NERD

Notes on Engineering Research and Development

Crust ~ 35 km

Mantle
2850 km thick

Fluid outer core
2200 km thick

Inner core
1280 km radius

Exploring the Earth's deep interior
Interview with Dr. Binod Sreenivasan
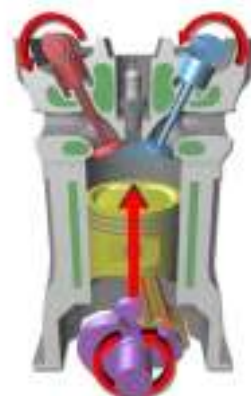
IIT-K student wins
ASME ICED
Undergraduate Presentation
Competition

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From the Editor's Desk

You hold in your hands a brand new NERD (Vol. 4, No. 2,) the second issue of the magazine for this academic year.

This is the first offering of an entirely new NERD team. After the previous issue, the outgoing NERD team handed over the magazine to us. With almost all the content in hand, it seemed quite simple to just collect it, compile it, put it in layout software and present to you a magazine. Believe us, it turned out to be much more than that; 'sink or swim' has undoubtedly been the experience of the new NERD team with this issue. When this initiative was started three years ago, the initial goal was simply to take this much needed idea off the ground to see how it would fly. No doubt, the consistent efforts of the pioneering NERD HERD paid off very well. Now, with the strong base that we have inherited from them, we aim high to propagate this best way of "Communication of Science" across society, igniting the idea of thinking science and inspiring an India-wide interest in research and development among students.

The magazine you hold in your hand continues with the best traditions of NERD. Interviews with eminent scientists and educationists have been a regular feature of NERD. In this issue, we bring you an interview with Dr. Binod Sreenivasan about his research on the Earth's deep interior which recently got published in the prestigious journal Nature. Also, read about our conversation with Dr. S.S.K. Iyer, who was awarded the 'Distinguished Teacher Award' in 2010.

Continuing with the new feature started in the last issue focusing on STS -- Science and Technology Studies -- we bring you the second part of the series written by V Gopi Krishna (IIT-K alumnus).

This year has brought a lot of laurels to IIT Kanpur in the form of student achievements. We bring you an article on Laser ignition in IC engine by Kewal Dharamshi which won him the ASME ICED Undergraduate Presentation Competition.

The magazine also includes winning entries of Science poetry and Science fiction writing competitions organised by NERD in Takneek'2011

In addition to the magazine, we have also continued with other NERD activities. In November 2011, we invited eminent researcher Mr. Gauhar Raza, senior scientist at National Institute of Science Technology and Development Studies (NISTADS) to talk about the concept of 'Scientific Temper' in India and how this concept has helped to shape democracy in India. His lecture witnessed active participation from the campus followed by an exciting round of questions.

We thank everyone for their overwhelming support for NERD as readers, as authors and as providers of feedback which is indispensable for this magazine. We extend a special vote of thanks to Dr. Anurag Gupta, the outgoing faculty advisor for NERD, for his invaluable guidance. At the same time, we extend our warm welcome to Dr. Suchitra Mathur, who is the new faculty advisor of NERD. We thank her for her valuable inputs in terms of knowledge and time without which it would be unimaginable for us to release this issue. We thank all the outgoing NERD team members (Arvind Kothari, Mohit Kumar Jolly, Bhuvnesh Goyal, Utsav Kesharwani and Pranjal Nayak) for their inspiring mentorship and their confidence in entrusting us with this initiative. Our heartfelt thanks to Professor A. K. Chaturvedi (Dean R&D), our mentor, whose efforts are countless and invaluable in shaping this magazine by guiding us whenever and wherever we needed it. Thank You Sir!

We are on the lookout for enthusiastic people interested in contributing to editing, layout, content collection and finances. Don't worry, there are no prerequisites, just the enthusiasm and commitment to learn.

Go ahead and acknowledge our efforts with your feedback! We'd be grateful. "**Create, Communicate, Contribute!**" remains our mantra.

Cheers!

Editors, NERD

Exploring the Earth's Deep Interior
Interview with Dr. Binod Sreenivasan

- Ish Dhand

Dr. Binod Sreenivasan is an Assistant Professor in the Department of Mechanical Engineering at IIT Kanpur. A former Research Fellow of the Leverhulme Trust and CNRS, Dr. Sreenivasan has magneto hydrodynamics, planetary magnetism, dynamo theory and vortex dynamics as his research interests. He recently published a paper in the prestigious journal, Nature based on mantle-induced melting of the Earth's inner core. Here are some excerpts of his interview with NERD team regarding his recent research.

NERD- Research on inner structure of the Earth has been going on for a long time now. How much do we actually know about it?

Dr. Sreenivasan- : The Earth's interior is very deep – more than 5000 km beneath the surface. We can obtain information about the events happening in the Earth's interior from two sources - the magnetic field that we measure on the surface of the Earth and seismic data coming from earthquakes. So each time an earthquake happens, we study its primary and secondary waves in an attempt to decipher what the interior looks like. From seismology, we know the radius of the inner core, and depth of the outer core and mantle.

What we are trying to do is develop a model for the Earth's core with the help of the momentum equation, the temperature or composition equation and the magnetic induction equation, as well as observational data. We are trying to simulate as best as we can the dynamics of the Earth's deep interior. I would say that there is still a long way to go before we can understand the Earth's interior to an appreciable extent.

NERD- OK, coming to an even more fundamental question - why do we want to know about the Earth's interior at all?

Dr. Sreenivasan- When you are working in a field like this, you should not ask why. First and foremost, there is some fundamental interest in this. Secondly, it is this magnetic field that makes the Earth inhabitable. If the magnetic field did not exist, the atmosphere itself wouldn't have supported life. And we now have evidence that the Earth has had a magnetic field as long as 3.5 billion years ago.

The magnetic field has also helped man in exploration through the magnetic compass, for example. The earliest evidence of the use of the magnetic compass is found in Chinese literature dating back to the 11th century A.D. The information that the early sailors gathered in their log books through their very elementary magnetometers is very significant and we should be thankful to them for it. Also, the magnetic field helps in exploration geophysics. It helps miners find the location of magnetic minerals.

From the point of view of people working on the geodynamo problem, they are interested in the cause of magnetic field deep inside the Earth, and its sustenance for billions of years.

> ## We all know that the Earth's magnetic field has a North-South configuration, but why?

NERD- What problems related to the Earth's magnetic field are you working upon?

Dr. Sreenivasan- For instance, we are trying to solve why the Earth's magnetic field is dipolar. We all know that the Earth's magnetic field has a North-South configuration, but why?

NERD- Does this dipolar behaviour have something to do with rotation?

Dr. Sreenivasan- All planets have some rotation and dipolar magnetism is a robust feature of most of them, but Neptune and Uranus don't have dipolar magnetic fields.

The other thing is how the mantle affects the dynamics of the core. Although the Earth's magnetic field is a dipolar field, some non-axisymmetric features can be seen which cannot come from the core if the core is free to rotate
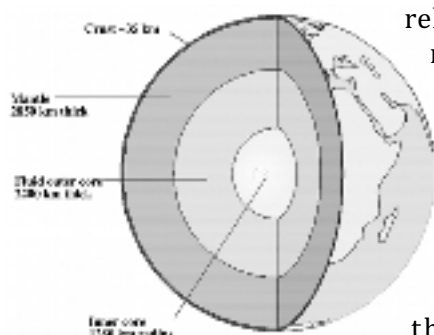
relative to the mantle. This implies that there are influences from the mantle which might be affecting the magnetic field generated in the core. When researchers looked at the seismic wave velocity distribution in the lower mantle they inferred that there were hot and cold regions in the mantle. Hot regions in the mantle are relatively quiet regions in the core – the higher the temperature, the less will be the heat flow from the core to the mantle. These are regions of high volcanic activity beneath Africa and the Pacific. Regions corresponding to Siberia and Canada are relatively cold in the mantle. These are the regions that extract more heat from the core.

What we infer is that, in cold regions, the magnetic flux tends to concentrate beneath the mantle. This does not happen beneath warm regions. So there is indirect evidence to suggest that the mantle is affecting the magnetic field in the core. These kinds of things actually give us some constraints to work with. The mantle control is one such constraint. Other constraints I have worked upon are that of polar vortices. We have polar vortices in our atmosphere too. They are formed due to the Earth's rotation and its uneven heating. There is a latitudinal temperature variation – hot at the equator and cold at the poles. The polar wind is cyclonic. Anything which goes east is aided. So if you take a flight from London to New York and New York to London, New York to London will be shorter. But the Earth's interior is exactly the opposite. Polar regions are warmer because of the rise of light elements in the core. The temperature difference is very small but sufficient to give rise to a massive westward circulation. This anticyclonic motion shows up in the time evolution of the magnetic field. If we measure the rate of change of magnetic field one can actually see the westward drift of the field. That is an additional constraint that can be used. In this way we try to constrain our models.

NERD- Does all this information come from seismic data?

Dr. Sreenivasan- : No. This doesn't come from seismic data. This comes from observatory and satellite data. Seismic data give information about the interior structure of the Earth. Transverse waves cannot propagate in fluids as shear stresses cannot be supported. Longitudinal waves, say sound waves, can propagate through both solids and fluids. The main difference is in velocities. All these developments took place in the 20th century.

The velocities in the core are estimated using the induction equation. Magnetic diffusion here is set to zero. From the drift of the observed magnetic field, we can predict the velocity and its direction. This way, we get those anticyclonic velocities and we could also actually constrain the parameters in the model to obtain the kind of observed drift. This is how the subject is making progress.

NERD- You are relatively new to this campus as a faculty member. How has been your experience here?

Computational facilities are good here and IIT students are not lagging behind any university in terms of computing.

Dr. Sreenivasan- Computational facilities are good here and IIT students are not lagging behind any university in terms of computing. Experimental facilities are not quite adequate, but we can improve on that by time and effort.

There are not many people working in fields like this one. One thing that can improve is the communication between people looking at different initiatives. I was able to do this work only because I talked to geologists and seismologists. It is important to interact with people from other disciplines, otherwise we end up working in one area all our life, not being aware of other developments taking place around us.

Also, I believe that we lack in postdoctoral funding. The idea of doing independent postdoctoral research has not really taken off in India.

NERD- So what's your final message to the student community?

Dr. Sreenivasan- Keep trying to look for new things. Try to read research papers and not just textbooks. Try to work at the frontiers of your field. Make India a better place to live in.

NERD - Thank you, so much Sir, for sparing your time for us.

Laser Ignition in IC Engine

▪ Kewal Dharamshi

Darwin's theory of "Origin of species" coins the term "Survival of the fittest". Same applies to the practical world. World is sprinting in a race towards evolution of such technologies that are sustainable and more economically viable. To make our stand in this racing world, we need to compete with the existing technologies and try to develop the technologies that are universally acceptable.

Automobile industry is one of the largest and the oldest in the human's surge towards development. Starting with the invention of wheel in some 4000 BC, human race has never looked backwards. Now, with the development of high speed bullet trains, the journey that was completed in years can now be done in a few hours. In the complete development of Automobile industry, this one component "Engine" has undergone lots of changes. Internal combustion engines are most commonly used for mobile propulsion in vehicles. A spark plug is an electrical device that fits into the cylinder head of some internal combustion engines and ignites compressed fuels such as aerosol, gasoline, ethanol, and liquefied petroleum gas by means of an electric spark.

