raw challenge, train your creation to sustain different challenges and prove your supremacy over these machines. Events under this banner:

1. Optika
2. Treasures of da Deep
3. Race thru the Maze
4. Colour Sandwich

**ASTRO BOUT***The space know how*

Astro Bout aims at delivering newer technologies to the world in the field of space exploration. Astro Bout is a five level competition that will test the research capabilities, quizzing skills, creativity, knowledge and even practical implications. The last man surviving these

**INDUSTRY SPONSORED PROBLEMS**

This special section of events is designed to give Technex a direct interface with the Industry. In this section, problems are set by the company. This approach will not only provide an industry-oriented professional touch to the event as a whole but can also provide some very innovative solutions to the company concerned.

This year the problems were given by **GE**. The winning team got support from researchers at GE, JFWTC in terms of review, and financial support to carry out their further research with help of their faculty using Institute facilities

The given problems:

1. Methodology for ash content reduction in Indian coal by 50% of its existing level.
2. Maximize solar power output from existing solar panel foot-print

five rounds will be declared the Monarch.

## AIR BOURNE

It all started with the Wright Brothers when they chased the dream of conquering the skies...of flying without wings and since then their invention has been revolutionized... and today we have the supersonic planes in our show case.

Participants made a glider which can travel maximum horizontal distance when launched from a launcher from a certain height and any angle from the horizontal.

## PANCHATANRIKA

*Hunt for a complete man*

*(In association with TCS)*

The race is on to search the one outstanding person which can outperform every difficulty and cast a lasting impression in every sphere of life.

Panchatanrika is a hunt for the complete man...the perfect tech whiz who not only possesses sound technical knowledge but also various life skills. It is a five stage battle which will effectively separate the wheat from the chaff.

## PAPYRUS

*Paper Presentation Competition*

Papyrus-the paper presentation competition-provides a platform for bringing forth and presenting innovative ideas or researches in front of a panel of experts.

## SPECTRUM

*Creativity at its Best*

This is an event for – “The imaginative class of TECHIES”

Spectrum is an event for all those who have a creative bent of mind. It consists of the following Events. This event gave awards to the best photographs, documentaries, posters. Events under this banner

1. E-Motions
2. Tech-Flick
3. PosTech

## BAL VIGYAAN

*Catch 'em Young*

*(In association with Resonance)*

This event aims at capturing the young talent...the school going children who have a scientific bent of mind. Balvigyaan will not only provide a platform to children for presenting their ideas but will also

develop in them a scientific attitude everything in a fun way.

This event has witnessed a lot of participation from the young up coming tech-whizzes in the past. This year too the talent presentation would be monumental.

## GAMES BOND

*Dare to belong*

Time to get out of the jungles of Vietnam coz there's a crucial 'Counter Strike' that you have to command.

Break away from the sands of time coz there's an entire 'Empire' waiting to be ruled. Zoom past the drag racers coz you feel a 'Need for Speed' that has never been quenched. What is there to life without some thrill and entertainment? So, here's the call for all the gaming buffs who like to 'live it on the edge'.

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# PRONITES

After a day long exposure to technical extravaganza, Pronites "the fun filled nights" aimed to entertain people and fill in the energy to start another enthusiastic day.

## Laser Show



An extravaganza of laser graphics, overhead laser spectacles, dazzling colorful 3D laser animations, cartoons, and beam effects all choreographed to a musical soundtrack and theme. Experience beautiful sheets of the liquid sky light filling your room with colors and let your heart go beyond the limits you restrict it. Our laser show will provide you with the joy, the fun that technology can provide.

## The PYRO Sparkles

For the first time in Institute of Technology- Banaras Hindu University, you will see real action of colors at the event: the Pyro-Show at TECHNEX 08 will amaze you with fireworks and huge flames dancing over the top of your head. The sky lighted up with a spectrum of lively colors.



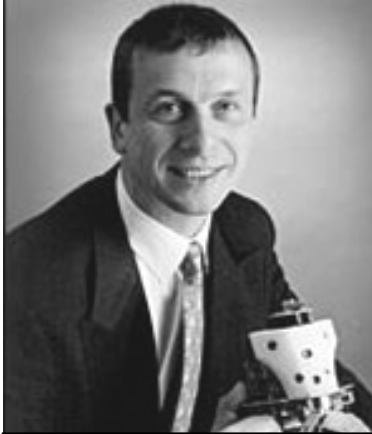
## The Water Screen Show



This year TECHNEX 08 is going to witness a most memorable ending with a fun filled movie night on the mid air. Mid air?? yes, you read it right, this is a high resolution projection surface created entirely in a cascade of flowing water! The interaction of light and water brings a whole new visual dynamics to our presentations.

