

# SYNC

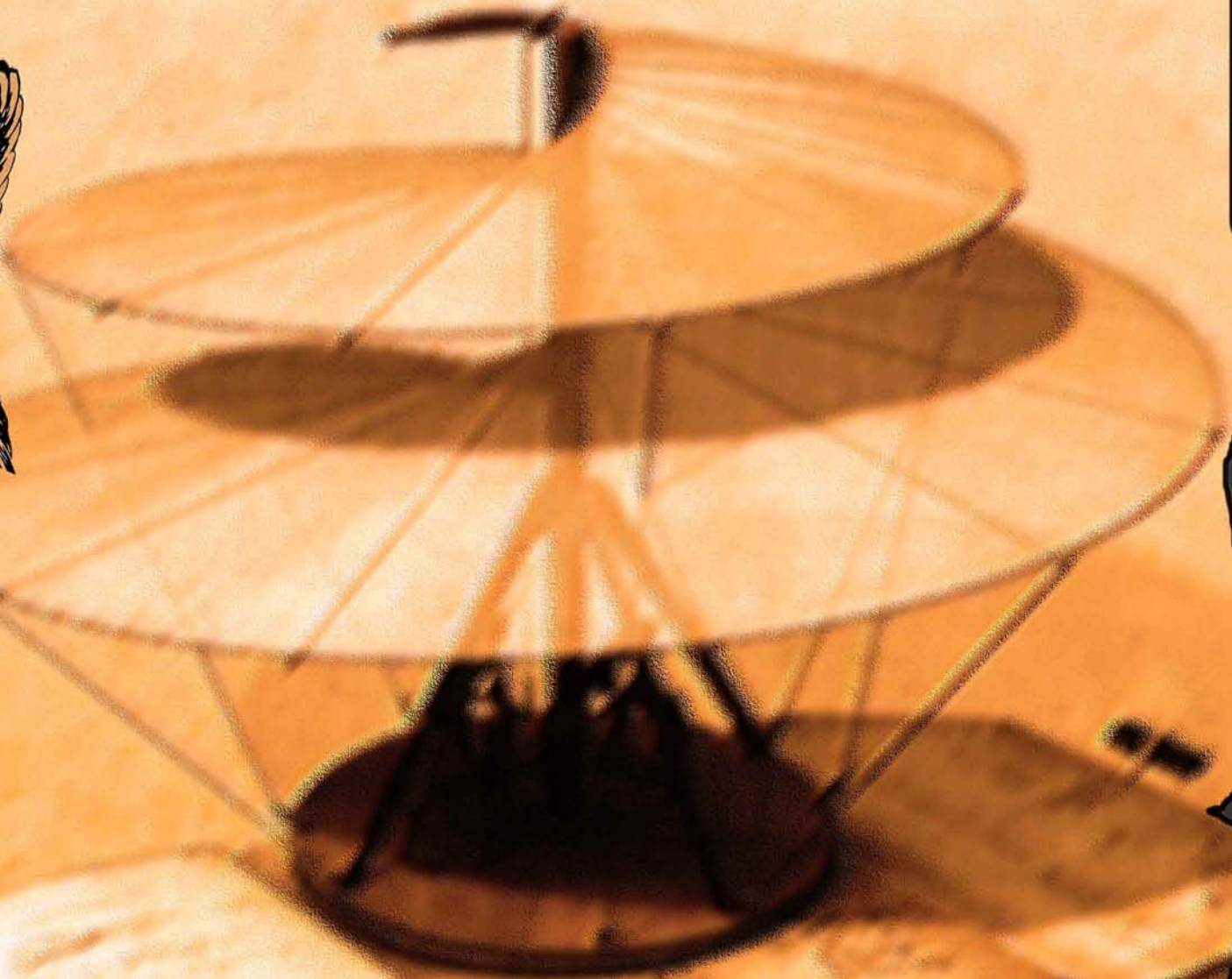
following excellence....

Vol III, January 2011 Issue

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Mechanical Engineering Students'

Association (MESA), IITG

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turn to

# Message Desk

## Message from HoD, Mech. Engg.

I am happy to note that the third issue of the e-magazine, SYNC has come up. I congratulate all the present and past members of MESA for successful compilation of SYNC for the third consecutive year. In the last three years, SYNC has been continuously improving in terms of its quality and acceptance to the readers. Thanks to of all the team members of the publication committee of the present and the past issues for their effort. As expected, SYNC has become a network between the faculty, students and our alumni. In last one year, our students' strength increased and a number of new faculty members have joined the department. We are growing at a fast pace.



It is therefore important that there are more and more teacher-student interactions discussing academics and other allied activities, so as to keep our standards high and improve continuously. It is expected that more and more quality articles in the form of latest development in the mechanical engineering, techno-socio-economical issues will find place in SYNC. Team members are dedicatedly working in this direction. Other members (faculty, staffs and students) should also cooperate with them in achieving this. We already have a good number of alumni who are on responsible positions in different organizations and their cooperation should also be sought for further improvement. Like previous issues, I wish that this issue of SYNC will also find acceptance among the students /teachers /staffs.

Wish you all a very happy new year 2011 ahead.

Debabrata Chakraborty  
Professor & Head

## Message from the Faculty Advisor

I am elated to see the Mechanical Engineering Students' Association (MESA) of IIT Guwahati publishing the third edition of its e-magazine, SYNC. The published articles encompass a range of topics to suit to the taste of a general techno-scientific community. Apart from shedding some light on few interesting developments related to science and technology, it also covers few general topics, extracurricular activities, informative articles by alumni as well as valuable experiences of our faculty members. In short, the magazine continues to act as a platform for sharing knowledge, experience and activities.