With increasing restrictions being placed on reciprocating engine emissions and increasing demands for energy efficiency, the traditional spark ignition system is quickly reaching its practical durability limits as well as its effectiveness in igniting ultra-lean fuel/air mixtures. Using the traditional ignition techniques will require more voltage and pressure in order to increase efficiency and reliability of Ignition. A lot of problems are associated with these traditional methods like limitation on sparking position, high voltage breakdown,

erosion and higher NOx emissions. Lean combustion has most significant advantage of lower NOx emission however at the cost of relatively lower power output. Therefore in order to overcome lower power density issues, in-cylinder charge needs to be pressurized to higher levels at the time of combustion. Lean combustible gas mixtures and increase in in-cylinder pressure poses problems for conventional spark plug. The amount of the spark energy required for plasma generation at the electrodes mainly depends on the combustion chamber pressure and the distances between the electrodes. An increase in in-cylinder pressure keeping the same distance between electrodes requires an increase in required voltage for ignition. Higher voltage severally reduces the spark plug life and durability. Since, the engine field is very diverse the main emphasis and basis of operation boils down to lower power requirements, better output and reliability of the system.

An alternative solution to standard spark plug is the use of pulsed laser. The laser beam interacts with the molecules and increases their kinetic energy. With the use of proper optical system a localized deposition of energy takes place, which in turn leads to plasma formation. Now, the plasma formation generates the shockwaves and leads to flame kernel development and finally the combustion of the ignition mixture. It has been known for some time that when a short duration laser pulse is focused in air, a strong spark is generated by plasma formation. This plasma could be used to initiate the combustion in a spark ignition (SI) engine potentially. For any technique to be adopted universally, it is its implementation that has to be
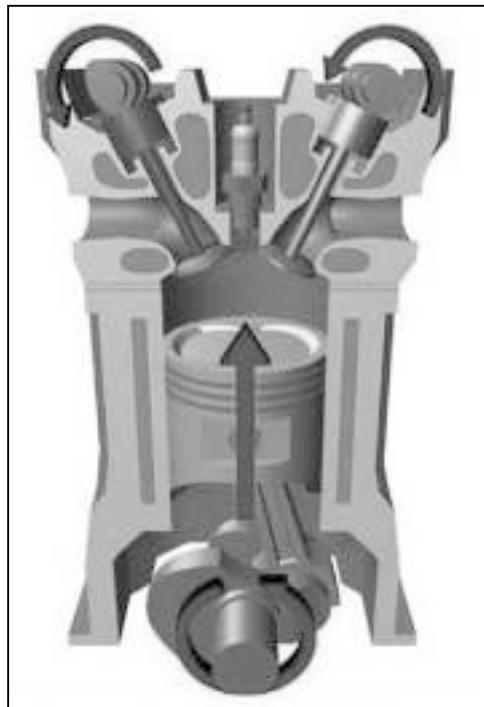
focused on. The implementation of any new system can be judged from its application, advantages and disadvantages. The use of Laser

the laser has its own associated constraints.

pulse as an ignition source is also associated with plethora of advantages:

- Feasibility to choose the position for plasma formation.

- Since there is no discharge between the electrodes, therefore absence of erosion effects and redundancy in plasma formation is ensured.

- The lifetime is expected to be higher than conventional spark plugs.

- Allows ignition of leaner mixtures and thus reduced NOx emissions.

- Precise Ignition timings

The feasibility of positioning of plasma gives an advantage to position it exactly at the middle of the cylinder. This would support better flame kernel development and also divert the energy wasted at cylinder walls to some useful work. Absence of erosion effects and reduced NOx emissions could lead to higher engine efficiency. The Automobile Industry around the world is going through a transformation phase. The introduction of such new technique if implemented correctly could prove out to be a major breakthrough in the Automobile world.

Each and every boon has its own limitation. The judging of implementation of new technique not only depends upon the advantages of using it, but also on the limitations associated with it.

The limitations of Laser Ignition Technique are:

- Higher experimental cost: The installation cost of the setup is comparatively higher than the traditional techniques. But, over the period of time with the new advances in this field, this cost factor limitation could be brought down.

- Laser: The Laser system should be protected from all sorts of mechanical and thermal stresses. The system needs to be insulated from vibrations. The presence of optics for focusing

- Window: If some matter gets deposited on the window surface then it may lead to reduction and irregularity in energy of beam. It may also lead to misfiring. Thus efficiency and reliability of system of considerable affected

Other important parameter that comes into picture when deciding the applicability is the Laser mounting system on the engine. The system should be well isolated from the effects of heat and vibration caused due to working of the engine. The choice of Laser mounting system depends on cost of implanting it and complexity of assembling it. Also, when it comes to laser ignition, the quality of laser beam is an important parameter. Speaking qualitatively, the beam profile should form a Gaussian curve in an idealized case.

Concerns about energy availability and pollutant emissions, such as nitrogen oxides and particulates, have driven concerted efforts towards the design of the next generation of internal combustion engines, capable of higher efficiency and lower emissions. Among the various new designs and concepts, the Laser spark plug development is one of the promising approaches. The technique is still at the development stage. Over the years to come, with substantial research in the field, maybe we would see the world running with engines igniting with Laser Ignition technique.

About the author:

Kewal Dharamshi is a fourth year student in the Department of Mechanical Engineering, IIT Kanpur. His primary areas of research include automobiles and engine technology. He has been declared one of the three winners of the ASME ICED Undergraduate Presentation Competition. More details can be found on the following website:

http://www.asmeconferences.org/ICEF2011/UndergraduateCompetition.cfm

Genome
The Autobiography of a Species in 23 Chapters

▪ Sashank Pisupati

Matt Ridley, in his gripping book *Genome*, takes us through the fascinating story of Life, written in the immortal pages that are genes. Ridley takes us through the genome as if it were a book in itself, a book of Life in which the history of the long struggle of survival is firmly imprinted, chromosomes being the chapters containing genes, the very recipes of life!

Many a religion has thought about creation, and most have one theme in common: that of Creation. In the beginning, there was God, and there was Word. God had not created Word, nor had it created him. God was simply there to preserve the Word, and from them together arose the universe.

Ridley describes the genome as this "Word", and how the information contained in it is a history of life, but since it is also a book of recipes, it has practically *written itself!* He elucidates the mind-boggling thought that, through the singular force of evolution, this word, originally just a piece of self assembling and self replicating chemical code, has turned into self-aware, sentient beings that can ponder their very creation!

What's more, by looking into this book of life, we may just about witness the "original word", the genetic code of the last "universal" common ancestor to almost all the life present on the planet. This is a humbling thought, one that really unites all living beings.

Ridley presents this book of life in 23 chapters, as a metaphor of the 23 chromosomes present in humans. Each chapter takes a look at some aspect of life, by considering certain interesting genes present on that chromosome, their origin, functions etc. unfolding piece by piece, the mystery of how something as complex as a human being can be dictated by a stretch of minuscule fiber.

For example, in a chapter titled *Stress*, Ridley tackles genes involved in the production of a hormone called cortisol, which, among other things is synonymous with stress. He talks about how genes respond to psychological stress, leading to cortisol production, which can suppress the body's immune system, making it slightly more vulnerable to infection! Exam fever doesn't seem so surprising now, does it?

In another chapter, he talks about *Conflict* between the X and Y chromosomes. He talks of genes as if they have personalities, as if the y chromosome is "under attack" from its counterpart, how paternal genes may not "trust" the maternal genes, and the placenta may be the paternal genes' way of "usurping" maternal resources for the embryo.

He discusses diverse topics ranging from the enigma of *Instinct* to the horrifying notions of *Eugenics*; from how *Disease* could have shaped our genes, by allowing metabolic disorders to prevail in return for immunity against infections, to the *Cures* that this knowledge has given us, like gene therapy etc.

Finally, he talks about *Fate* and *Free Will.* He explains how knowledge about the genome, far from being a death sentence or dooming us to disease, is actually liberating, and helps us gain far more control over our life than we thought possible. Even though determinism is an essential part of the genome, he explains how determinism does NOT equal fatalism. He describes how this knowledge is a blessing and not a curse, and how ultimately, the mind, body and genome are intricately connected and affect one another, instead of a rigid hierarchy of command.

In all, this book is truly an eye-opener, gives one both a sense of awe for one's own life-code, and a feeling of freedom, that one's genes are not dictators of one's life, rather, they are the core committee that makes the individual unique. As he puts it, "Freedom lies in expressing your *own* determinism". Read this book today, and you will be inspired, liberated and positively awestruck by the magical book of life you already possess!

About the author:

Sashank Pisupati (sashankp@iitk.ac.in) is a second year undergraduate student in the Department of Biological Sciences and Bioengineering. His academic interests are biology, cognitive sciences and bionics.
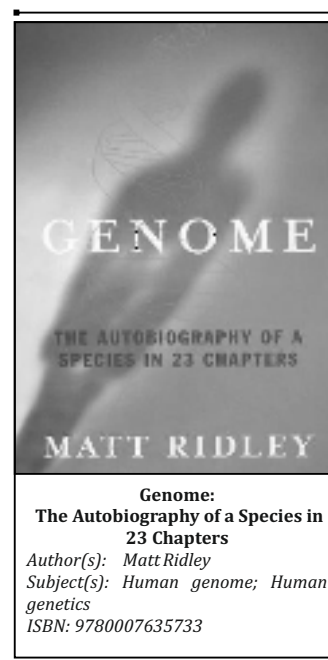
VORWIS @ IIEC 2011

VORWIS (Virtual Object in Real World: Interaction & Sharing) is a product which has grounding in two different concepts: one to make portable holograms and the other to merge the digital world (restricted to computers) with the real world in which we live. The idea is to bring and place the virtual objects (which may be simple 3D objects, the display of your monitor or any kind of digital data) in the real world and provide the user with the ability to interact with them as we would do with normal objects.

The objective is to make an application through which a user can create and modify 3D virtual objects in real world via gesture recognition. Viewpoint is a Kinect sensor attached to an LCD screen which shows the video of the real environment. Two users with the same kind of device can share their virtual objects. The virtual objects are embedded in the real world, and can't be differentiated as virtual looking at the screen, because, on changing the viewpoint, the 3D object doesn't move with the screen; rather appropriate faces become visible depending on the new viewpoint. For example: If a user is looking at the front face of a virtual cube positioned 2 m ahead of him, rotating his view point to his left should enable him to see the right face of the cube.

The VOWRIS project was an effort aimed at producing an application which could affiliate these features and enable interaction with the virtual objects in much more realistic and intuitive manner. Carrying out this task involves the integration of multiple components, including skeletal tracking, hand tracking, gesture recognition, 3D virtual object creation and embedding it into real time streaming video of environment.

Microsoft Xbox 360's Kinect is an imaging depth sensor. It can be thought of as a webcam which gives depth data as well. It captures the real world onto which virtual objects are rendered and merged using perspective principles and shown on the display. User hands are tracked and gestures recognized using algorithms, which are used to interact with the virtual objects in real-time. To make the interaction more intuitive, the virtual world is created in a Bullet physics engine to generate real world effects.

After two rounds of screening, we made it to the finals of Intel Embedded Challenge 2011. We were given an Atom processor for bringing our idea into reality. The prototype was showcased at the finals held at Intel Bangalore. The prototype is able to successfully combine virtual objects (like 3D CAD models) with a stream of the real world and provides gesture interface to interact with the models, all in real-time on an Atom processor. In this way, we provided a proof of concept of merging digital and real world, with natural user interaction. This won us the Education Theme Prize among 31 finalists.

In future the advancements in display technology will enable the development of virtual retinal displays. These are the pair of transparent glasses with an embedded projector which projects the virtual images directly onto the retina. It makes the user feel that a virtual object is embedded in the real world. Using this display technology and using proper tracking sensors, these can be

developed into marketable products.