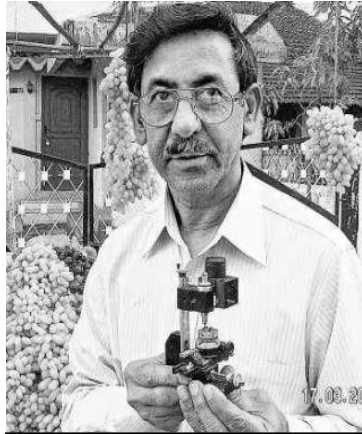
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## GUEST LECTURES



**Prof. Kevin Warwick**  
*Dept. of Cybernetics, University  
of Readings, UK*

Prof Kevin Warwick has main research interests in artificial intelligence, control, robotics and biomedical engineering. Kevin has carried out a series of pioneering experiments involving the neuro-surgical implantation of a device into the median nerves of his left arm in order to link his nervous system directly to a computer. He is the world's first Cyborg - that is part human and part machine. He has been featured on Discovery Channel and TIME magazine.



**Mr. Iqbal Ahmad**  
*Machinist, Guinness World  
Record Holder*

Mr. Iqbal Ahmad has secured his position in the Limca Book of Records, and in the Guinness Book of World Records for having manufactured the World's smallest rail engine of the size of a thumb nail in 2001, a position that till date has no other claimant. He is passionate about Micro-Machining and conducts workshops on it through out the country. He has also made couple of models which are miniature marvels such as working lathe machine of size of about one inch.



**Prof. D C V Mallik**  
*Indian Institute of  
Astrophysics*

He is a distinguished scientist in the field of astronomy. He is a visiting professor at IIA (Indian Institute Of Astrophysics). His lectures are admired all over the country and world are admired. His presence here for three days will give life to 'ASTROBOUT- the astronomy event in Technex '08'. He would be giving a guest lecture on "Life beyond the Earth".

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## Our Cyborg Future

Prof. Kevin Warwick

*Fictional Cyborgs appeared in some of sci-fi movies such as the Borg in the Star Trek and the Cylons from the re-imagining of Battle star Galactica. Prof Kevin Warwick is well known as a first real Cyborg of the Earth. He is a professor of Kevin Warwick is Professor of Cybernetics at the University of Reading, England. He has surgically implanted computer chips in his body. He has been featured many a times on Discovery channel, BBC, TIME magazine etc for his extraordinary research.*

As a species, humans evolved in a very different world to the one in which we now find ourselves. Hunting on open plains requires a skill set which bears little relationship to the technological world of today in which decisions are expected immediately, instant communication around the world is a requirement and multiple criteria must be met daily. So humans have turned more and more to the power of machines to help us fly, travel at high speed, memorize, calculate and communicate.

Giving machines physical capabilities is one thing, giving them intellectual abilities is quite something else, because just as intelligence is the sword

that humans have used to exert power over other creatures so the danger is real that the same sword will be employed against humanity by intelligent networked machines that humans created. Machines that are being given the power to choose who they kill or destroy by other humans. How can you reason with an intelligent fighting machine wants to get you?



Fortunately we have an alternative. As humans we can upgrade and become, what science

fiction has termed, Cyborgs – part human, part machine? In particular by linking human and machine brains together so an individual can be enhanced intellectually. Some of the advantages exhibited by machine intelligence can be experienced as a Cyborg. Extra sensory input, extending one's nervous system over the internet and communicating directly brain to brain are just some of the features already realised, to an extent at least.

With your nervous system linked in to the internet, your brain can directly control not just your own body, but any technology also connected.

You can switch on lights, drive your car or move a buggy on Mars, just by thinking about it. You can also

experience senses that will be new to you – for example ultrasound, infra red and even X-Rays. But what does that make you? What will it mean to be a Cyborg?

From my own work, communicating by thought alone, directly between brains, must provide an enormous commercial opportunity. Meanwhile assisting people who are disabled to operate technology around them will considerably facilitate lives in the future. Using neural signals to operate a robot arm and subsequently to feel what a robot hand was feeling were things we achieved back in 2002 – a version of this was

exhibited more recently in Vienna with direct application on a disabled individual.

“Hacking directly in to someone’s brain will mean a form of control never before experienced”

But there are dangers. Certainly human individuality will diminish, but we will gain much from our communal network merely the next, natural step. But it will be a

base. This is the way society has been moving – Cyborgs are field day for hackers – hacking directly in to someone’s brain will mean a form of control never before experienced.

Indeed the concept of a software virus affecting an individual’s nervous system doesn’t bear thinking about. Clearly security will need to be far greater than it is with the systems of today.

There is no question in my mind however; by 2050 it will be Cyborgs who are in the driving seat on earth. Humans will be some form of subspecies. I can’t wait. But after all I want to be a Cyborg.

\*\*\*

# Data Storage: A Nanotechnologist's Perspective

**Dhishan Kande**

*Dhishan Kande is a Metallurgy 2007 batch pass-out of IT-BHU and is currently pursuing PhD, at Materials Science and Engineering, Carnegie Mellon University, PA, USA  
His area of interest is Hard Disk Technology.*

**W**ell this article is not about using complicated scientific terms and impressing a very narrow section of society. The aim is to bring certain scientific accomplishments to light, and demonstrate the kind of impact that they have on humanity.