I would like to extend my hearty congratulations to the publication committee, the authors and the entire team of MESA for their commendable efforts in successfully bringing out the e-magazine. I would also like to express my sincere thanks to Prof. D. Chakraborty, Head of ME and the colleagues in the department for their constant support and valuable suggestions for publication of the magazine. Hope you enjoy reading that would encourage bringing out future editions!

Dr. Ashis K Sen  
Faculty Advisor, MESA

## Message from the Publication Secretary



I feel proud in unveiling before you the 3rd edition of SYNC, the annual e-magazine of MESA. In the zest of constantly improving year over year, we have strived to put together an assortment of various kinds of articles in this edition. As in the words of a great business tycoon Azim Premji, “Change is the only thing that will never change. So better adapt to it.” Hence, it is our effort to incorporate the “beneficial” changes in the magazine while preserving the core values.

The magazine covers a vast range of thought provoking articles like “Is the ‘Judgement Day’ possible in our future?”, “Dodge Tomahawk”, which will make you think that where this limitless technological advancement is leading us to. As the inclination towards the use of renewable, more efficient and eco-friendly resources of energy is increasing, an attempt is also made to portray some of the new dimensions in this area. On a bit lighter note, the articles on CWG Village, Alumni Talk, Interview of Dr. Arup K. Das and Intern Experience are also included in this edition.

I am thankful to our Head of the Department and Faculty Advisor, MESA for being constantly supportive and encouraging and to all my fellow members of the Publication Committee for their invaluable contributions to this e-magazine. I would like to express my profound sense of gratitude to Dr. U.S. Dixit for writing a truly inspirational article on the ups and downs of his student life. I’m sure that the students as well as the faculty members will be definitely benefited by his experiences and way of thinking.

We are consistently trying to broaden the scope of the articles so that we can reach out to the larger community of readers. I do hope that the forthcoming editions of SYNC shall be a compilation of even more enriching thoughts and ideas. We are open to all the enthusiasts to be a part of our team.

I have shown you just the tip of the iceberg, read on to discover more into the depths....

A Very Happy & Prosperous New Year!

**Anupam Singhal**  
Publication Secretary, MESA

P.S.: Comments and suggestions regarding the improvement of the magazine will be duly appreciated and acknowledged. For any queries mail at: [mesa@iitg.ernet.in](mailto:mesa@iitg.ernet.in)

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# MESA Activities



Freshers' Party to Batch-2010



Seminar by Dr. Ashis Sen



MESA Orientation to Freshers



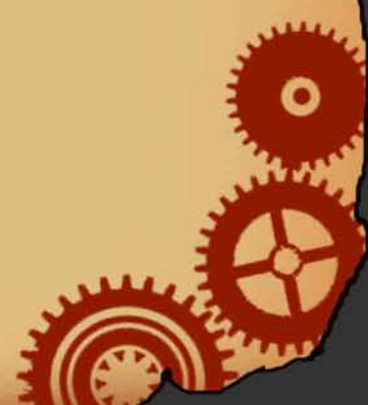
MESA Placement Talk



Student - Faculty Advisor Interaction



Departmental Volley Ball Match



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# Harnessing the Vast Ocean Power

- N.R.SREERAM

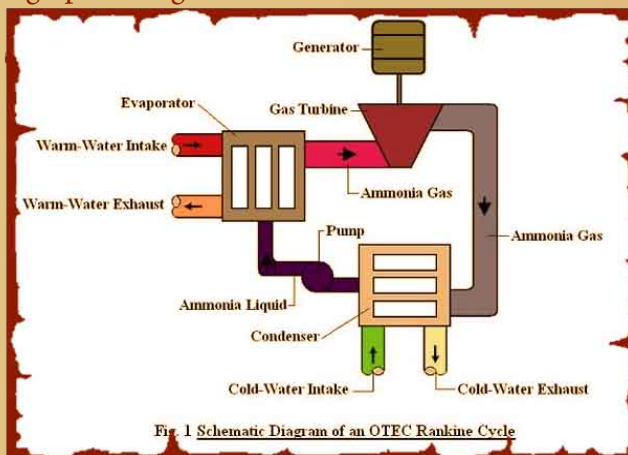
“Blue, green, grey, white, or black; smooth, ruffled, or mountainous; that ocean is not silent”  
- H. P. Lovecraft

Looking at the ocean in all its majestic beauty always bring images of peace and serenity in our minds. But behind this facade of tranquility and quietness lies a powerhouse of latent energy and activity, unexplored and unknown to man till recently. Every aspect of the ocean, right from the salinity of its water to the motion of its waves and tides is a potential source of energy for the future. Oceans have been recognized as an efficient storage of solar energy. With the threat of Global Warming and the so-called “Meltdown” scenario looming over our heads, harnessing this seemingly limitless source of energy gains more prominence. The source of all energy on the Earth, as you know, is the Sun and with more than three-quarters of our earth filled with oceans and seas, most of it is absorbed by them – which is in turn converted further to other forms of energy like tides, pneumatic (wind) energy, waves etc. Even the temperature difference between two different levels of water layers can be used to produce electricity. In general, energy sources can be classified as concentrated or distributed. This classification is rather important, since it relates to the physical space required for an energy conversion system. The ocean thermal resource, which depends on the temperature difference between the water at a great depth and water near the ocean surface, can be considered somewhat concentrated, whereas Ocean and tidal currents are more on the distributed side as they span a larger region and take place over a distributed amount of time.