It will provide extraordinary teaching assistance in understanding 3D structures and graphs. It will have widespread use in 3D CAD design, medical science imaging technology and enhance the gaming experience of users. Artists will be able to create 3D artworks real-time using the gesture recognition and hand tracking algorithms developed. With the assistance of virtual retinal displays, the human computer interface will change to a large extent, as users will be able to view their digital information in 3D space around them.

IIEC 2011 is a great competition for embedded enthusiasts (be it professionals/hobbyists) we have ever witnessed. It's different from others because of various fields the participants look into.

It provides a common ground to bring out the innovators in us and gives us a platform to share our innovations on such a large scale. IIEC 2011 has been a mile-stone in our lives which we will long cherish and a first step towards making our dreams come to reality.

About the author:

Pragyanandesh Narayan Tripathi (pragya@iitk.ac.in) is a third year undergraduate in the Department of Electrical Engineering at IIT Kanpur. His technical interests lie in computer vision, virtual retinal displays and web application development.

Ganesh P. (ganeshp@iitk.ac.in) is a third year undergraduate student in the Department of Electrical Engineering at IIT Kanpur. His research interests lie in virtual reality, machine learning and data visualization.

Mars Simulation Crew 'Lands' on Earth

After 520 days in isolation, the six-member crew that was simulating a voyage to Mars, has "landed."

Mars500, a $15 million project sponsored by the European Space Agency (ESA), China, and Russia, set out to answer a crucial question in the quest to send a crew to the Red Planet: can people maintain their health and sanity in the 17 months it takes to get to Mars and back?

The crew emerged from their mock spacecraft on Thursday and was briefly allowed to greet family and friends before they were whisked into the last phase of the experiment, a three-day quarantine period that rounds out the Mars mission experiment.

"On this mission we've achieved the longest isolation ever so that humankind can go to a distant but reachable planet," crew member Diego Urbina said.

However, psychologists worry that the return to normal life could be a shock to the crew. In a press release, the ESA said the men will undergo "extensive" medical and psychological evaluations in their first few days of freedom. They will greet the media on November 8, and the mission will technically end in December as the astronauts are debriefed, tested, and evaluated, to collect the final results of the mission.

"Time seems to have flown by since we closed the hatch last year," Igor Ushakov, head of the Russian Institute for Bio-medial Problems, the organization that runs the faux ship, told Reuters.

Throughout the simulation, the crew lived exactly as they would if they were traveling to Mars. They subsisted on food provided to actual astronauts, showered infrequently, took daily urine and blood samples, and were subject to surveillance everywhere but the toilets. They also performed more than 100 different experiments onboard.

When the ship "landed" on Mars in February, the crew spent 10 days on the Red Planet and simulated three "Marswalks."

Though the Mars500 crew has "returned" to Earth, according to Reuters, space experts say it will be "decades" before a crew can safely make the 35 million mile trek to Mars.

Source: www.pcmag.com

Hitchhiking on the edge of thought
Part Two: Acceptance and Opposition

· V Gopi Krishna

" … arguments which have led up to the theory and the whole state of mind of most physicists with regard to it may someday become one of the puzzles of history." P W Bridgman, Nobel Laureate.

Following Bridgman's assertion, that puzzle is precisely the one we are trying to solve. In the previous article it was suggested that logically, one need not, and even cannot, DISPROVE an existing worldview before going to the next stage of concepts. It was also noticed that there are generally some "small" discrepancies which start to be observed, which in retrospect are seen to have called for a wholesale revision of concepts. An analysis of a reason for this is seen to be that the coupling of mathematics to reality, or our concepts to reality, determines the need for the revision. We see the same things in a different way.

Let us now continue to examine this process a bit more closely. For this, we need to observe the numerous tales of opposition presented to EVERY new concept that has come about in scientific circles, even to those which have been shown to represent reality correctly. We are not here speaking of extensions of existing scientific view points, but those which question their foundations. What prevented a scientist, or an investigator, from accepting the idea that his current view of the world is incomplete, and more importantly, in accepting the next worldview?

Let us consider the example of Alfred Wegener, who in the relatively recent 1940's, put forward his idea, among other things, that South America and Africa were at one point a single landmass, which drifted apart with time. Frankly speaking, the observation that the two continents fit together is easily obvious to anyone who has the capacity to observe a map, and it follows that a way to accomplish that has to be present. Nevertheless, the idea went through a tremendous amount of opposition, especially with the opposition of the expert of the day (Simpson) leading the way. It was insisted that the continents could not have been together; because

there was no way that they could have moved. It took twenty years' time for the data to finally override these oppositions.

It is interesting to note that around the same time that the quantum hypothesis was being examined in physics, the corresponding "quantization of inheritance" i.e. Mendel's work with relation to genetics was being re-discovered after nearly half a century of their formulation. Earlier formulations supposed that inheritance was a "continuous blend" of characteristics, and Mendel's work showed that the inheritance was based on specific units. And this theory required 50 years for its acceptance. Why does it take that long? If that were to hold true today, it is likely that we are also in the "waiting period" of some such future revelation that is already among us. Do we just have to play the waiting game till the time is right?

One common factor that turns out with respect to opposition to novel ideas is that they are mostly opinions of the scientists of the time. In other words, there is a hesitation, or reluctance, to readjust one's conceptual structure. Imagine that you have worked for your entire career under the assumption that the Earth is flat. Would you welcome the suggestion that the Earth was round, when you are past your prime? Herein something turns up in our analysis for the first time… the subjective and personal elements which come up due to the fact that science is, after all, done by scientists. Hesitation, opposition, acceptance, support, "small" discrepancies, interpretations… these terms point at the fact that to understand why science gets held up in its tracks, we must understand scientists themselves, or more generally: human perception, especially as regards to opinions. It is indeed weird, that with science having to be objective, we are led by its very examination straight to an examination of human understanding and thought processes – the human

element.

At this point we must follow a parallel thread, as to how much of mathematical development of a theory we must carry out by putting our perceptions "on hold". It is observed that a lot of abstract mathematics are possible, some of which our perceptions cannot access. Which one are we to follow? Here there are two possibilities with regard to the situation the mathematics is pointing towards:

1. It is beyond our perception at the moment, but is real nonetheless.

2. Our correlation of mathematics with reality is erroneous.

To decide between the two, what is required is experiential knowledge. But we have seen earlier, that even experiential knowledge can be ignored, during the sequence of development of scientific theories, and this ignorance, or refusal to acknowledge, once more ties up with the human element, labeled commonly as "human error". When human error leads one to make a mistake in reading 1.6 as 1.8, it can be accounted for. But if human error is tied up with the very process of scientific understanding, then one has to account for it, and understand it.

To summarize, it is seen that in order to determine which theory is correct and why delays are seen in

"accepting" a new idea, it is necessary to examine the human interaction with scientific data. Seeing that the data is generally already available for making the shift to a new perspective, it is not logical to merely allow large periods of time to pass in order to allow new concepts in thinking to sink in, but instead to ask "Why did people miss this fact before this time? What caused them to refuse to take it into account, and downright deny its existence?" Besides, we might very easily miss something that is staring us in the face, during this wait. Hence, the human participation is seen to be vital and cannot be ignored.

The next article will examine the relation between the rich field of human experiences and their association with scientific theories, in order to find some tell-tale signs of those delays in acceptance, and to see if they can be overcome.

This article is the second part of the series of 7 articles the author, Gopi Krishna, has written for NERD; on the topics related to philosophy of science and society. Reach out for next issues of NERD to read the following articles of the series.

About the author:

V Gopi Krishna (vgopik@gmail.com) graduated from IIT Kanpur in 2009 and his currently pursuing his doctoral studies at the University of Houston.

Be a Part of NERD HERD!

First of all we welcome all the new members in the them. We invite all those interested. Come which is the only one of its kind in the whole outreach with students contributing from more universities. As we always say, there whole bunch of activities for all of you:

- Become a staff writer! Write regularly solely dedicated to your articles in each

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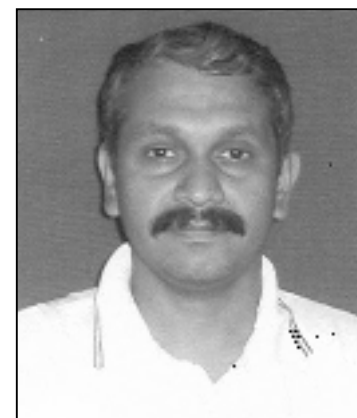
for NERD, and we will have a column issue.

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Just drop in a mail at nerd@iitk.ac.in mentioning your interests and we will certainly get back to you!

The Academia-Industry Bond
Interview with Dr. S. S. K. Iyer

Dr. S Sundar Kumar Iyer has been a faculty member in the Electrical Engineering Department since 2004. Well known among the campus community for traffic awareness initiatives, Dr. Iyer has been also been involved with efforts promoting the education of underprivileged kids. He was awarded the 'Distinguished Teacher Award' on September 5, 2010 in the Teachers' Day function. Here are some excerpts from the interview NERD team had with him as a researcher in organic solar cells, a teacher and an active member of the campus community

NERD- You have been a faculty member of this institute for six years now. What is the most distinguishing feature of this institute in your opinion?

Dr. Iyer- One of the best things is that there is a continuous flux of new young students coming in, who are bright, enthusiastic, with fresh thoughts and wanting to do something novel with their ideas. Also, there are also many activities on this campus that I find quite exciting.

NERD- You have been awarded with the Distinguished Teacher Award on Teacher's Day in 2010. What pedagogical technique makes you a different teacher from others?

Dr. Iyer- Honestly speaking, I was surprised by the award that was given to me, because I never thought of myself as a teacher. It just happened that I joined here as a faculty member. Certainly, it was one of the best options available to me to be able to come back to India at that time. Over the past six years that I have been here, I have come across some brilliant teachers around me and whatever pedagogy you are likely to find in my teaching are all borrowed - either from my colleagues or my earlier teachers whom I had a chance to observe. Even now, I continue to learn a lot from my colleagues for whom I am a tutor or they happen to be tutors in my course.

NERD- Coming to your academic interests, you have been working for Organic Solar Cells. Please elaborate your area of interest to our audience. What has been your major contribution to this area?

Dr. Iyer- Almost a decade back even as I was exploring what I wanted to do in the future, I felt I should do something that will be useful to the society. At that time, my work in microelectronics, although intellectually challenging, was meant for immediate use in video games chips. But I couldn't relate to that. So I wanted to work in an area that I could visualize having an impact on the well-being of the society -such as the energy sector. Once during a visit to IIT Kanpur on the invitation of Prof. Deepak Gupta, I came across this motivated team working on organic light emitting diodes (OLEDs) for displays at Samtel Centre. I thought to myself – "Why not organic solar cells?" I felt that this might be an area I really wanted to work in.

My motivation for Organic Solar Cells was because it was organic, natural i.e., the building block Nature herself has chosen to create the life forms. Most modern electronics are based on inorganic semiconductors, especially silicon. If you look at the periodic table, another element, carbon, has very similar outer electronic configuration as silicon. Carbon could also become the building block for electronics – although the devices fabricated from it today might not be very efficient. But why did Nature choose carbon – because it can form many more varieties of compounds, thus giving more options for newer designs during adaptation. Also, these compounds in life forms are degradable - they degrades after the life of the organisms, get back into the ecosystem and then again come back in some another form to support and build the ecosystem – as we can observe in the trees, vegetation and life-forms in a tropical evergreen forest. Thus there is no issue of any waste being created. So, cleverly designed organic electronics could one day eliminate electronic waste that we are worried about creating today! Also, organic materials are usually formed with less energy – the binding forces between the molecules being Van der Waal forces. Thus the method we adopt for making these devices (organic solar cells) are extremely simple.