Talking of the impact that hard disks have, the following figure was taken from the presentation of Seagate, a global player in this industry.

Apart from being lucky enough to be working in a research group that claims to be the best in magnetic data storage research in the US, the inspiration for this article comes from a "YouTube" video I saw sometime back. It was about the Nobel Prize in Physics for the year 2007.

Well frankly speaking I never bothered to find out about the Nobel Prize winner every year, and even if I did, I thought I would not understand the work anyway, then why bother!

But this one caught my attention.

The video talked about iPod nano and I was like: "iPod nano and Nobel prize?"

Well the video showed that

"The Nobel Prize in physics for the year 2007 went to two guys for their discovery of the technology that made the iPod nano a reality".

I am talking about Albert Fert (France) and Peter Grunberg (Germany).



They came up with the discovery of Giant Magneto resistance that was later used in the read heads of the hard disks in every computer, laptop, and iPod known today (including the iPhone).

Magnets have been a part of our lives ever since we were born, ranging from the magnets that we played with as kids, to the iPods that we so stylishly carry in teenage, to the transformers that regulate power delivery. The earth itself is a giant electromagnet!

From our basic physics, we all know that when we apply an external magnetic field (say we place a magnet) and place a material like Iron close to it, it gets magnetized. Even after removing the magnetic field, the iron remains magnetic. In a way, it has stored a signal. Every piece of information can be represented as binary code i.e. either "0" or "1". Also in materials, we have a specific direction in which they magnetize easily (easy axis of magnetization). So if "0" can correspond to magnetization in one direction (easy magnetization direction) and "1" to the direction opposite to it (which is still easy magnetization direction) then we are storing information in magnets. So having an array of magnetic powder particles that move under a coil made the first hard drives. Depending on whether there is a "0" or a "1", the coil magnetized the powder particle in one direction or the other, thus storing the data permanently.

But how many magnets should we have just to store the name of a person?

Every alphabet has a binary code and there are many such alphabets; hence we need a huge number of magnets to store a small name that way.

Well if some people are still under the impression that nanotechnology is an over-hyped term and it has never been put to use

in industry on a large scale, they are truly mistaken.

By using the techniques of nanofabrication we can make magnetic grains of a few nanometers size, each of which can store a bit of information. So the current hard disks that we all use in our computers are thin films of magnetic material that have millions of these tiny magnetic grains storing huge amount of information.

The current hard disks are made of Cobalt-Chromium-Platinum alloys. In the future they will just be Iron-Platinum. It won't hurt to know that there is 30% (mole) platinum in the hard disks of today. On a lighter note, the problem is that people have not been able to successfully extract pure Platinum metal from the used hard disks.

**If they do, every hard  
disk-owning man would  
have a wife who wears  
Platinum jewellery!**

The hard disk industry is money intensive and has global penetration. The major players are Hitachi, IBM, Intel, Seagate, Western Digital, Fujitsu, and Showadenko.

It is driven by pure research and development and the money that goes into this kind of research is unimaginable. The following curve shows how the new breakthroughs in technology have maintained a continuous rise in data storage capacity over the decades.

In fact the following lines were taken off the website of Hitachi:

"Notebook computers can be as powerful as desktops these days, especially as hard-disk makers like Hitachi Ltd. grab industry bragging rights by unveiling a 500-gigabyte

drive for laptops. The 500 GB drive is the beefiest one yet for laptops -- enough to hold up to 500 hours of digital video, 178 standard-definition, feature-length movies, 250 games or 125,000 four-minute songs, Hitachi said. Currently, the largest laptop drive on the market is a 320 GB model by Western Digital.

Asustek Computer, based in Taiwan, said it would use two of the drives to create the

world's first laptops with a monster capacity of 1 terabyte”

This just shows the rate at which companies are making progress in this industry.

To conclude, data storage research rests on the pillars of Materials Science, Electronics, and Physics and it looks like one hell of a field for young research aspirants!

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## THE EXCITING WORLD OF ENGINEERING

### Shivam Srivastava

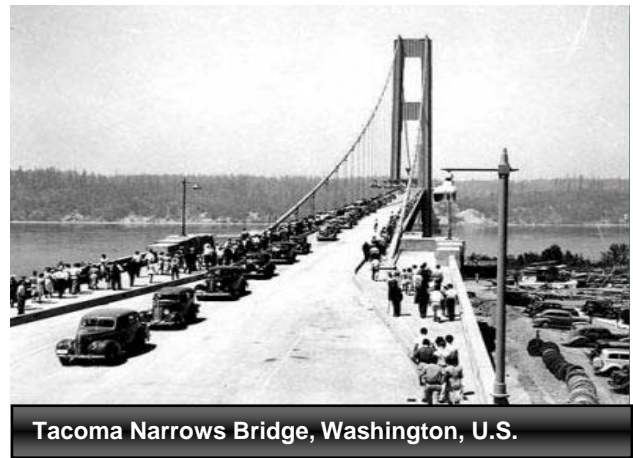
*The author is a senior undergraduate student of civil Engineering. His area of interest is Structural Engineering in which he has published several international papers. He wants to pursue PhD in this field.*