## OTEC: Ocean Thermal Energy Conversion

One of the primary and more viable sources of energy from the ocean, depends on the temperature difference between different levels of water in the ocean due to the upper layers being easily heated and relatively hotter than the bottom ones. This process of conversion requires that there should be a minimum of 18 C temperature difference between the upper and bottom layers. This process is based

on the Rankine thermal cycle (Fig. 1) where the working fluid evaporates when passed through the warm-water evaporator (which is achieved by the warm water from the above layers) and becomes a high-pressure gas.



When the gas expands, it flows through a gas turbine which drives an electrical generator. The gas then passes through a cold-water condenser (which is achieved by the cold water from the lower layers), thus returning it to the liquid state. A typical candidate fluid is NH<sub>3</sub> (ammonia) which has a low boiling temperature and high condensation temperature, ideal for this kind of process. Also a higher temperature difference between the surface and deep waters increases the efficiency of the system. Researches and analysis of the world temperature patterns in oceans show that the ideal region for this kind of energy tapping is between 20° N and 20° S latitude. Though the high cost of implementation of this system has caused it to garner less attention among other non-fossil-fuel based energy sources, further research on increasing the efficiency of this method by improving its labor-intensive and material-intensive structure can be a promising option in the future.

## Tidal energy conversion

We can classify the tidal phenomena relating to energy conversion as either quasi-static or dynamic. Tides, being a wave form, can resonate with confined waterways. For wind waves, the phenomenon occurs in harbors, and is referred to as a “harbor resonance”. The dynamic pressure corresponding to the velocity can be exploited to provide usable energy as shown in

# Harnessing the Vast Ocean Power

the diagram (Fig. 2). As you can see, oscillating water movements make the air move accordingly which turn a turbine connected to a generator producing electricity. For static (resonance) tidal energy, some type of barrage is required, which is extremely expensive because of both material and labor. Furthermore, the turbines must be bi-directional and of high capacity. Their large cost and relatively scarce locations around the world which provide feasible conditions for conversion limit the possibilities of this technology as of now.

More recently focus has shifted to the dynamics of the tides in the form of tidal currents. To convert the hydrostatic tidal energy into electricity, so called "underwater windmills" are created. For example, in the East River at New York City, the Verdant Power Company has installed submerged water mills. According to Verdant Power, six turbines in the East River will generate approximately 10 megawatts. On the other side of the Atlantic, Marine Current Turbines Ltd. (MCT) has installed a 300 kW plant in the English Channel off Cornwall. A field of the MCT water mills would resemble as that shown in the figure and works just like the regular windmills, but since they handle water rather than air, the extra sturdiness and labor required to set them goes up without saying.

A similar setup is also used in harnessing energy from water currents that occur frequently in seas and oceans. This system too uses the kinetic energy from the tides to convert it to electrical energy. Its setup is different from the tidal one in the sense that the turbine housing would

bebuoyant and the setup would be tethered to the seabed. Since the speed of the water currents is maximum on the surface and the speed diminishes rapidly with height, the turbines must be within 10m of the surface for any significant effect. Another shortcoming of this system is that to produce power of about 1MW when the speed of the water is 2m/s, the diameter of the turbine should be at least 25m. Using this setup in the Florida current, for example, where the water speed is 1.3m/s we would need a whopping 57m turbine radius!

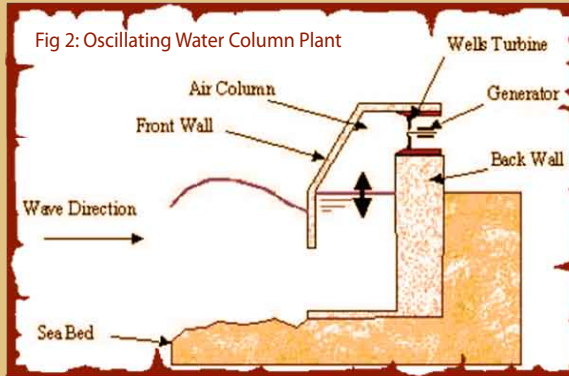


Fig 2: Oscillating Water Column Plant

## Salinity gradient energy conversion

Another interesting way to use the ocean as a source of energy would be to use the saline properties of water to create a pressure gradient. Brine when separated from fresh water through a semi-permeable membrane creates a pressure called osmotic pressure which can go up to 200 atmospheres if the water is saline enough. The energy associated with this high amount of pressure is about  $23 \times 10^6$  J per cubic meter of water.



Fig 3: Marine Current Turbine  
Conceptual Sketch of tidal Turbine Field

In spite of all the limitations and shortcoming of the above listed technologies, and in spite of all of them being in their infancy, they definitely open hitherto unopened doors to fully exploit the various sources of energy that 'Mother Nature' has been kind enough to provide us and further reduce our dependency on our already depleting

resources of fossil fuels.

Courtesy: [http://memagazine.asme.org/web/Harness\\_Seas.cfm](http://memagazine.asme.org/web/Harness_Seas.cfm)

# Jatropha - The Future of BioFuels

- SHASHANK SAXENA

## THE PROBLEM!

All current high pollutant diesel fuels are derived from diminishing natural resources. One of the major problems to be encountered with the more widespread use of the diesel engine is the emission of particulate matter (i.e. smoke) consisting of carbon and unburned hydrocarbons which are very hazardous to the environment and cause drastic phenomena like Global Warming



and melting of Ice at the poles. Researchers have indicated that the successful use of vegetable oil is a function of the engine type. But then, they too cannot be safely used in an indirect-injection, air-cooled engine for long periods of time. Basically the problem is related to the high viscosity of the vegetable oil, which causes inadequate atomisation and incomplete combustion. Another problem associated with the use of vegetable fuels as diesel substitute is the reactivity of the unburned fuel, which is the cause of fouling of the injector nozzles and cylinder deposition.