Wouldn't it be fascinating if we build them just with equipment available in a typical kitchen? Building organic electronic device could be a cottage industry! (Silicon based fabrication are typically highly specialized and costly.) In view of all this, since it was more eco-friendly, I felt that organic solar cell is a great option. Today's silicon solar cell may not be necessarily produced in an eco-friendly manner. Also, the energy payback time (the amount of time required to retrieve the same amount of energy as was put in synthesizing the product) for organic solar cells can be much less as compared to that in silicon cell. Say, I am incorporating a solar cell in a bus ticket using RFID. A ticket may be used for a month and after that it will be thrown away. But if I use a silicon solar cell for that, its energy payback time is two to three years – meaning all the energy spent in making it is wasted. So organic solar cells can be very attractive in products where things need to be disposed very frequently as well.

Regarding my contributions in field of organic solar cells, I am still in the early stages of the research. We have built a strong team at IIT Kanpur which has built up basic expertise in the research area. We have a few neat

Once we are working on developing a technology, different subjects are bound to come in.

ideas on improving the cell power conversion efficiency that we are pursuing. We are building on these to eventually build modules of solar cells for practical applications such as cell phone chargers, laptops or maybe some novel applications that has not yet been thought of.

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NERD- So, instead of using silicon in solar cell, you are using some carbon based compound for making these solar cell.

Dr. Iyer- Exactly - but there are a lot of challenges involved. Today energy efficiency of a organic solar cell is quite low and the question of reliability remains. Because, if you need less amount of energy to put them together, you need less energy to break them apart as well. So, you need to make sure that the solar cell which you are making will works well at least for the lifetime of product. Otherwise you can get into trouble in commercial production.

NERD- So, this is at an interface of chemistry, electrical engineering and material science i.e. it is very interdisciplinary way.

Dr. Iyer- Certainly. There is one thing that we should keep in mind. Once we are working on developing a technology, different subjects are bound to come in. If somebody is compartmentalizing a technological endeavour as electrical engineering, material science, chemistry … or even economics and social studies, it cannot lead to a practical product. No subject should be out of bounds when working on a real world technology – one should learn what is needed to make the technology successful. So it is not surprising that one has to involve different subjects.

NERD- 2010 Noble Prize Physics went for Graphene. How do you see it connected with organic solar cells?

Dr. Iyer- Graphene is an exciting material that can find application in organic solar cells as well. For example, this material could be used as an electrode in the solar cell. It is interesting to note that it is sp^2 hybridization which makes organic electronic possible and the carbon in grapheme also exhibits that hybridization.

NERD- You have also been involved in solar energy initiative. So, please tell us about that initiative and the benefits that are expected to be obtained through that project.

Dr. Iyer- The solar energy initiative is an important one started by the institute. I am just one of the many members involved. The interdisciplinary team is being led and coordinated by Prof. Monika Katiyar with Prof. Raj Pala as the co-coordinator. The initiative has people working on various aspects such as power-generation, energy storage, power management and tariffs, power electronic systems, etc. The idea is to build a solar energy research enclave (SERE) where solar power around 500 kW on an average and the peak value around 1 MW is to be

generated. (This exact final power generation figures are still being decided and depends on the funds that become available). So, it can be used to supply power to one or two hostels. The enclave will also serve as a test-bed for carrying out real world testing of ideas related to solar power and will be an excellent resource for researchers in different departments of the institute (and possibly outside as well). It will give a big boost for solar energy research in the coming years and decades at IIT Kanpur.

Besides this, our institute is also involved in a Pan IIT Solar Initiative of the Department of Science and Technology, Government of India. Prof. Sensarma of Electrical Engineering department is heading that effort on Power Electronic Systems - where faculty members from various IITs are trying to build a clever way of managing solar power generated in Indian conditions (where grid may not be reliable or even available.).

So, these are exciting times for those working on subjects related to solar energy. A number of big projects and solar power plants are being initiated today in the country, and there is a clear need for them. India is a land of sunshine and it is surprising that these did not happen much earlier. At this juncture, our institute is also playing an active role and taking a lead in promoting this important area.

NERD - Coming to your industry experience. So, you worked for six years with IBM after your PhD before you joined as faculty here. What made you shift from industry to academia?

Dr. Iyer- Strictly, it was five and a half years in the industry. I spent six months of that six year period as a visiting faculty at IIT Kanpur. It just happened that I switched to academia at that point in time. I had finished the project assigned to me within IBM to an acceptable stage, and was looking for newer and exciting opportunities. It happened that I come to IITK and met this group working on organic electronics. I felt organic solar cell may be a good research option for me. IIT Kanpur also has a good reputation in terms of its academic strength and so moving here seemed like a good idea. I was also considering returning to India, as working in one's own country does not require any justifications – as well as some family reasons.

Things just came together and I made the switch from industry to academia.

NERD- During your industry experience, you must have realized that industry-academia collaboration is very well utilized in west as compared to that in India. How, in your opinion, can we improve this collaboration back in our academic system?

Dr. Iyer- In India, the higher education system is top-down, that is, the government decides to set up these institutions and everything develops around them. But now, it is becoming imperative to have more industry collaborations, especially in the coming years. The government is able to fund us now, but there will come a time, when this would not be the case. Then, automatically, one will be forced to go to the industry and work with it.

> **Industry academic research is becoming imperative in the coming years. Industry sets the final goal for research which is often a problem in academic research**

But, one has to be careful here – research generally focuses on far reaching results which industries generally do not support. This is true, even in the west. Except for a few places like IBM, most industry support only research which will yield benefits in the short run. After safeguarding support for good quality long-term and even some blue-sky research, I feel that we should make conscious efforts to involve industry, especially in short term research. This is specifically for two reasons – the first is that it would make the research more relevant to the society. It will get us excited about what we are doing, because we will be able to see the products that come out as a result of the research work. This would be a big motivation, especially for the students in our technological institutes, encouraging more students to pursue research. Secondly, once you know what a product needs, you have a better direction for the research, which makes the whole exercise more effective. Many times, in research, the major challenge is to decide the direction to take, the targets to set. Since the final goal is decided by the industrial, societal and real-world requirements, at least one of the dimensions – the research targets for the project gets defined. Once you have industrial collaboration, another fall-out is that you have to be on your toes all the time. You

find that they keep coming back periodically asking you about the progress. This is not about just submitting the reports on a regular basis, but they want to get real and tangible progress. Even if you don't have good report but good, relevant results, the industry will be much happier than if you had well written regular reports - results and findings no one is likely to use, as could happen in the case with government funded projects. I strongly feel that collaboration with industry is important for these reasons.

In my opinion, IITK has been doing a pretty decent job here across various departments. I am familiar with Samtel Centre since I work there. This centre is an interesting model for the Indian scenario, where industry, government and academia directly collaborate. We get research funding from the government and some from the industry. Researchers and technical staff from collaborating industries are often stationed here or visit us at IIT Kanpur to participate in the research work. The targets for the research projects are arrived at in consultation with the industries. Prof. Deepak Gupta has been leading a successful collaboration with Samtel Colour in OLED for displays. Prof. Monika Katiyar [and now also Prof. Ashish Garg] is working on a project related to organic solar cells and OLEDs on flexible steel substrates with Corus (now Tata Steel, Europe), a steel company. Prof. Y.N. Mahapatra is heading a project on printable electronics involving Manipal Press. We also have an MoU signed with Moser Baer and are presently working with them in an organic solar cells project - and looking to work on a project involving OLEDs for lighting in the future. All the Samtel Centre members participate in these projects and contribute to them according to their areas of expertise. Just as in this centre, we have many examples of successful national and international collaborations across the institute in the different departments and centres. So, we are on the right track.

NERD- And this is different from consultancy projects that faculty members do for industry?

Dr. Iyer- Yes, it is not about consultancy. It is purely research, but the direction for research is

defined by involvement of industry. We write very similar project proposals as we do for our research funded by the government. Most of the IPR (Intellectual Property Rights) created are also open in that sense. The first use rights might go to the participating industry.

NERD- What is your opinion on recruitment of faculty members with an industrial experience?

Dr. Iyer- In faculty recruitment, the primary criteria should be whether the person is well qualified, accomplished and has a good academic track record. The person should be knowledgeable and interested in teaching the subjects he/she is expected to teach on joining the institute. Industrial experience, of course, brings in an additional dimension of experience to the faculty pool which can bring value to the teaching and research that he/she eventually takes up in the institute. I would welcome it.

> **Industrial experience, of course, brings in an additional dimension of experience to the faculty pool which can bring value to the teaching and research that he/she eventually takes up in the institute.**

NERD- You are also very actively associated with *Asha*, which plans to catalyze socio-economic change by educating underprivileged children. Please tell us about the activities of the group and the challenges that this group is tackling.

Dr. Iyer- I was lucky to come across an organization such as *Asha for Education* during my PhD days. Many individuals came together voluntarily with similar hope (Asha) for socio-economic change by contributing what one could – ideas, time, money, leadership ...- towards education projects for underprivileged children in India. The organization came together with a minimum of a formal structure or hierarchy, except what was needed as per the law of the land where the group got registered. There were a few basic rules, such as, projects should not discriminate on the basis of politics or religion. All work of the organization, especially outside India, is voluntary and there are no paid staffs or overheads. In India, in some special cases some fellowship or stipend is given to 'full-time' volunteers working at the grassroots level. Within this framework, a whole gamut of education related activities are taken up with project partners across India or in a few cases directly by *Asha* volunteers themselves. As in the name, the

purpose is to spread 'Asha' or hope which can initiate changes in individuals and communities in a self-sustaining way. Today, there are more than 40 active chapters across the US, Europe and Asia, besides India.

After coming back to India, I have been able to be part of some of the activities of *Asha* in this region and in a few other parts of the country. It is worth mentioning that two of the founders of *Asha* are linked to IIT Kanpur – Prof. Deepak Gupta and Dr. Sandeep Pandey. There is a vibrant chapter of *Asha* at Kanpur led by some dedicated people involved in some targeted projects. There is an *Apna Ghar*, in Nankari, where some children of migrant labourers working in brick-kilns decided to break the cycle of migration. Their experience in last two years has been really encouraging. They are much more self confident now and are performing well in their school. Even when they go back to their villages, they are able to negotiate better with moneylenders and the contractors - and thus their parents are less likely to be exploited. So, even a small amount of education to children has had a positive impact. There is another effort linked to *Asha* Kanpur called *Sankalp.* This group works with mentally disabled children and works to make them self-sufficient to the extent possible. With proper care and training these children can also participate as fruitful members of the society. Then there is *Manavia Siksha Sanskar Sansthan* at Mandhana that had strong links with Asha in its formative year. Now the group has matured and is independent, but continues to work closely with *Asha*. This group holds workshops on Jeevan Vidya and other activities for all members of the society to help lead a better life. (They also hold workshops at IIT Kanpur regularly.)

NERD- You have also been active with PRAYAS and involved with Minimum Wages Monitoring Committee. What motivates you to work for these underprivileged ones?

Dr. Iyer- I have not worked much with *Prayas*, except joining in some classes when I had first joined IIT Kanpur. This mainly because of time constraints. I think the students at *Prayas* are doing amazing work by helping needy children in

the neighbourhood. Hats off to the students who are putting in a lot of time and effort.

That way, IIT Kanpur is lucky that there are many dedicated groups, such as *Siksha Sopan* and *Jagriti* to name a couple more, that have emerged from here. These groups led by faculty members and students of the institute are doing important work in the sphere of basic education for children over the past many years.