Is 'addiction' really a negative word, or is it one of those words that have been painted black and have lost their objective meaning. Is it just an infatuation that dangles dangerously close to craziness? Or an obsession that yields nothing fruitful? Maybe, addiction is an obsession. In fact, it is an obsession. But, it is this same obsession that has given so many inventions to this world that it is now so pleasantly littered with them. It is this same obsession that has made this world what it is.

Obsessed to create; addicted with the power to create, and sometimes so woefully ignorant of the other pleasures of this world....perhaps this is what engineering is. And if I say that it is this obsession that makes engineering exciting, it might not cut much ice with the common man. He is fascinated with the final creation but perhaps not excited with the process. So, what's the difference between those who are fascinated and those who are excited? Everyone looks at the pyramids and says 'Wow!', a civil engineering student looks at them and says 'How?'. I will try not to be ostentatious, but to be excited with this 'How' requires a certain degree of reasoning power.

To be stuck in a physical problem on a subject you love, you can spend hours

and might not get the solution, but still you will spend another several hours on it. It is the ticking of the brain and the cessation of time that is exciting, scratching the rust on the problem and getting to the fresh solution is



Tacoma Narrows Bridge, Washington, U.S.

**“The Tacoma Narrows Bridge failed just because engineers failed to foresee the wind.**

exciting, getting stuck at dead ends and then finding a way out, which is exciting.

Everything, everything in this world, from a piece of paper to a microprocessor, a paper boat to a space shuttle; everything starts with a single

stroke of imagination, a thought, an almost insignificant idea. Those who are blessed with this brilliance possess a special quality- they dare to dream. But, it is not that simple, for when the innovation and creativity of a human mind settles the destiny of a thousand others, it's definitely not that simple. That is where technical excellence comes into play. The things engineers produce may be works of art for them, but they are not made only to soothe their eyes. These are invariably things for general human use and benefit. People trust them with as much as their lives. An airplane was someone's dream. People failed a hundred times, finally it turned to reality. Now, thousands use them and they take it for granted that it won't crash. People don't appreciate how much brain and sweat goes into making a bridge. The Tacoma Narrows Bridge failed just because engineers failed to foresee the wind. That was a disaster. But, still when thousands cross any bridge on any given day, they take it for granted that it won't fall. Now consider this. When thousands visit any art gallery every day, do they, in this case also, take it for granted that they will admire it. No. The argument is '*art is something much above the mundane things of this world*', mundane things such as engineering. Well, an engineer makes things with his heart, soul and brain. Beautiful skyscrapers, bridges and buildings are as much a work of art for him as modern day paintings are to a painter.

There is also another, rather amusing fact about engineering. While engineers are all excited, charged up and focused on their endeavors, they take the same excitement out of the common man's life. How? Sample this. Graham Bell

was no less than thrilled to hear the voice over the wire from the other room. Now, overseas calls from thousands of kilometers away, fabricated waves traveling with your voice over the seas, over the clouds, are no more spectacular events. Airplanes fly overhead and nobody gives these slender beauties a second thought. Well, it seems engineers are themselves the devices that turn astonishing things into routine.

The physical world is what has inspired generations of thinkers. Nature has been the constant source of inspiration for the intellectual minds. Structural engineering is that field which derives its elements from the nature and turns them into marvels that blend with nature itself. Good structural engineers understand the surroundings like a brute force; grace is in integrating with the nature so that both nature and the structure appeal as complimentary. The *prospect* of 'creating' a formation that touches the sky out of flat barren soil, cantilevers that jut out the cliffs and join above a raging river, a hole blasted through the body of a mountain to the sunshine on the other side, this is what fires a civil engineers' ambition and the fact that these things can be learnt and done ignites the minds of a structures student. One such endeavour that is still on the drawing board is the proposed bridge that is going to connect the continents of Asia and North America across the Bering Straits. To say the task is gargantuan will be an understatement... reasons being obvious. Nothing so big has ever been built, the weather conditions are best described as extremely treacherous. Thick blocks of ice will come with great momentum and crash into the piers. The wind velocity is phenomenal. How does a structure stand

in such hostile conditions? Well, if we go by the brains of modern day structural designers, it can stand up pretty well. Offer least resistance to the wind, build sloping projections in the piers that scoop the ice upwards and break them automatically by making them come under bending. The major obstacles are done with, but, it's still on paper. Structural engineers dream big, but they also dream costly and often: the bigger, the costlier. So, we might not see this proposed bridge till some economists say that it is worth the money and the sweat. This is a fact; all engineers have to live with.