## Is there a Solution?

During the five-year research project, Daimler AG was able to show that jatropha (specifically

jatropha curcas – a member of the jatropha family) is suitable for the production of high-quality biodiesel. The use of the fuel from the jatropha seeds was tested successfully in test vehicles with modern common rail diesel

engines from Mercedes Benz. The biodiesel manufactured from the seeds of the jatropha seed has similar properties to fuels from other oilseeds. It also has a

positive CO<sub>2</sub> balance and offers an ecological advantage over fossil diesel fuels, particularly when the specific advantages of the plant are properly harnessed. Jatropha can be cultivated on non arable, eroded soil, thus also making a



Jatropha Seeds-The Fuel of the Future!

contribution to environmental protection without interfering with the food sources for the local people.

The main question that arises in every engineers mind is that what will be the modifications required to use such a fuel. Daimler AG

came up with an answer stating that the modern engine does not require any significant modifications apart from a few rubber and plastic parts in the fuel lines that need to be changed to counter bio-diesel's corrosive nature. Biodiesel can also be stored like petro-diesel without any additional requirements in the infrastructure.



# The Future of BioFuels- **Jatropha**

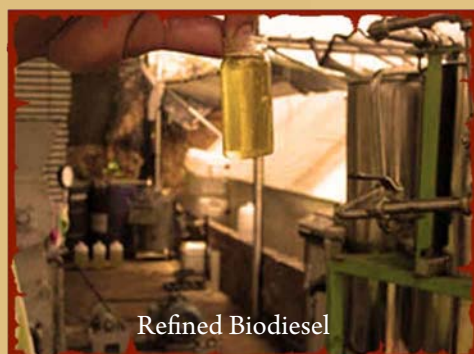
## Other Advantages of Jatropha

The bio-fuel has other advantages as well. When used in existing diesel engines it results in considerable drop of unburned hydrocarbons, carbon monoxide and particulate matters. With approximately negligible sulphur, no aromatics and 12 per cent incorporated oxygen, biodiesel aids complete combustion. Each Jatropha seed produces between 35 to 37% of its mass in oil. In addition, by planting Jatropha, one can, in fact create carbon sinks that help remove carbon dioxide present in the atmosphere. Two mature Jatropha plants absorb around one metric ton of Carbon dioxide, according to Jatropha.org.nz. The shell, having a calorific value equivalent to coal, can be made into briquettes and used in solid fuel fired boilers and other applications as a substitute for fossil fuel.

## The Proceedings in India

Developments on jatropha based derived bio-fuel have taken a good shape now. According to Rolls-Royce, the bio-fuel has met or exceeded

all the required technical specifications during laboratory testing. China is about to become the world leader in the cultivation of jatropha, a sustainable, perennially growing oil-seed crop that can be used to produce the planet's fastest-growing alternative fuel—biodiesel. India is not far behind. The Rs 3.25 crore jatropha project is being funded by DaimlerChrysler AG, and is in collaboration with the Hohenheim University-Institute for Animal Production in the Tropics and Subtropics, Germany, an institute which has vast experience with jatropha plantations, and the Central Salt & Marine Chemicals Research Institute (CSMCRI), a government owned industrial research institute in India with a mandate to reclaim wasteland in India. The latter two are responsible for project management and implementation while DCIL assumes the responsibility of project organisation, funding as well as vehicle testing. It may not yet be complete replacement for petrol or diesel, but it is definitely a promising step in the right direction towards a greener and more environment friendly future.



Courtesy: <http://projectjatropha.blogspot.com/>; <http://www.mercedes-benz.co.in/>

# Eastern Experience

- ANAND KARTHA

Like every pre-final year student I too dreamt of a western summer, of Berlin, of Pisa, of Rome. Hopes were high for a European summer. But, what turned out was an internship to the least expected place—"Tokyo". The European dream was shattered but a new one took its place. I was elated and my joy knew no bounds.

You are right, if you have the impression of Tokyo from the film *Fast and Furious*; you have those powerful bikes zipping past you making revving sounds, those costly designer cars right in front of you shining magnificently belittling every other thing in sight, those futuristic looking electronic gadgets that can do almost anything and the



University of Tokyo

majestic amusement places right at the heart of the city. You name it and you'll find it. It definitely makes your heart pump a bit faster than normal. Animes, gaming parlours, clubs, baseball matches, skyscrapers and cute girls make the experience all the more enthralling.

It offered a perfect fun filled summer, made more exciting by the high quality technology all around. Travelling by the fastest trains in the world, witnessing the fastest assembly line production, watching humanoid robots (Asimo, Honda), the jet engines, the advanced aerospace technologies, and many such jaw

dropping technologies were only a part of the big picture. The museums and exhibitions of the Samurais (of historical importance), natural science, rocket and nuclear technologies, Industrial exhibitions of Mitsubishi and Nissan, exotic cuisines (a vegetarian here, I ended up tasting everything there, including beef and octopus), amazing people and adventures in the forests, hiking up 2700ft at dawn, serene highlands, pleasant weekends on the

islands, ride on cable cars, rope ways, view from one of the world's largest giant-wheels (at Yokohama), the eternal calmness of the Buddhist monasteries, visits to the art galleries showcasing the rich eastern art collec-

tion, striking a pose alongside the Sumos. Gosh it was amazing! Living in the world's costliest city, indeed was, something exciting in itself, offering new surprises each day.

Asimo (The humanoid robot) exhibiting its extraordinary dexterity and balance was something never to be forgotten. The most lasting memory, for me, is the Asimo officially welcoming the students of IITs to Japan.

The visit to the Honda factory left me dumbstruck. What I saw there was something

# Eastern Experience

## People and Culture

spectacular, a car rolling out every 45 seconds on the assembly line, the car's body being brought together with precision and robots working in tandem, in a manufacturing process choreographed to levels of precision beyond imaginable.