Regarding Minimum Wage Committee, it happened that I was nominated to be part of the committee by the institute. Within the constraints, I hope the committee was able to contribute positively – and I believe it did. We are dealing with some deep rooted systemic problems and such committees at best work as band-aids. But even that is necessary and the fact that IIT Kanpur has such a committee is indicative of the dedication and efforts of many individuals who have been working on these issues for a long time. Real change will come only when the socio-economic structure of the society changes in the Kanpur area, UP and in India.

> **I think the students at *Prayas* are doing amazing work by helping needy children in the neighbourhood**

NERD- How would you describe Dr. Iyer in one line?

Dr. Iyer- An ordinary person.

NERD- What is the final message which you would like to give to the students?

Dr. Iyer- The most important thing is to be positive in life and be a good human being. If you can do that, you will have a satisfying life. So, this is what, I would strongly recommend to all the students - be a good human being and bring out the best you have for the benefit of mankind.

NERD- Thank you, so much Sir, for sparing your time for us.

Magic Table

· Deepam Kedia

Today's generation need no introduction to touch devices. They all have Mobiles, I-phones, Tablet PC. Apart from the classy feel, touch interface provides a dynamic user-machine interaction. The interactive surface changes according to the screen and needs of the user. It also facilitates for larger displays as we eliminate the use for other peripherals.

Every touch based device needs a set-up to recognise the coordinate of interaction over its display. There are different ways to implement this based on which touch technologies can be broadly classified into three categories.

1. Resistive

2. Capacitive

3. Surface Wave Touch screens

The Resistive touch screen has two layers, a conducting layer and a metallic resistive layer. When a point is touched the two layers make contact over the point, current flows and the coordinates are registered by measuring the current. When two points are touched simultaneously, the layer gets deformed and touches the conducting layer at many "garbage" points. Thus, this technology does not support multi touch.

In a capacitive screen, a layer of electronic charge is created. There is a decrease in the electronic charge at the point of touch which is measured by four electrodes at the corners. This technology can implement multi touch but only to a small extent.

Surface Wave touch screens have an electromagnetic wave dispersed over the screen. Whenever a touch is made, the corresponding reflected ray is received by a receiver and the coordinate is marked. This type of touch is better than others because, the amount of display light that reaches the user is almost 100%. It can also implement large number of touch recognitions simultaneously. The cost of scaling up is minimal compared to other touch technologies.

In our project a layer of infrared

was set with the help of infrared lasers. The reflected wave was detected with the help of an infrared camera. An image processing library called Touchlib processes the data communicates with the computer. This data can be integrated with Windows 7 using a driver called multi-touch vista. The camera is a normal webcam which is hacked to replace its infrared filters with a photographic film to block visible light. This converts our webcam into an infrared sensing device. Contents are displayed with the help of a projector.

Technologies like these can be very useful in the future especially in the areas that require large number of people interacting with the same device. For example, these devices can be implemented at railway stations on large information desks where every user has an individual niche, to enquire details of his interest. Similarly they can be used in conference rooms, schools and restaurants. A project like this converts a normal table into an intelligent device, which until now was used only for decorative purposes apart from keeping objects.

This project mainly involves the cost of a computer, projector and a webcam. The use of Kinect cameras, can greatly improve the efficiency of such tables. They may even eliminate the need for a table to interact with the computer. The next planned release of Windows also promises an integrated touch communication driver and specific multi touch based applications. This will make the interactions easier and smarter.
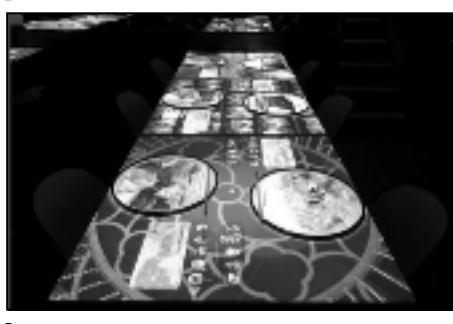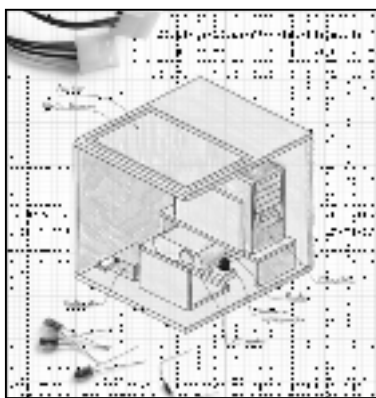
About the author:

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F-14 Tomcat
A REMOTE CONTROLLED FIGHTER PLANE

- Deepak Pawar
- Manish Kumar

F-14 History:

The **Grumman F-14 Tomcat** is a supersonic, twin engine, two seat and variable sweep fighter aircraft. The Tomcat was developed forUS Navy's Naval Fighter Experimental (VFX) program. The F-14 was the first of the American teen series fighters which were designed incorporating the experience of air combat against MiGs during the Vietnam War.

Introduction:

The special feature about F-14 Tomcat is that it uses variable geometry, i.e. the wings can be swept back and returned to its original flight.Typically a swept wing is more suitable for high speeds while an unswept wing is suitable for lower speeds allowing the aircraft to carry more fuel and payload as well as improving field performance. A variable sweep wing allows a pilot to select the correct wing configuration for the plane's intended speed. The variable sweep wing is most useful for those aircrafts that are expected to function at both low and high speeds.

Special Features:

1. The first EDF(Electric Ducted Fan) jet plane in the club.

2. Variable wing sweep.

3. Use of tailerons, i.e. completely movable surfaces working as both ailerons and elevators.

Specifications:

- Weight – 750 g (without batteries)
- Wing area –approx. 1400 sq.cm
- Wing span - 105 cm unswept and 61 cm fully swept
- Wing loading - 0.535 g/sq.cm

Construction:

In the first and next half week, we cut designs of every part of the plane from bio-foam and sanded each part carefully. Extra care had to be taken during the cutting.

After that came the part of assembling the plane. Assembling the plane was not easy because of its complex shape and design.Before that we made the wing sweep arm for wing sweep mechanism. It was made from balsa ply.

The fuselage is a one piece part. After placing the side parts, we made inlets for mounting the EDFs. Then

EDFs were mounted along with wing sweep arm. Next we made wings,tailerons and rudders, and assembled them with main fuselage body. Then we learnt about the electronics parts and installed them.

Difficulties we faced:

1. One of the major problems was to maintain the symmetry of the wings before and after sweep.

2. We needed to run two motors using only one battery, so we made Y connector for this. But then we found out that one of the ESC (Electronic Speed Control) motors was responding late.

Wing sweep mechanism pictures:

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Accolades

This academic year brought many academic achievements and laurels to IIT Kanpur. Hope for the same trends to continue in future. Below we summarize the major accolades by students and faculty members of IIT Kanpur in last few months.

- Two dual degree students in Aerospace engineering**, Puneet Singh and Sriram. G** won the best new entry in the **American Helicopter Society Student Design competition** 2011.

- "Vaayu-An effort towards greener aviation" proposed by **Mukul Atri and Sriram. G** of Aerospace department (under the mentorship of **Dr. Abhijit Kushari**) was placed 1st in the foreign division category of the **2010 NASA Student Design Competition**-Environmentally Responsible Aviation (ERA). The challenge was to submit ideas and designs for aircraft or engine concepts and technologies that would assist in meeting the project's goals for more environmentally friendly aviation by the year 2020. The links for the results are following:

  http://aero.larc.nasa.gov/era_univ/competitions_univ_era.htm

  http://cio.gsfc.nasa.gov/topics/aeronautics/features/2011-ERAProject.html

- **Kewal Dharamshi** (Fourth year undergraduate student of Mechanical engineering Department) was declared to **be one among three winners of the ASME ICED Undergraduate Presentation Competition**. The details can be found at the following:

  http://www.asmeconferences.org/ICEF2011/UndergraduateCompetition.cfm

- **A Ravi Kant** (a PhD student in Biological Sciences and Bioengineering department, working with **Dr. Anupam Pal**) received the **best paper award** for his oral presentation at the plenary session of the 1st Biennial Meeting of Indian Motility & Functional Diseases Association (IMFDA) held at Sanjay Gandhi Post Graduate Institute of Medical Sciences (SGPGIMS), Lucknow. The paper he presented was titled **"Intestinal transport and mixing analyzed using computer simulations", A Ravi Kant, A Pal**.

- Two teams from IIT Kanpur won the finals of **Intel Embedded Challenge 2011** - A national level Embedded Design Contest to recognize and reward outstanding ideas in embedded technology, based on the Intel Atom processor.

  Brief descriptions about the two projects are as follows:

  (i)VOWRIS: Virtual Object in Real World Interaction and Sharing

   A system for interacting and sharing virtual 3D objects in a real-time classroom environment using Kinect sensor.

  Award: Education Theme

  Team: **Ganesh Pitchiah and Pragyanandesh Narayan Tripathi**

  (ii)Embedded Eyes for the Blind

  A novel system to support indoor navigation for the blind with auditory guidance in real time using stereoscopic vision.

  Award: Popular Choices

  Team: **Anurag Awasthi & Avani Nandini**

- **Sriram. G** of Aerospace engineering department was among the 32 students selected worldwide to participate in the 2011 Caltech Space Challenge conducted by Keck Institute of Space Studies and California Institute of Technology. **His team "Voyager", comprising of 16 students from 8 different countries won the Caltech Space Challenge 2011**, where students divided into 2 teams prepared

- competing proposals for a manned mission to a Near Earth Object (NEO). They were mentored by

scientists and engineers from NASA JPL, European Space Agency, Japanese Aerospace Exploration Agency and Lockheed Martin through lectures and discussions.

The relevant links for the final presentations, lectures and the news are the following:

http://www.kiss.caltech.edu/workshops/space-challenge2011/schedule.html
http://features.caltech.edu/features/235

- Mr. Joydeb Goura (of Chemistry department under the supervision of Prof. V. Chandrasekhar) was adjudged "First" in the section of "Inorganic" poster presentation in recently held UGC-sponsored and CSIR-aided International Symposium on "Recent Trends of Research in Chemistry (RTRC - 2011)" at the Department of Chemistry, Midnapore College, West Bengal.

- Mr. Ashutosh K. Dubey, a PhD student of Material science and Engineering department has been chosen to receive the Young Scientist by Indian Science Congress Association (ISCA) for 2011-12.

- Mr T S R Ch. Murthy, an alumnus of Material science and engineering department (MTech, 2002-2004), received 2011 Young Metallurgist award by the Ministry of Steel, Government of India. He is a scientist at BARC, Mumbai.

Some of the above works have come in the first two issues of NERD of this academic year (Volume 4 Number 1 and the present issue – Volume 4 Number 2). We hope to bring other works in next issues of NERD.