Man is a different animal. Now he fights the battle for survival at a different level. He can logic, and he can reason. His intellect drives him to goals that are far

away from the routine humdrum.

Engineering is not the territory of those who only know how to act, it is the domain of those who know how to act, and act as well. Problems are challenges that are to be confronted with. They are evidences of the fact that we are humans and the word 'difficult' does exist in our dictionaries. But, rational, focused and dedicated thinking gives way to solutions. This corroborates the fact that yes, we are humans, but humans are powerful enough to come over their problems. The word 'impossible' does not exist in our dictionaries.

As long as the drive remains in man, or more simply- as long as man remains a man, the quest of knowledge will be there and the wish to create will always appear exciting.

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# INTERVIEW

Manick Sorcar

## Oscar Winner of Laser Industry

An ITBHU Alumnus

(1968 Electrical Engg. Batch)



**Q:** *Hello Sir, It is great delight for us to take interview of our own alumnus.*

**A:** The feeling is mutual. It is my pleasure to be interviewed by you.

**Q:** *How was it like coming to IT-BHU? As we heard that you are heir of famous magician Padam Shree P.C Sorcar so how was coming from world of magic to the world of engineering?*

**A:** The roots of it go back to many years when, as a youngster, I used to help in my father's world-touring magic shows in doing its lighting design as well as painting backdrops. I am immensely grateful to my father who had noticed my simultaneous interest in art and science and allowed me to experiment in his shows. Each item, as you know, had an elaborate setting and artistic theme which needed intriguing lighting design to reflect the story as well as create the magical effects. Each item was unique and a challenge. This eventually led me to become an electrical engineer as well as an artist. BHU was in my heart for many reasons.

One of them was the cosmopolitan atmosphere of the university which allowed me to experience cultures of all India. We had some of the greatest academicians of the time in BHU, and we were fortunate to have many of them as our professors. I graduated in 1968 with a first class in Electrical Engineering. The experience was unforgettable. Today, whatever little I have accomplished, I credit BHU for building its foundation.

**Q:** *How are you able to do so many things - CEO, Animator, Sculptor, Painter, Music Director, Writer etc. extraordinarily in your life? You are the Leonardo da Vinci of this age.*

**A:** When you fall in love with art and science simultaneously and so passionately, soon you find art in science and science in art. This may sound crazy, but it is absolutely true.

As you probably know since last over three decades in the USA, I have been a full time engineer by day and an artist by night. Through my day-time engineering practice in lighting design I have been

able to make each one an exciting project by applying art in its design. At night I diligently retired in my basement studio to create artwork of many forms, which resulted in fine arts, music records, and a series of award-winning Indian animation films which have become a staple on USA television. But soon the fine line between the two was gone, and I started mixing science with art. The laser which we used for electrical engineering during day, was used for art at night. In making a project successful you need to stay on the top of all aspects of it; the mind starts networking a variety of work simultaneously.

**Q:** *How did you keep your priorities (academics/co-curricular) in IT- BHU?*

**A:** It was no different than any other. Sorted out priorities as required; worked hard before the exams, and for fun went to see movies in the city or boating in the Ganges.

**Q:** *We heard that you rose from junior engineer to Vice president of Howard W. Butterweck and Company within a period of two years - is that true? How did you rise so high in your career with a very short span of time?*

**A:** I have been very fortunate to have an employer like Howard W. Butterweck & Company, which appreciated my ideas and work. When I joined the company, I noticed, one of the responsibilities of the company was to give a realistic cost estimate of the lighting systems of potential massive projects before they got on to board. They needed to be energy-efficient,

aesthetically pleasing in addition to cost effective. This was quite a challenge as the whole study and the realistic cost estimate needed to be determined within a minimum time.

After joining the company, I developed a short cut technique involving a series of graphs, through which the design and its construction cost could be determined in a fraction of the time. The graphs were developed from the performing characteristics of the popular high-intensity discharge and fluorescent fixtures integrated with energy-efficient ballast/lamp combination. Needless to say it made the company productive, saved a lot of money and was very pleasing to Mr. Butterweck, the owner-president of the company, which led to my becoming company's vice-president. The technique I developed was used by the whole company, and it eventually became my first book "Rapid Lighting Design and Cost estimating", published by the renowned McGraw-Hill company. The other books that followed, "Energy Saving Lighting Systems" (Van Nostrand Reinhold) and "Interior Lighting for Commercial Interiors" (John Wiley & Sons), were also the results of my research work which became a text at several universities.