Finally, the trains, travel on the Shinkansen, the fastest trains in the world (Test run speed 443 Kmph), was something amazing. The acceleration was similar to the one felt on an aeroplane. Smooth pick up and the comfort levels on it during travel were unparalleled.



Fastest train in the world  
Shin-Keisei (bullet train)

I kept telling this to my friends and everyone back at home, "People in Japan are the most humble, the most patriotic and the most

helpful people in the world." I'm trying not to hyperbolize but to state the fact. You find that the Japanese maintain their schedule, are punctual and meticulous at their work. There have been instances during my stay when strang-

ers have spent almost an hour helping me get the right thing. All you need to know is a bit of mime. Language is a bit of a problem; however, it shouldn't be a cause of big

concern when you go. I did survive.

## Nature

Japan has a lot to offer if you are a nature lover and wish to enjoy its pristine beauty. From the gardens in the highlands to the dormant snow capped Mt Fuji, from the Islands of Enoshima to the heights of Mount Hangetsu, from the Onzen (hot water springs) at Nikkio and the Sea port at Yokohama to the nature parks in your ward, each offered a rich variety of the natural beauty there.



Yokohama, Japan's First International Sea Port

Deep down, there are striking similarities between the Indian and the Japanese cultures. Buddhism, with its roots in India, has a significant influence on

their culture. It was amazing to see the way in which human values were upheld in the midst of the busy daily life. I felt quite at home with the people and the culture there. Sometimes I felt I was taken better care of there, than at home.

# Is **The Judgment Day** possible in our future???

- **VASU GOEL**

“If you are listening to this then you are the RESISTANCE!!!” - **Terminator Salvation**

**Detective Del Spooner:** What if I'm right?

**Lt. John Bergin:** [sighs] Well, then I guess we're gonna miss the good old days.

**Detective Del Spooner:** What good old days?

**Lt. John Bergin:** When people were killed by \*other people\*” - **I Robot.**

Just imagine a world when these lines are merely not spoken by our favourite actors but by us only. Or say we are hiding in junks of metals fighting a war with the machines whose brain, activities, movement and everything were once decided by the simple codes written by humans. Yes, it seems so surreal and so not happening with us or our near future generations but let's think a step ahead of it. There were times when man used to live in caves, used to eat raw meat, wore bits and shreds of skin of dead animals and used stones as his tools, who would have thought about what their future or, our present, will look like. But today we live in a world where we live in homes well furnished with the best of technology to fulfill our needs; we wear clothes which are strong enough to stop a bullet travelling at 150-200m/s without even hampering a single strand of the cloth or now we have metal made moving bodies to serve us.... *Well this present will be just a long gone past of an unthinkable future.* And the possibility, that our future will be an exemplification of the creativity of various movie directors, is strong with all their necessary odds.

So the question ‘**Can Robots Take Over The World?**’ actually pivots on whether we can initially create a robot that is, or becomes, a sentient being capable of independent thought and self-replication or in simpler terms can we create a machine that thinks, learns and behaves like a human and indeed in a manner be

superior to humans? Isaac Asimov was the first to conceive of intelligent autonomous robots, and so devised the three logical robotic laws that are hard-



wired into every robot thinking machine:

- A robot may not injure a human being or, through inaction, allow a human being to come to harm.
- A robot must obey orders given to it by human beings, except where such orders would conflict with the First Law.
- A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

Now let us consider how these laws answer to our question. Basically these are moral laws that, if hard-wired into a robot's systems would make them incapable of taking over the world. Now you may ask, what if a robot re-programmed itself? That's where the term "hard-wired" comes into play. It



presupposes a way to program a robot brain so that certain programming cannot be changed. If a robot were to design another robot, in other words, procreate, then it would be obligated to also hard-wire these directives into its progeny, because of

the first robotic law.

Also robots lack sufficient motivation. Any hysterical notion of robots taking over the world imagines

# Is The Judgment Day possible in our future???

nefarious motives of enslavement. Well, quite frankly, if robots could procreate and had enough intelligence to launch a coup, why in the world would they want to? Robots would not fear death, they cannot die. Robots do not need our bodies or our labor. Robots would not be bothered by our presence at all. If robots ever achieved sentience, developed autonomous non-emotional motivations and decided to do something, they would logically decide to do what is at the core of every sentient being:

explore their universe. Robots that were advanced enough to develop true sentience would also derive from that intelligence, true morality. Morality and ethics are based in logic. And, although intelligence is not absolutely required for ethical behavior, neither is emotion. A robot, thinking logically would develop a perfect code of ethics because it is a purely rational creature, unblinded by emotion and self-interest. It would seek to fulfill its "deficiency needs" first, in order, and finally discover its growth need. It would endeavor to satisfy its physiological, safety, belonging, and esteem needs, and then develop its self-actualization need. Since a robot is a purely logical and rational being, it would develop a purely rational and logical ethical system.

Going into this technically would make us come to a standstill at a particular point of our future which is

foreseeable, in the sense depends truly or thoughtfully on our present advancement and understanding of knowledge which in a matter of time will ofcourse change its all forms with just embedding us in them. Just to say in the simple terms we cannot



determine how our technology will look like even after 200 years. It's fascinating to consider the possibility of robots becoming as prominent as humans have on Earth; however, if intelligent machines are to become the inheritors of the biosphere, it will occur in a way that will

take almost everyone by surprise. We won't wake up one day to a robot-run planet, but rather, to a planet where we have the option to become robots ourselves. It's a common mistake to believe that



robots with human-level intelligence will just suddenly spring into the picture, thanks to Hollywood movies, but long before we have the ability to create artificial intelligence on par with humans, we will perfect the technology that allows us to augment our own biology.