Nobel Laureates, 2011

Nobel Prize in Physics

Saul Perlmutter, Brian P. Schmidt and Adam G. Reiss "for the discovery of the accelerating expansion of the Universe through observations of distant supernovae"

Nobel Prize in Chemistry

Daniel Schechtman "for the discovery of quasi crystals"

Nobel Prize in Physiology/Medicine

Bruce A. Beutler and Jules A. Hoffmann "for their discoveries concerning the activation of innate immunity" and Ralph M. Steinman "for his discovery of the dendritic cell and its role in adaptive immunity"

Nobel Prize in Literature

Tomas Tranströmer "because, through his condensed, translucent images, he gives us fresh access to reality"

Nobel Peace Prize

Ellen Johnson Sirleaf, Leymah Gbowee and Tawakkul Karman "for their non-violent struggle for the safety of women and for women's rights to full participation in peace-building work"

Nobel Prize in Economics

Thomas J. Sargent and Christopher A. Sims "for their empirical research on cause and effect in the macroeconomy"
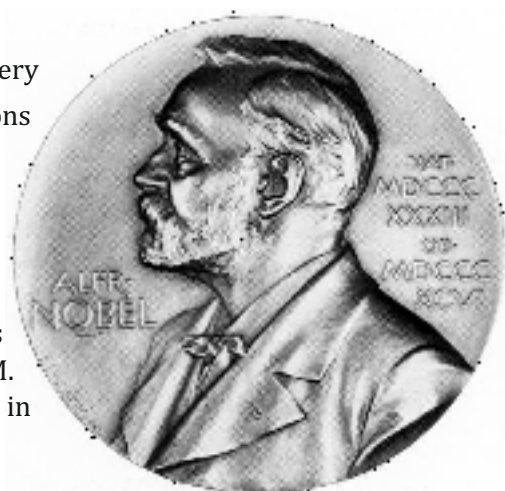
Mobile Sniffer

Introduction

This handy mobile bug or cell phone detector, pocket-size mobile transmission detector or sniffer can sense the presence of an activated mobile cellphone from a distance of one and-a-half metres. So it can be used to prevent use of mobile phones in examination halls, confidential rooms etc. It is also useful for detecting the use of mobile phone for spying and unauthorized video transmission.

wavelength of 3.3 to 10 cm. So a circuit detecting gigahertz signals is required for a mobile bug.

Here the circuit uses a *0.22μF disk capacitor (C3)* to capture the RF signals from the mobile phone. The lead length of the capacitor is fixed as 18 mm with a spacing of 8 mm between the leads to get the desired frequency. The disk capacitor along with the leads acts as a small gigahertz loop antenna to collect the RF signals from the mobile phone.
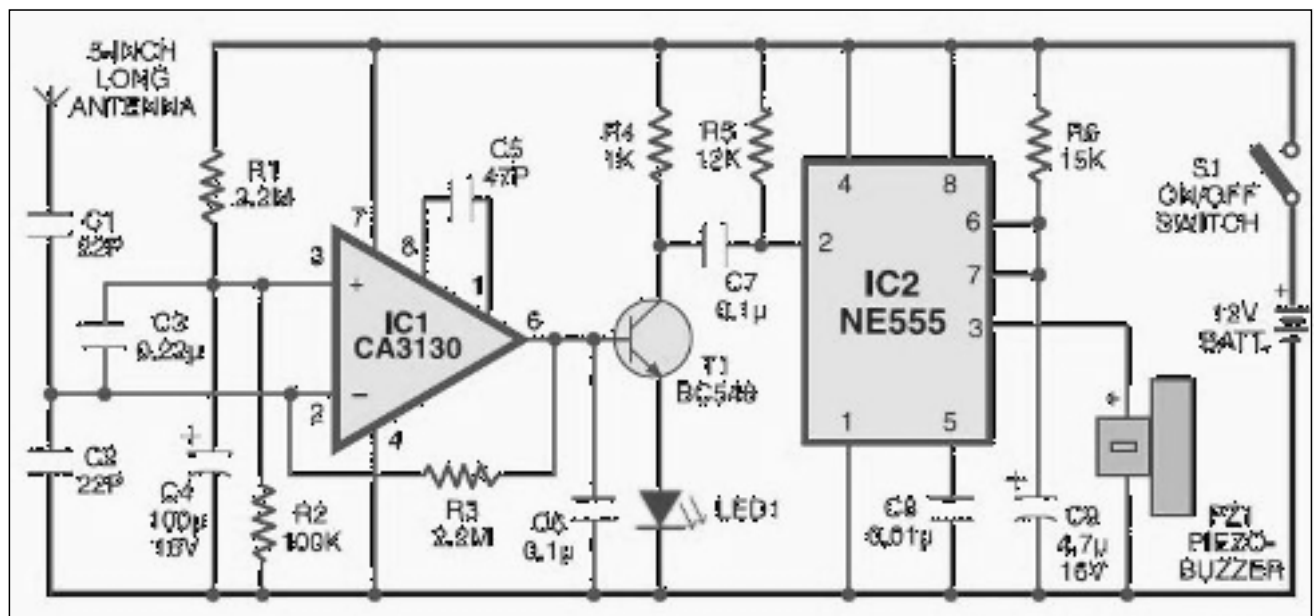
The circuit can detect both the incoming and outgoing calls, even if the mobile phone is kept in the silent mode. The moment the bug detects RF transmission signal from an activated mobile phone, it starts sounding a beep alarm and the LED blinks. The alarm continues until the signal transmission ceases.

Functioning

An ordinary RF detector using tuned LC circuits is not suitable for detecting signals in the GHz frequency band used in mobile phones. The transmission frequency of mobile phones ranges from 0.9 to 3 GHz with a

Op-amp IC CA3130 (IC1) is used in the circuit as a current-to-voltage converter with capacitor C3 connected between its inverting and non-inverting inputs. It is a CMOS version using gate-protected p-channel MOSFET transistors in the input to provide very high input impedance, very low input current and very high speed of performance. The output CMOS transistor is capable of swinging the output voltage to within 10 mV of either of the supply voltage terminals.

Capacitor C3 in conjunction with the lead inductance acts as a transmission line that intercepts the signals from the mobile phone. This capacitor creates a field, stores energy and transfers
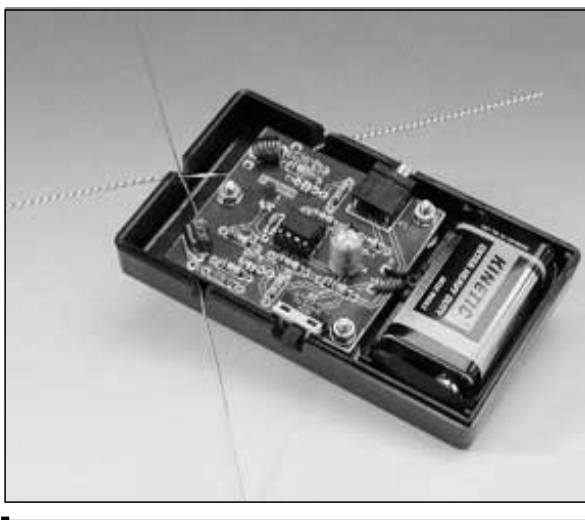
the stored energy in the form of minute current to the inputs of IC1. This will upset the balanced input of IC1 and convert the current into output voltage.

Capacitor C4 along with high-value **resistor R1** keeps the non-inverting input stable for easy swing of the output to high state. **Resistor R2** provides the discharge path for capacitor C4. Feedback resistor R3 makes the inverting input high when the output becomes high.

When the cell phone detector signal is detected by C3, the output of IC1 becomes high and low alternately according to the frequency of the signal as indicated by LED1. This triggers monostable timer IC2 through capacitor C7. Capacitor C6 maintains the base bias of transistor T1 for fast switching action. The low-value timing components R6 and C9 produce very short time delay to avoid audio nuisance.

Uses and Applications of Device

1. It can be used in examination rooms, library, banks etc. where the use of mobile is strictly prohibited.

2. It can be used by armed personals at check points, borders and other places of national interest.

Future Modifications

The range of this device can be improved to 6-8 metres from the existing 1.5 metre range. At present this device can detect only mobiles operating on GSM900 MHz but in future we would build it to detect GSM1800 MHz along with GSM900 MHz. This device has been built on breadboard but in future we would like to solder it on PCB.

Conclusion

Looking at the present situation, this device in its naive form can be used in small examination rooms and also can be used for fun.

About the author:

This project titled 'Mobile Sniffer (Detector)' is a bona fide work of Kuldeep Yadav (10358) and Suman Kumar (10733) under the guidance and supervision of Manish Kumar (Y9317) done as summer project of HAM Hobby Group. The authors are interested in building moving mobile sniffers and mobile jammer circuits.

REVOLUTION IN TECHNOLOGY
'AAKASH'

India has launched the most economically priced computing device Aakash LCAD Tablet on 5th October 2011.It is expected to cost around Rs.3000 and government has decided to provide it approximately at Rs.1500 for students.

The product will come pre program including browser, conferencing, Pdf reader, sci - administration functionality, for media devices, selection content material viewing. The tablet could have provision receiving phone calls making The product includes an image tablet pc carries with it an and aides an expanding installed with software capability with regard to video lab, open office, remote device media player, input and output for interface and able to several more recent edition of the pc regarding making and use of the tablet pc via GSM. resolution of 800x480. The internal storage space of 2GB memory space of 32 GB. The tablet computer carries a 256 MB Ram and two USB plug-ins. . As it is compact convenient to carry wherever you would like.With all these benefits it can make India a 100% pc literate nation. There will be no student left without pc in few years in India. Aakash tablet can certain be a milestone in India' s development.

Source - http://protradecopycat.info/various-importance-of-aakash-tablet/

Virtual Boxing

Background

The Buzzwords: Interactive Gaming, Computer Vision, Image Processing, Real time 3D Graphics

Have you ever wanted to interact with your computer using hand gestures, a la Tom Cruise in *The Minority Report*? To the typical home user or gamer, the idea would sound intriguing. The method that we used, although inexact, did offer enough functionality to be used for simplistic tasks. In the process, we delved a little deeper into the world of interactive gaming, the latest craze among game developers.

The result was a webcam-driven boxing game that you can play by moving your own hands.

The Methodology

Using the in-built webcams available on laptops, it is possible to process the incoming video feed and use it as an input medium. We made use of a popular open source computer vision library called Open CV, along with a blob library built upon open CV called cvblobslib.

In consonance with our spirit of a simplistic approach, we made use of colour to distinguish the user's hands from the background. We needed to develop a real-time 3D graphics environment for which we utilised Open GL.

We created a simple mapping between the playing region in our game and the coordinates of our hands, which were using the webcam and appropriate libraries.

THE TOOLS WE USED

Open CV

The task of detecting the position of the hands was done using open CV library. (Using this library we can manipulate images pixel wise. It also consists of many inbuilt functions, which make the task of image processing easier.)
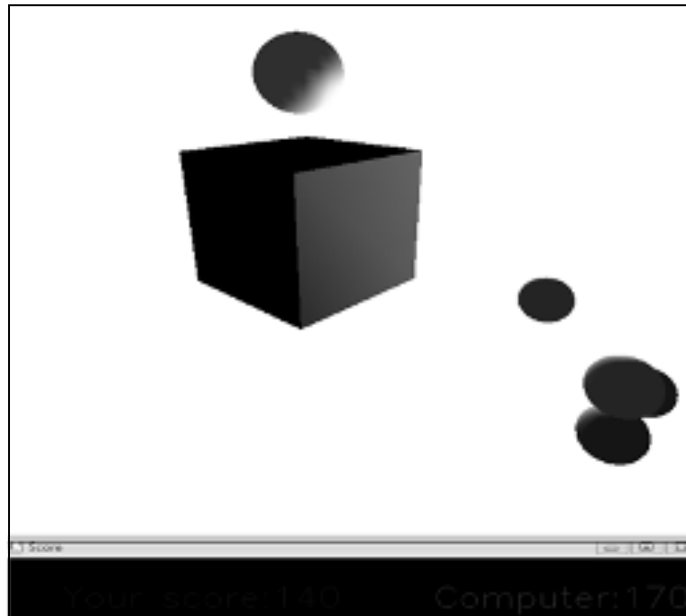
We classified each pixel into two categories, depending on whether its colour matched the pre-assigned colour range. Based on this, we gave the pixel a white or black colour.