**Q:** *How and when you got into laser animations?*



**A:** It was not until late nineties I started animating with laser and actively mixed art with science on stage. At my electrical engineering firm, we work with laser lighting for many purposes. One day it struck me to use the strong beam of light for life-size animation on stage. After some experiments, the mission was successful. The very laser light we used for engineering work, was manipulated to be used as a paintbrush to create laser graphics and animation in space. Soon I was using laser animation to act with live actors on stage. In 2000, "Calcutta Forever – A Laser Fantasy" was shown at the prestigious Nandan Theater of Kolkata and was promptly recognized as India's First laser documentary shown inside a theater. My next laser show "Dancing with My Soul" at New Jersey, was the recorded as the First life-size laser animation integrated with live action on stage, and in 2006, "Enlightenment of Buddha", a laser show mixed with live action received the coveted Artistic Award (Oscar of Laser industry) in Italy, from International Laser Display Association (ILDA).

**Q:** *What is SorcarScope? Sir please tell in details along with brief technical details also.*

**A:** Laser is the acronym for Light Amplification by Stimulated Emission of Radiation. It is a thin beam of light the intensity of which can be varied to perform a wide range of activities:

starting from delicate eye surgery to melting through a thick piece of iron. Entertainment with laser falls somewhere between the two. "SorcarScope" is a technique I developed through which live actors on stage can act simultaneously with laser without any fear. First time I used the technique was for "Dancing with My Soul" where the laser-soul comes out of the live performer and dances magically with her on stage. Through SorcarScope, the intensity of laser power can be cut down to a safe level, without any loss of quality in its aesthetical impact. Through this, I can project the laser graphics which seem to be magically floating in space for interaction with live actors.

**Q:** *From your life it appears that you are more interest driven rather than money driven?*

**A:** Absolutely right. Most of my activities are interest driven rather than money. When you love to do something, you just do it. Love cannot be measured by money.

**Q:** *What would be the best advice you like to give to our students.*

**A:** Love your work with all your heart and have full confidence in yourself. Success awaits you.

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# The Code Breakers...

*Deepanshu Shukla*

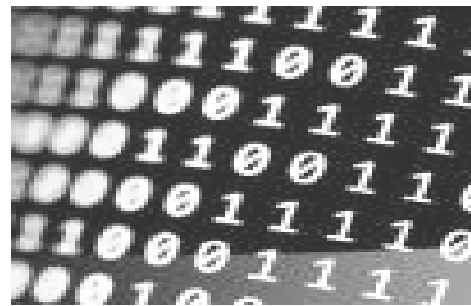
*Senior Undergraduate Student in Applied Mathematics. Crypto is his passion and he has conducted workshops on cryptography. He wants to pursue PhD in Cryptography in future.*

Ciphers or secret codes are not new ideas; in fact, they are almost as old as writing itself. Egyptians and Greeks have used them since time immemorial. Most of the early development of the Cryptology– the science and study of code making (cryptography) and breaking (cryptanalysis) was during wars. During the World War II, the Germans invented a cipher machine ENIGMA for encrypting and decrypting secret messages. To counteract it, an English mathematician Alan Turing made a machine called Bombe to break ENIGMA's codes. History certifies that without breaking them, it would have been quite difficult for the Allied forces to overcome Hitler's submarines which used those codes for communication.

The later half of twentieth century saw an increase in use of internet for communication as well as for commerce; and hence security became a tremendously important issue. Cryptography endeavor to guarantee that the information that is transferred remain private. Right from logging on to your mailbox to using your ATM card you are using some sort of cryptographic scheme or protocol. Secure mail, secure communication, network authentication, digital cash, digital signatures, smart cards, authentication systems and data

distribution are some of the key applications of cryptography.

Watermarking techniques, used for proving ownership of some digital data



also uses crypto techniques.

Because of its strategic and financial importance, rapid developments are taking place in this field. It includes contributions from different branches of science like complexity theory, number theory, coding theory, information theory, algebraic geometry and even quantum physics.

Cryptography is unique in sense of design. Designers in other fields generally look for the simplest models available, while cryptologists hunt for complex, unsolved problems to develop cryptosystems. Most of the present cryptosystems use some computationally hard problems (integer factorization, discrete logarithm problem, elliptic curve discrete logarithm problem, MQ

Problem etc. to name a few). Modern cryptographers don't want these ciphers to be unbreakable; they only want them to not break before the death of

Universe! For example, consider the most widely used encryption scheme today, RSA (based on integer factorization problem). It will take years to factorize a suitably chosen number of the size around 1000 bits, even on a super computer.

A natural question then arises, what if someone comes up with a better computation model? The answer is: Of course, attempts are being made to build quantum computers which can solve factorization problem (for example the Grover's algorithm) in lesser time, but side by side a new set of Quantum Cryptographic algorithms are being developed to deal with these quantum machines. Also there are some schemes like Multivariate Public Key Cryptography that will survive even the quantum attacks.