So thinking about it in this way and what the present scenario dictates to us we may sleep at night without wondering about Autobots falling from the sky or Skynet taking over the world and same goes for our near future progeny, but we will have to wait a long to be

reborn into a world (if birth naturally is possible then) or virtually created to see us working under the robots or some heavy metal junky stuff giving us orders .....

# Faculty Talk Dr. Arup Kumar Das

## 1. After completing your PhD, you had joining letters from many elite institutes of the country. Then what inspired you to choose IIT Guwahati over those institutes?

Just after my PhD, I had applied in few IITs to get the job including IIT Jodhpur. But when I came here at IIT Guwahati, the atmosphere and ambience that I felt here was better than other IITs. Also in growing IIT, you can enjoy extra freedom for proceeding on your idea without much resistance from the department. In established IITs, you cannot do the fundamental independent research and one has to be a part of the subsections of the department, but the situation is different in IITG. Such kind of groupism or encroachment does not exist here. Here you can do independent research, senior faculties are always encouraging us and administration is supportive. In new IITs people are busier in lab development but here as we have the developed setup, we can start our work from that point.



## 2. Why did you choose University Academia over Industrial Research?

After my B.E., as I hail from a middle class family, my mindset was to go in the industrial field and get a job as soon as possible. But my work experience in the industry was not that good. I had worked for 4 months in a manufacturing company based in Faridabad, but I left the job as it was not paying the returns to me. After that, I joined M.S. Programme in IIT Kharagpur on a friend's advice, and then I thought that I should spend my life in research and teaching.

## 3. What differences did you observe on your 3 months stay in Switzerland in terms of student-faculty interaction and the work culture?

As per my experience in Switzerland, the professors there are a little busy, so you can't directly interact with them. They maintain some sort of hierarchy in the way that you have to first approach post-graduate and PhD students for your problems. If you have got something very interesting to discuss, then only you can contact senior faculty. But in India, all the students can equally approach the faculty. Also, the lectures there are taken by the PhD scholars and post-doctoral fellows. Professors there are busy in research, consultancy work and service to the nation.

## 4. Do you think that the undergraduates should be given more exposure to practical knowledge in addition to theoretical concepts? What is the scenario abroad?

The research in abroad is a bit application oriented. The research projects that I have seen there are funded by industry but in our country they are generally funded by the government. So, the direct application of the technology is difficult here. In abroad, the companies directly approach the professors and the output taken by the company is immediately employed in the development of the project. So in India, if we can give some sort of touch of application, then it will be beneficial.

Also, the horizon is very big for mechanical engineers. So, one can get a good base of theoretical knowledge upto 3rd year and then can get inclined towards application part in the final year. Also, the industrial training should be taken up seriously.

# Dr. Arup Kumar Das Faculty Talk

## **5. How did you manage to have numerous journals, conference papers, two patents and several awards to your name in a short span of time already?**

I started doing my research from my MS. So, unlike M.Tech. programme, I had the time for doing research for 2 more years excluding PhD, and it's not really a short period of time if you do serious research. Some of you even publish the papers in your final year of B.Tech. So, nothing is difficult if you devote yourself and think in the right direction.

## **6. What was the motivational force behind these achievements- was it your wife whom you met at IIT Kgp?**

[Laughs heartily and nods] It's true that all my publications came after I met my wife at IIT Kgp. That was obviously some sort of motivation. But the fact is that if you can manage it well, two things can go on simultaneously. If you know your goal, then nothing can stop you from achieving it. My wife has also done M.Tech. and PhD from IIT Kharagpur itself.

## **7. Tell us something about the unique software used by the students and professors in IIT Kgp to send, share and discuss the assignments. How can it be implemented in our IIT?**

It is 'Intinno', which is a learning management system fostering collaboration between administration, teachers and students. It is a server maintained by some moderator. Professors can post the lectures, assignments and even marks on this server, so eliminating the need to send them via e-mail. The users can register and login, then the interaction can be done through this webpage.

## **8. How do you envision IITG after 10 years as compared to other established IITs?**

(Smiles) Ours is a growing IIT. The developed IITs are like 4th year students, so they are on the verge of saturation. On the other hand, IITG is like 2nd year student (new IITs are like the newcomers), so it has immense potential to develop. In the next 10 years, it can reach the level of other IITs and can even surpass some of them. If we all see the dream and work to fulfil it, then it will not be difficult.

## **9. What research activity are you currently involved in?**

Basically, I'm a person from 'Multiphase Flow'. I have done both experiment and numerics. I have learnt numerics and experiments in my PhD and M.S. respectively. But, I'm more inclined towards experimental work. At present, I'm also involved in studies related to heat transfer, numerical fluid mechanics, multiphase/free surface flow and microfluidics. But I am open to any topic which seems exciting to me.

## **10. What is your view on the proposal of introduction of multifarious disciplines like medicine etc. and its effect on the current reputation of IITs?**

Nowadays, we have to extend our boundaries beyond the fundamental research. The interdisciplinary work has to be promoted to solve the real world problems. There are different applications of technology in medical field also. So, why can't we penetrate there? One person can't go alone in the society. We have to enhance the knowledge and accept the peripheral developments.

# Faculty Talk **Dr. Arup Kumar Das**

## **11. What is your image of an ideal student?**

[Thinking...]The student should listen to the words of the teacher. At the same time, they should stretch their outer links, i.e. apart from the academics they should also participate in other activities and contribute to the society. And obviously, first and foremost thing is studying. So, a balance is to be maintained between all the activities.