Cvblobslib

The binary black and white image created had two major regions which were predominantly white. The key was being able to find the centre of each region separately. This was where cvblobslib came to the rescue. Using this library, we could pick such distinct regions of high density, referred to as blobs. So, we determined the central position of the largest two blobs available, as well as their areas, the latter being used for depth perception.

Open GL

We made use of the open GL Utility Toolkit, often referred to as GLUT, to create the windowing interface and the graphics environment. This enabled us to easily draw objects like spheres and cubes without going into the finer details of drawing using open GL. OpenGL allows us to create a 3-D world and how we want to look at it (Perspective projection, orthographic etc. This makes heavy use of matrix transformations.). The camera angle and position could hence be very easily changed during the duration of the game. Other features of Open GL like colours and lighting were also incorporated in the game. As the game is still in its initial stages, and because our primary goal was the interface, each player is represented as a rudimentary collection of spheres and cubes.

The computer's hands are programmed to hit the user's body in a finite number of preset moves, their order being chosen by a random function. Of course, you can always hit back. The key was making sure the game wasn't one-sided.

Problems along the way

Our original intention was to use two cameras which would determine the position of the hands, to a reasonable extent of accuracy. However, in practice the two cameras caused the program to slow down. In addition the user would have to ensure that his hands were in the field of view of both the top and the front camera, which would make the interface more difficult to use. Because adding two cameras did not lead to a significant improvement in our application we chose to drop the idea altogether and use a single camera. Instead, the area of the blob elements (our hands) was used for depth perception in the game.

Lighting conditions led to a variety of complications. We were initially using BGR colour space for specifying the required colour range. We later realized that colour ranges in the HSV colour space were intuitively easier to adjust when the ambient lighting changed. However, the application still does not work well in dim lighting.

The other major issue was choosing the right colour. This was a major decision for us to take. Black was our initial choice. However, though easily detected, hair and other darker objects in the background led to problems. As a result, our blobs didn't actually coincide with the position of our hands. We then started testing other colours, with purple and orange giving the best results. This was largely because the two were rarely present in the background. Although the program could run for a number of colours, we decided to stick to purple.

We also incorporated shape detection, but then discarded the idea as this usually lead to slower performance. After all, our interface had to be real-time.

The Way Ahead

1. Generalising the Interface: Hand Gesture Recognition.

A project called HandVu by the Moves Institute manages to detect a significant variety of hand gestures. This is probably the future route for our project as well, because it is important to go beyond the use of coloured gloves for the purpose.

2. Making use of More Precise Technologies.

An SDK for Kinect has been recently launched. Because it is probably the best hardware we can get for the purpose, we plan to test its capabilities when used for our application. The software technology enables advanced gesture recognition, facial recognition and voice recognition. Kinect is capable of simultaneously tracking up to six people, including two active players for motion analysis with a feature extraction of 20 joints per player. However, Prime Sense has stated that the number of people the device can 'see' (but not process as players) is only limited by how many will fit in the field-of-view of the camera.

This somewhat superficial foray into the latest developments in gaming and user interfaces was never intended to satisfy the seasoned programmer to ditch the keyboard. Instead, the target was to initiate a new line of thought and to stimulate future developments in this direction.

About the authors:

The above game was developed by Prajya Bhatt (pbhatt@iitk.ac.in;CE), Harshit Maheshwari (harshitm@iitk.ac.in;CSE) and Shubhdeep Kochhar (shubkoch@iitk.ac.in;CSE) as summer project under Programming Club, Science and Technology Council, IIT Kanpur. Their interests lie in the field of image processing and computer graphics.

Time to Shoot

We are looking for some really mouth-design the first cover pages of

The photograph maybe a very picturesque in the campus. So sending in the latest photographs is selected for the cover page, you require at least two photographs the photographs should be original image editing software.
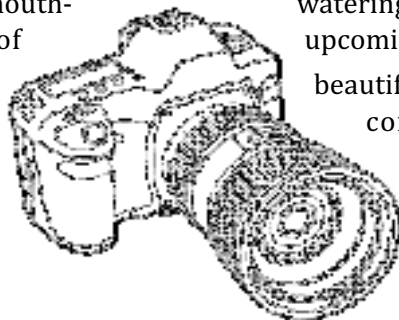
watering photographs that might help us upcoming issues of NERD.

beautiful image of a bird or a tree or anything come forwards and contribute by to nerd@iitk.ac.in. If the photograph get certificate of appreciation. We per issue. Please keep in mind that and may be modified using any

Aerospace Summer Workshop

From 16 May to 15 June 2011, a group of highly enthusiastic first year and second year students from the department of aerospace engineering participated in a summer camp. It was aimed to encourage practical and hands on learning. The students were mentored by fourth year students and were given lectures by some of the faculty. The participants prepared reports on their work and gave a final presentation to the department, which was appreciated by all. They were subdivided into three groups and worked on a small project as detailed below:

Rockets
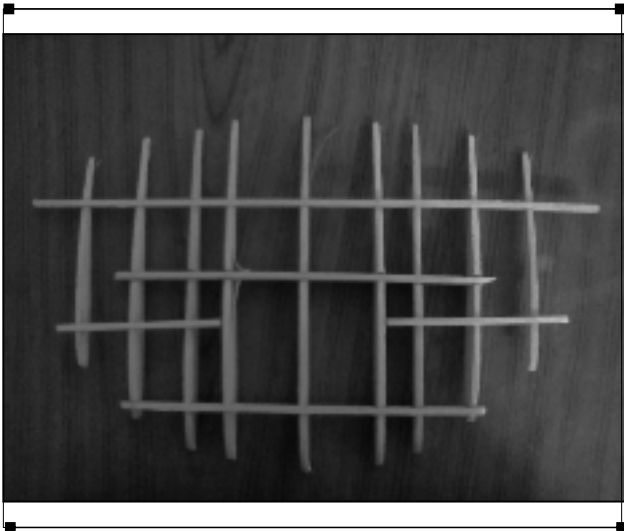
One of the most awe inspiring moments , is that of a rocket blazing a trail of smoke as it reaches out to touch the sky. This is exactly what the team of 5 students, Abhishek, Ankit, Asit, Avish and Nikhil were able to achieve this summer. They experimented with different shapes and sizes to make a stable rocket.

On course to this goal, they built a portable and steady launchpad, which could be adjusted to give a specific launch trajectory. They experimented with home-made rocket fuels. They made a fool proof ignition mechanism that allows the rocket to be launched safely from a distance.

There were several eureka moments and much struggle. The appreciation of the control surfaces was enthusiastically explained to the team by Dr. AK Ghosh. And when perfect launches were achieved, everybody was left staring straight up, gaping and the only word that escaped their lips was "Wow!"

Aircraft Wing Box Design

The golden rule of every aircraft designer is less weight. But ensuring safety of passengers or cargo requires high structural integrity which is at odds with the lower weight principle. The team of Alif, Ankit, Karan, Siddhartha and Varun set out to build the lightest wing box structure that can take a total of 64 kg weight cantilevered.

Dr. C S Upadhyay introduced them to design concepts in Aerospace structural engineering. They experimented with different cross section beams, made CAD and FEM models and ended up with a structure that could take 59kg and weighed only 580g itself! It was a hands on experience that they will never forget.

Micro Air Vehicle

Tiny flying things have been the toys that every kid dreams of. And with a new wave of interest into these vehicles by government and private agencies, research has multiplied in the area. The team of Abhijit, Anubhav and Brijesh did an extensive literature survey on how to build a 30cm flying MAV. They applied design optimization principles and came up with the best plan.

Dr. Sanjay Mittal advised the students on stability and control of aircraft, while Dr. C Venkatesan gave an overview on how to plan for and solve problems in such projects.

It All Started with a Big Bang...

■ **Sarthak Chandra**

Once upon a space-time,
At the beginning of it all,
There was a sudden inflation,
And expansion of it all.

This inflationary period,
Caused universal homogeneity.
This held scientists puzzled everywhere,
From Europe to New-York city.

This weird phenomena,
Whose reason is still unclear,
Left its mark on C.M.B.R.,
With temperature uniformity there and here.

After this inflation,
Temperatures fell suddenly.
Protons caught electrons,
In atomic jugglery.

Anti-matter was also present,
But in a far lesser amount,
The cause of which so far,
No-one could surmount.

The matter began to coalesce,
Due to gravitational attraction,
Starting of generation I
Star cycles in action.

These stars were clustered,
In structures called galaxies,
Shaped elliptical or spiraled,

Or irregular like a swarm of bees.

Some stars exploded,
To star dust once again,
Kicking off the cycle,
Generation II began.

Our sun is characterized,
As a Generation III star,
Giving us light and heat,
From a distance afar.

Here lies the planet we inherit,
Just dust on the cosmic scale,
To protect it is our duty,
And not put it up for sale.

For this is our only planet,
This is all we get,
Save our earth to save yourself,
This we must never forget!!!

About the Author:
Sarthak Chandra (sarthakc@iitk.ac.in) is a first year undergraduate student in the Department of Physics.
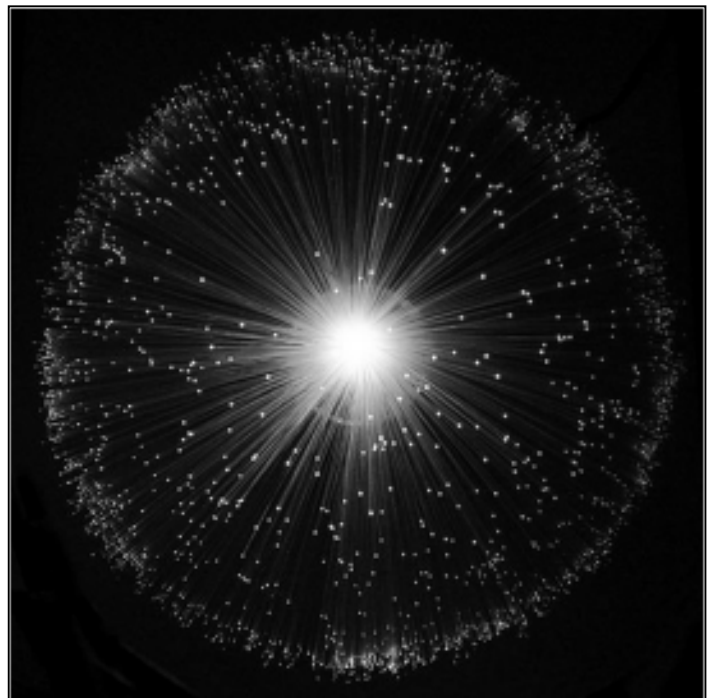
The Four Horsemen

▪ Parth Saurabh

1892

Huge gusts of wind blew through the desert. There was the lone guy on horseback trying to make his way to the next town. He knew there were people in the town who wanted him dead. He was starved and couldn't go on this way any longer anymore. So, he finally gathered the courage to enter the town. On the very gates of the town, he met the two people he was dreading.

"So, little Bill, you are finally here to grace us with your presence," said the guy with the smaller physique, a balding man, in his middle age.

"Look Sherriff, I got no grudge against you. What I've done in the past can be forgotten and we can have a peaceful life now. That is all I want Sherriff, peace and quiet," said the guy on horseback. The concern in his eyes was even greater than the hunger.

"The law is supreme now, little Bill, cowboys like you can no longer inhabit the roads. You will have to pay for the unlawful things you've done."

Little Bill was tired, but the instinct of survival suddenly flared within him. He was the best shot in the county. He quickly upholstered his gun and took two shots. The shots were right on target. Seconds later, the Sherriff and his deputy were stretched out on the ground.