The other part of the story constituent cryptanalysis. A typical cryptanalysts

thinks like 'Every Code is made to be broken'. Unlike code making, broken', unlike code making, cryptanalysis is more like an art than a science. There are no set of pre-defined rules for cryptanalysis. It requires a bit of mathematical intuition and luck. Techniques ranging from hardcore mathematical techniques like differential attacks, linearization attacks, and rank attacks etc. to side channel attacks (attacks on crypto hardware) like Power Analysis Attacks, Acoustic Attacks etc. have been used. Recently, an Acoustic Attack (a system for deciphering the codes from sound that comes from the computer while encrypting) was proposed to guess the RSA modulus. Some clever cryptanalysts use well established techniques for solving other problems, to solve the cryptographic primitives like use of SAT solvers to crack hash functions. In fact cryptanalysis is one of spur to develop more and more secure system. This is just a snapshot; the history of cryptology is full of stories of cryptanalysis and consequent cryptography.

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# WHAT NEXT??

**Animesh Pathak**

*The author is an ITBHU alumnus of the B.Tech. CSE 2003 batch. In his 1st year, he had planned to do an MBA after B.Tech, but discovered teaching/ research in his 2nd year, and is currently set to complete his PhD in the University of Southern California. He spends his free time working on his blog, and entertaining pipe dreams about teaching in his alma mater.*



**I**t was a good day, a couple of years ago, wasn't it? I am talking about the day when your JEE results were declared, and you were informed that all the effort you had put in the years before had finally borne fruit. A voice inside you said - "Well, great! My life is all set now. After spending four years in a top engineering college, I will be an engineer, and will have an easy life."

Guess what? In case you haven't realized yet, life's struggles do not end with passing the JEE. You are now in the company of fellow brainiacs, and need to keep working hard to stay ahead. "So what?", you say, "thanks to the IT boom,

all the final yearites are getting *dream jobs* with fat salaries. No matter what happens in these years, my job is secure". The above reminds me of a conversation I once had with my mom as a kid. After a rather grueling study session, I asked her -- "Mom, you say that we should work hard now so as to lead a comfortable life later. But I seeded going to office everyday. What is the comfort in that?" She smiled and said "Yes *beta*, but he has a job that he *likes*, and that makes all the difference."

And that is what I believe our aim should be --- doing a job that we like. Knowing that you are the cream of the nation, I am sure that you would each like to pursue interesting and creative careers. There are other options to a post-baccalaureate life than a job in the IT industry. I know batch-mates and other fellow alumni who went for a diverse range of options ranging from the Civil Services to MS/PhD, MBA, etc. One of them (MEC'85) is a patent attorney now, and another (CIV'03) is a scriptwriter in Bombay, while countless others (many of whom chose to take "core" jobs) have their own companies. What I am saying is that there are a ton of options for each of you when you are done with your degree. All you need to do is to work towards getting the relevant information and guidance. Of course, these choices mean that you will perhaps be in school for some more years, but as any of us who took that path will tell you --- those years will be well spent. Remember, you may still choose to take that post-ITBHU job after weighing you options, but you must explore your options. You owe it to yourself.

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# Story of stars

**Prof D.C.V Malik**

*Indian Institute of Astrophysics*

**A**stronomer, a lover of stars, can



scarcely be criticized for attaching human attributes to stars. To him or her star is a living thing – it has its birth, growth and death. The cosmic wombs, where stars are conceived, are the Giant Molecular Clouds. The graveyard, where they are buried, is the vacant interstellar space. Death of a star is accompanied by a spectacular display of colors and explosive phenomena on a scale unimaginable to us on the Earth. During their life stars go through several colorful transitions – being of a deep red or infrared colour at infancy, to a recognizable blue or yellow or red colour at adulthood, to a predominantly red colour for a short period to finally a grey or white colour as they near the end. When a star burns out completely, it turns black and disappears from our view. The first thing that strikes an observer of the night sky is the great diversity in the brightness of stars. The naked eye can easily distinguish a range of about a hundred in brightness. A star appears bright if it were intrinsically bright or if it were close by to

the solar system. The Sun appears so bright because it is our parent star and is only 8.3 light minutes away. Our nearest stellar neighbor, a star named  $\alpha$  Centauri, is 4.3 light years away. Intrinsically, it is as bright as the Sun but looks dim because it lies at a great distance from us. A remarkable correlation was discovered in the 1910s when luminosities of a large number of stars were plotted against their colour or surface temperature. It was seen 90 % of the stars in the sky fell in a well defined band. In this band, the hotter stars are more luminous. The band is known as the Main Sequence. Further, by studying the orbital dynamics of the main sequence stars that occur in binary systems, astronomers learnt that the more luminous of them are also the more massive. However, the range in masses is much smaller than the range in their luminosities. The most massive stars on the main sequence are about 50 to 60 times as heavy as the Sun while the least massive among them may be about a tenth of a solar mass. All stars in the main sequence band burn hydrogen to produce helium in their centers and the energy thus released keeps the stars glowing. Before the centre of a star becomes hot enough to initiate nuclear fusion, a star contract through the action of gravity and releases energy, a part of which is radiated away and the other part goes in heating the interior. Initially, people thought the release of gravitational energy was sufficient to keep stars like the Sun glowing but it turned out the mechanism could not supply energy over long timescales like billions of years and geologists had un-covered evidence to show that the rocks on Earth were at least a