## **12. Do you believe in forgiveness or being strict and giving F grades?**

[Laughs] I always believe in forgiveness. But, one has to give 100% in class. Even then if the student is not scoring well, then by giving extra assignments or extra teaching material, the student can be given a chance to cover up. Sometimes, if due to lethargy of the student, he/she is not performing well, then at that time professors should ask them personally. There is not any point in punishment. Friendly relation has to be maintained between a teacher and a student.

## **13. Sir, what do you vision yourself as, after 10 years from now?**

First of all, I want to be a good teacher. Let me tell you a short story. C.V. Raman was in the first batch of Bharat Ratna recipients. The honourable President of India invited him to receive the award. But he refused saying that he couldn't come, giving the reason that one of his PhD student had a viva exam on the same date as the award ceremony. He said that he couldn't shift it as it would hamper the plan of the student. So, he then received the prize in absentia. Likewise, I want to be with the student always. If I consider my students as friends then knowledge transfer can take place from me to them and vice-versa. If we maintain this sort of thing, then I could be good teacher and good academician.

## **14. Tell us about any memorable incident of your life.**

First of all, it was when I submitted my PhD thesis to the academic section for evaluation. Submission of thesis marks the end of a phase with the most exciting things. That is the best moment of my life till now. Also, when I was jobless for 2 months after I left the job and later came in research work, that time was very difficult for me. That transformed my vision from industry to academics. That was the watershed of my life!

## **15. What is your message to the students?**

There are two types of persons-one who refuse to help his/her family and friends whenever they approach, and the other who are always ready to help, if asked. I suggest you to be none of them. Better you should approach your family and friends first and ask them their difficulties. Hold their hands and advance together. On the other hand, apart from academics, you should try to do some material work also and try to project your skills to a yet higher level.

**Interviewed by: Anupam Singhal and Nitin Khola**



# World's Fastest Bike Dodge Tomahawk

- GAURAV KUMAR BANSAL

The Dodge Tomahawk is a Chrysler Group design concept which was produced by Dodge. Its unusual design inspires every bike admirer and especially the "speed bike lovers". Dodge unveiled this vehicle at the 2003 North American International Auto Show in Detroit, featuring the 500 hp (373 kW) 8.3 L V10. The vehicle has two front wheels and two rear wheels, making it a kind of motorized quadricycle rather than a typical motorcycle. It is a pure mechanical sculpture with joyous celebration of the artistry and emotion of design.

There are bits of the machine that are pretty much interesting. Take the engine for example, it's got more horsepower than a Ferrari F430, and remember, we are talking about a bike here. And to add further, this bike makes the speed and power figures of the Hayabusa seem insignificant. It can reach 60 miles an hour in about 2.5 seconds, and has a theoretical top speed of nearly 300 mph as specified by the manufacturer. Although, this hasn't been tested on the roads, but considering that fact that the bike weighs a little over 600 kilos and produces 500 bhp, it's hard to deny this. Another astonishing fact is that this bike uses a traditional chain and sprocket system for power transfer from the engine to the rear wheels.

Although, this bike is the fastest in the world but it is not certified for legal use in the United States since it does not legally qualify as a bike thanks to its four wheels and also due to its low slung LED lights. Hence, the fastest bike that can be legally ridden on the street is Suzuki Hayabusa. So, the people at Dodge finally decided to keep it as a Concept but also managed to sell few, 10 in total, through Neiman Marcus, a firm specializing in retail of luxury brands. The price tag for this beast was initially planned to be \$200,000 or lower, if mass produced, but with the absence of street legality and the inability to mass produce due to that reason, had raised the price to an astronomical \$555,000, that's about 2.5 crores. This made it an extremely rare piece of machinery. On the whole, the bike was an engineering marvel and it defined what concept machines can be like. It also showcased the technical and engineering prowess of the Dodge brand and spawned a new era of concept vehicles.

## Engine Extreme

<b>Manufacturer</b>	Dodge
<b>Parent company</b>	Chrysler
<b>Model year</b>	2003
<b>Class</b>	Single -seat Viper -powered motorcycle concept vehicle
<b>Engine</b>	8.3 -LITRE, OHV, 20 - VALVE SMPI V -10 Type: 10 -cylinder 90 - degree V -type, liquid - cooled
<b>Compression Ratio:</b>	9.6:1
<b>Top speed</b>	300 miles per hour (480 km/h) or more. (Estimated by manufacturer based on horsepower and final drive, ignoring drag.)
<b>Power</b>	500 horsepower (370 kW) @ 5600 rpm (60.4 bhp/liter)
<b>Torque</b>	525 lb-ft (712 N-m) @ 4200 rpm
<b>Transmission</b>	2-speed manual
<b>Suspension</b>	Front: Horizontal double fork (each wheel has independent suspension)
<b>Brakes</b>	Front: 16 piston disk Rear: 8 piston disk
<b>Tires</b>	Front (2): 20x4 Size Rear (2): 20x5 Size
<b>Dimensions</b>	L 102 inches (2,600 mm) W 27.7 inches (700 mm) H 36.9 inches (940 mm) Wheelbase: 76 inches Ground Clearance: 3 inches
<b>Weight</b>	680 kg
<b>Fuel capacity</b>	3.25 US gallons (12.3 L)
<b>Fuel Requirement</b>	Unleaded premium, 93 octane (R+M/2)
<b>Body Const ruction</b>	Billet aluminum
<b>Lighting</b>	Headlights consist of Front: 12 five -watt LEDs Rear: 8 LEDs