The conquest was his.

1944

The village was suffering from famine. The Great War was still going on. On the outskirts of Hamburg, Ulrich was struggling for food. The allies were moving in closer every day. Along with that, the famine had struck, leaving nothing for the poor anymore.

Ulrich was sitting on the footpath, in the market, with his equipment. He was a locksmith by profession. In the horror of war and the struggle for survival, the last thing people cared for was locks. There had been no one at his shop since morning and it was already dusk now.

He had tears in his eyes. Suddenly, he heard footsteps on the pavement. He saw a guy passing in front of him. Ulrich jumped to the man's feet.

"Please, buy a lock. I have no money; my family is going to die. I have a little son, please." Ulrich pleaded before the man. He was weeping feverishly.

The man himself began to cry.

"I would give you money if I had any. I am a farmer. This famine has rid me from everything I own. I am sorry but I don't have anything to give."

The man went on.

This was the famine.

2006

The world was in crisis. The end of humanity appeared insanely close.

"This is how you attack. Mitch and Joe will take the starting planes. Kev, Joker and Oregon will follow in delta formation. Remember, the planes against which you'll be fighting are not planes made on earth. They can be faster and be more powerful than our anticipation but if you have courage in your heart, we will win this battle."

Kevin was up in his plane, flying. The alien spaceships were extremely close now. From this close, he could see how huge they were.

"Fire", Mitch said. Kevin hit the button and two missiles erupted from his jet and hit the alien spaceship right in the centre. The spaceship fell like a dead bird. Kevin felt ecstatic for the first time since the war had started.

The Captain's voice was on the line again. "That's the spirit. Blast them off boys. This is war."

It was war.

2054

"Yes, these symbols found are very significant. They have led me to conclude that there is some common element in these events. And these symbols have pointed out three men in history. I don't know why in particular they have been pointed out. I had made use of the 'past changing machine' to find the three men in history with the record of those alien symbols as I observed in my DNA. Why was I chosen? I don't know. There is a connection between the four of us. I can tell that

but I don't know yet what it is. I am working hard on the matter and I'll try to find it as soon as I can."

The scientist's words were met with surprise and dismay by everyone. To know that there was still hope was good but the lack of the connection proved disconcerting. Finally, the man presiding on the conference spoke.

"The resistance is wavering. We can't hold out much longer. It won't last more than 2 days. That's all the time we have to defeat the aliens, otherwise, its doomsday. Our only hope is you."

"I'll try my best, sir," was the scientist's reply.

There was someone to visit the scientist in his quarters.

"Go away. I have a lot of work at hand." The scientist said, without even turning.

"I'm here to help you, son." It was the priest.

"Okay, then listen to my story. Hear all I've found and then try to help. Think of it as a bloody confession," saying this, the scientist narrated the entire story about what he had found .

"Have you read the new testament, son?"

"No, I have better things to do." The scientist was getting frustrated every minute.

"You should. Conquest, famine, war and death go hand in hand. When the lamb opened the four seals, they emerged. They are the four horsemen of the apocalypse. When they unite at the time of the apocalypse, humanity will be saved."

And it all came swirling down for the scientist. So, he was death. So, he would bring an end to the alien attack but first he had to go back in time and bring the other three horsemen with him. But what if the priest was wrong? He couldn't tell what would happen but he had to take the chance. He was their lone saviour. He was the fourth horseman.

About the author:

Parth Saurabh (parths@iitk.ac.in) is a second year undergraduate student in the Department of Material Sciences and Engineering. This story won 1st prize in Intra-IIT technical fest Takneek `11.

FASTER THAN THE FASTEST !!!

A subatomic particle is challenging the very core of modern physics after scientists recorded it traveling faster than the speed of light.

According to Albert Einstein's special theory of relativity, which spawned the E=MC^2 equation, light is the last word in speed, but neutrinos have now been recorded traveling even faster.

In the Opera experiment, carried out more than 15,000 times over three years, the muon neutrinos – fired in a beam 454 miles between the CERN facility in Geneva to Gran Sasso in Italy – arrived a few billionths of a second quicker than light. The gap was tiny, but its significance is potentially so huge that physicists are struggling to come to terms with its implications.

First, though, researchers want to be sure that they haven't made any errors in their calculations and, having scrutinized the findings themselves, have asked their colleagues around the world to check them. "The feeling that most people have is this can't be right; this can't be real," James Gillies, a spokesman for CERN – the European Organization for Nuclear Research – told the Associated Press.

"They are inviting the broader physics community to look at what they've done and really scrutinize it in great detail and ideally for someone elsewhere in the world to repeat the measurements."

At Fermilab, a similar facility to CERN – in Chicago – head theoretician Stephen Parke said of the European finding: "It's a shock. It's going to cause us problems, no doubt about that – if it's true." Intriguingly, Fermilab scientists had similar faster-than-light results in 2007, but with such a large margin of error that its significance was undermined.

John Ellis, a theoretical physicist at CERN, who was not involved in the neutrino experiments, said Einstein's special relativity theory underpins "pretty much everything in modern physics" and it has since it was put forward in 1905 "worked perfectly up until now". He added: "This would be such a sensational discovery if it were true that one has to treat it extremely carefully."

Science A to Z Puzzle !!!

- Shoubhik Gupta

```
A  S  T  R  O  N  O  M  Y  F
I  M  A  E  R  T  S  T  E  J
N  O  F  L  E  H  U  I  U  C
T  T  G  K  S  E  R  P  L  C
E  I  H  J  P  R  H  H  T  I
R  N  A  R  I  M  E  Y  R  T
F  O  W  B  R  O  R  S  A  E
E  R  Q  U  A  M  P  I  V  N
R  A  H  L  T  E  K  C  I  I
E  S  V  O  I  T  O  S  O  K
N  A  M  C  O  E  K  P  L  M
C  U  E  Y  N  R  R  T  E  A
E  Q  T  G  S  C  I  E  T  B
J  R  S  O  C  X  B  M  R  I
M  K  Y  L  W  O  I  U  A  O
E  Q  S  O  A  N  M  I  Y  L
X  U  R  O  T  A  N  R  S  O
P  F  A  Z  K  C  P  T  R  G
E  X  L  J  H  L  S  T  V  Y
R  C  O  E  A  O  T  Y  B  A
I  A  S  U  L  V  O  J  U  R
M  Z  L  I  S  S  O  F  J  X
E  D  E  A  G  H  N  D  G  O
N  B  N  K  L  E  K  N  S  R
T  N  M  B  U  D  E  B  M  N
E  U  K  T  M  G  F  I  O  P
R  I  R  V  Y  R  H  I  T  R
P  O  C  X  H  P  S  J  I  O
N  B  O  D  G  U  R  K  O  T
Y  N  R  X  F  R  V  I  N  N
G  M  Q  F  C  X  C  N  L  R
O  Z  I  V  R  E  T  A  W  K
L  D  C  H  E  M  N  Q  T  J
O  W  A  R  S  D  O  C  A  X
E  D  U  T  I  T  A  L  E  O
G  Y  R  T  S  I  M  E  H  C
```

Can you find 26 science terms in the puzzle?

A _____

B _____

C _____

D _____

E _____

F _____

G _____

H _____

I _____

J* _____

K _____

L _____

M _____

N _____

O _____

P _____

Q _____

R _____

S* _____

T _____

U* _____

V _____

W _____

X* _____

Y _____

Z _____

* Indicates two words!

In Memoriam

Dr. Har Gobind Khorana (1922-2011)

Dr. Har Gobind Khorana, recipient of Nobel Prize for Medicine and Physiology was born in Raipur, in Punjab, India in 1922. He established that these chemicals combine to form three-letter "words" that represent amino acids, the components from which proteins are made. Using chemical synthesis he established that the genetic code of RNA consisted of 64 distinct three-letter words and also proved that the "words" are always transmitted to the cell in groups of three, called codons, some of which start or stop the manufacture of the proteins. He succeeded in synthesising the first wholly artificial gene . Later, in the 1980s, he synthesised the gene for rhodopsin, a protein involved in vision. The technology which Khorana pioneered has been central to advances in genetic engineering and the development of the biotechnology industry.. Dr.Khorana died of natural causes on November 9, 2011 in Concord, Massachusetts, aged 89.

Sir Steve Jobs (1955-2011)

Steve Jobs was born on February 24, 1955 in San Francisco. He was the co-founder and CEO of Apple, makers of the Macintosh computer, iPod, iPad and iPhone. He was the man behind the astonishing success of the computer animation firm Pixar, makers of Toy Story and Finding Nemo. He was awarded the National Medal of Technology by President Ronald Reagan. Jobs was a demanding perfectionist who always aspired to position his businesses and their products at the forefront of the information technology industry by foreseeing and setting trends.Jobs was among the first to see the commercial potential of Xerox PARC's mouse-driven graphical user interface, which led to the creation of the Apple Lisa
On October 5, 2011, Jobs died at his home in Palo Alto, California, aged 56.

Dr. Dennis Ritchie (1941-2011)

Dennis MacAlistair Ritchie was born on September 9, 1941 in Bronxville, New York. A graduate from Harvard University, Ritchie began working at the Bell Labs Computing Sciences Research Center and in 1968 he received a PhD from Harvard. He is best known as the creator of C programming language, giving his contemporaries a language that was structured, high level and could create system programs. This portability allowed him to write the UNIX kernel in C. He and Ken Thompson received the Turing award in 1983 for the implementation of the UNIX OS. Ritchie was elected to the National Academy of Engineering in 1988 for "development of the "C" programming language and for co-development of the UNIX operating system."
Ritchie was found dead on October 12, 2011, at the age of 70 at his home in Berkeley Heights, New Jersey.

Professor A.S. Parasnis (1928-2011)

Professor Arawind Sripad Parasnis was born on the 18th Aug 1928 at Ahmadnagar. He did his BSc from University of Poona, MSc from Bombay University and obtained his PhD from the University of Bristol in 1960. Immediately thereafter he joined the Institute as an Assistant Professor. He served as the Head, Department of Physics. He was largely instrumental in the initiation of CELT and Laser Technology Programs. He trained several students in holography and was responsible, together with his colleagues, in establishing a vibrant and a highly acclaimed Optics group at IIT-K. He was also central to the establishing of the Undergraduate Physics Laboratories.
Prof. Parasnis left for his heavenly abode on October 16, 2011.

CALL FOR ARTICLES !

NERD is the scientific and technical research and development magazine run by the students of IIT Kanpur. We publish news on scientific breakthroughs happening in various technical education institutes, research labs et cetera across India and the world with an emphasis on the work done by students. So NERD is a magazine of the students, by the students, for everyone. NERD is the first magazine of its kind and we need everyone who is interested in science and technology to be in our team. Join the NERD Herd! Yes, you can be the one featuring in this magazine.

SCIENTOON - by Riya Rana (Y11/Dept. of Mathematics/IIT-K)
(This scientoon won Third prize in Takneek, 2011)

For over 150 years, scientists have known that fire can be extinguished by sound, but they still don't know how. Sound waves are simply variations of pressure in a medium. The energy from vibrating objects moves from particle to particle in the air in a repeating pattern of high and low pressure zones that we perceive as sound. According to the ideal Gas Law, a decrease in pressure leads to a corresponding decrease in temperature, which may explain how sound can extinguish a flame. Such acoustic fire suppression might prove useful in space.

BOY: Let's play some music.
(Candle goes off due to sound!)
GIRL: O MY GOD! Are we supposed to have dinner in this dark? You ruined our date once again.

Write to us. We would love to hear from you!

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