few billion years old. The thermonuclear origin of energy solved this problem. When hydrogen fuel at the centre of a star is exhausted producing helium ash, burning stops but this does not signal the death of a star. Helium fuel can burn too, into carbon and oxygen producing energy, but the temperature at the centre of a star when hydrogen is exhausted is too low for these reactions to take place. A star goes through a series of structural adjustments until helium starts burning at the centre. During the intervening period hydrogen fuel in a shell outside the centre burns to helium to supply the energy a star needs to keep shining. Stars which have masses lower than about 8 times the mass of the Sun cease to have nuclear burning once their helium fuel is exhausted. Such stars eventually become white dwarfs after shedding their extra mass. Their centers are so dense that the electron gas there is degenerate and the pressure due to electron degeneracy is enough to balance the inward gravitational pull. Stars which have masses larger than 8 times the mass of the Sun go through further nuclear evolution and the more massive among them continue to burn until their centers become iron rich. Nuclear burning with release of energy is not possible once iron nuclei are formed

they are the most tightly bound nuclei found in nature. In a massive star whose centre is thus full of iron nuclei and which ceases to produce any more energy, the inward march of gravity cannot be halted. When gravity finally overwhelms, these stars produce supernovae which release enormous energy into space blowing up their outer regions while the inner core becomes a neutron star. Freshly cooked heavier elements are then strewn into space. They mix with the existing interstellar gas and become a part of the molecular clouds where a new generation of stars is born. As the cycle of birth and death of stars is repeated, material in our Galaxy becomes richer and richer in heavy elements.

Thus the calcium in our bones and the iron in our blood and the oxygen we breathe have all come from stars that have lived and died. We are truly the

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## TECHNEX 08 – STUDENTS TEAM

### Gen Secretary, CCA Wing

A. Rakesh

### Jt. Gen Secretary, CCA Wing

Aditya Kandoi

### CORE COMMITTEE

Veerendra Singh

Shreyas Tiwari

Mohit Jaiswal

Manoj Kumar

Navin Kumar

Karan Gupta

### Event Management Team

Vijit Agarwal

Kevad Jindal

Ashutosh

Saurav Bhatia

### Marketing Team

Tilkesh Bhatia

Prabjhot

Dhruv

Pavan

### Publicity Team

Satya Prakash

Gaurav Yadav

Danish Khan

Rahul Singh

Prachi Mittal

Pratha Jhawar

### Hospitality team:

Md. Kaifi Ahmad

Mudit Gandhi

Deepak Shukla

Utkarsh Shukhla

Amandeep Verma

### EVENTS:

#### Modex

Brijesh Vikal

Alok Kumar Singh

Gunjan Agarwal

Sunil Kumar Singh

Praharsh Sharma

Abhishek Kumar

Satish Kumar Singh

Sunil Jangid

Suvradipta Basu

Aditya Jain

Ankita Verma

Upasana Dixit

Ritika Nagar

Ankit Kumar Singh

Yudhish Modi

Pritesh Kumar

Saurabh Srivastava

Apporve Chandra

Amit Singh

Laxman

Saurabh Juneja

Azad Pal

Arjeet

#### Robotrix

##### Race thru d maze:

Siddharth Shankar

Ankit kumar

Mohit modi

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**Optika:**

Viram Mishra  
Neeraj Tripathi  
Milind bhamawat  
Anugrah agrawal

**Color sandwich:**

Vivek Singh  
Bhuvnesh Sharma  
Hitesh Kr. Tanwani  
Harshit Dixit

**Treasures of da deep:**

Siddharth Shankar  
Jishnu Chandra  
Anuj Chandak  
Amit kumar gupta  
Vipul Vikram  
Ankita Verma  
Piyush Sharma  
Amit Agarwal

**Xtreme Engg:**

Rahul Gupta  
Usama Ahmed Abbasi  
Deepak Gandotra  
Rahul Rajput  
Avanish Tripathi  
Kartik Tiwari  
Saurabh Arora  
Ashish Ranjan  
Himanshu Shekar  
Sanchit Kaushal  
Shashank Gupta  
Abhishek Kumar  
Arun Kumar Singh  
Ravi Kishore Singh  
Abhishek Sharma  
Dharmendra

**Airborne:**

Himanshu Verma  
Anupam  
Konark jain

**Spectrum:**

Happy Saini  
Gaurav Yadav

**Byte the Bits:**

Akshat Sharma  
Shashank Shekhar Suman

**Papyrus:**

Bhavik Killawala  
Abhishek Kumar

**Panchatanrika:**

Ankit Rawat  
Amit Kumar Singh

**Astro Bout:**

Sravan Kumar

**Air Bourne:**

Anupam Kumar

**Games Bond:**

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Sandeep Siddhartha  
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**Bal Vigyaan:**

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**Graphics Designer:**

Prashant Sharma

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