Courtesy: <http://bikeadvice.in/dodge-tomahawk-concept/>

# कुछ यादें इंजीनियरी पढ़ाई के चार साल

-डॉ० उदय शंकर दीक्षित

इस बार जब ग्रीष्मावकाश में पंद्रह दिनों के लिए अपने पैतृक निवासस्थान गया, तो कानपुर और लखनऊ में रहने वाले कुछ पुराने सहपाठियों के घर भी जाना पड़ा। मेरे सहपाठियों के पुत्रों ने आई० आई० टी० संयुक्त प्रवेश परीक्षा में सफलता अर्जित की थी और उन्हें मेरी सलाह की आवश्यकता थी। हाल ही में कुछ और पुराने सहपाठी मेरे संपर्क में आ गए हैं, जिसमें इंटरनेट का काफी योगदान है। मेरे सहपाठियों के बच्चों का आई० आई० टी० या अन्य इंजीनियरी संस्थानों में चयनित होने का सिलसिला चल चुका है, जो मुझे एहसास कराता है कि मेरी पीढ़ी सीढ़ी के एक पायदान ऊपर चढ़ चुकी है। ऐसे समय में मेरे प्रिय छात्र अनुपम सिंघल ने जब मुझसे अनुरोध किया कि छात्रों के हितार्थ में चार साल की इंजीनियरी पढ़ाई के अनुभवों को लिपिबद्ध करूँ तो मुझे महान हर्ष की अनुभूति हुई। पीढ़ियों के अंतराल को मिटाने की दिशा में यह अच्छा कदम है। बहुत ही संक्षिप्त रूप में चार सालों की कहानी प्रस्तुत कर रहा हूँ। गोपनीयता के लिहाज़ से सहपाठियों के नामों में थोड़ा फेर-बदल कर दिया। घटनायें यथावत बिना मिर्च-मसाले के परोसी जा रही हैं।



मैं अपने को जन्मजात प्रतिभाशाली नहीं मानता हूँ, जो भी हासिल किया, मेहनत और लगन से। एक छोटे से गाँव में जन्म लेकर 1983 में मैं रुड़की विश्वविद्यालय (वर्तमान आई० आई० टी० रुड़की) पहुँच गया। रिक्शे से उतर कर अपने पिता के साथ जब मैंने गंगा भवन नामक छात्रावास में कदम रखा, तब मेरा मन भयमिश्रित हर्ष से व्याप्त था। देश के सबसे पुराने इंजीनियरी विद्यालय में प्रवेश पाने का मेरा सपना आखिर पूरा हो गया था और तिस पर अपनी मनचाही शाखा यांत्रिकी अभियांत्रिकी मिल गयी थी। हिंदी माध्यम के निम्न-मध्यम वर्गीय परिवार के बालक का इससे ऊँचा सपना क्या हो सकता था? बारहवीं कक्षा में प्रवेश करते ही मैं स्नातक शिक्षा की योजना बनाने में लगा था। मुझे जानकारी मिली की रुड़की विश्वविद्यालय ही इंजीनियरी का एकमात्र संस्थान है, जिसकी प्रवेश परीक्षा हिंदी भाषा में भी दी जा सकती है। तभी से मैंने इस संस्थान से अपना भावनात्मक सम्बन्ध जोड़ लिया था। "जा पर जाकर सत्य सनेहू, सो तेहि मिलै न है संदेहू", की उक्ति के अनुसार मुझे रुड़की मिल तो गयी थी, पर तरुण मन विभिन्न सम्भ्रमों में गोते खा रहा था। क्या मैं इंजीनियरी की पढ़ाई ठीक से कर पाऊँगा? अंग्रेजी में मेरा अल्पज्ञान आगे की पढ़ाई में बाधक तो नहीं बनेगा? क्या रैगिंग के वारों को मेरी नैतिकता झेल पायेगी? और सबसे बड़ा डर कि कहीं मेडिकल टेस्ट में फेल न कर दिया जाऊँ? यद्यपि मैं मेडिकल फिटनेस का प्रमाण पत्र लेकर आया था, तथापि रुड़की विश्वविद्यालय के निर्देशों के अनुसार संस्थान के डॉक्टर से भी अपने स्वास्थ्य कि जाँच करानी थी।

गंगा भवन के स्वागत कक्ष में अपना बिस्तरबंद रखा। चयनपत्र दिखाया। तुरंत ही 'ए' ब्लाक के भूतल में मुझे पाँच नंबर कमरा आवंटित कर दिया गया। कमरे में पहुँच कर जैसे ही सामान व्यवस्थित किया, श्रीनिवासन नामक एक मद्रासी लड़का अपने पिता के साथ आ गया। वह मेरा रूम पार्टनर था। श्रीनिवासन के पिता इस बात से बड़े प्रसन्न थे कि उत्तर भारतीय होते हुए भी मैं शाकाहारी हूँ और सुबह पूजा भी करता हूँ। उन्होंने बताया कि श्रीनिवासन थोड़ी-बहुत हिंदी बोल लेता है।

पंजीकरण की सारी प्रक्रियायें समाप्त हो गयीं। अभिभावक गण चले गए और कक्षायें तथा रैगिंग शुरू होने की बारी आ गयी। पहले सेमेस्टर में पढ़ने वाले विषयों की सूची देखकर मेरा दिल काँप उठा। भौतिकी, रसायन और गणित तो संभल जायेंगे पर अंग्रेजी? और यह क्या, एक विषय ज्यामिति ड्राइंग और एक मशीन ड्राइंग। यदि ड्राइंग में मैं अच्छा होता तो कक्षा दस के बाद जीवविज्ञान क्यों छोड़ता? मैं तो इन विषयों में पास भी नहीं हो सकता, अच्छे अंक लाने की बात कौन करे? एक विषय वर्कशॉप भी था जिसको लेकर भी मैं आशंकित था। मनसूबे तो यह बनाकर चला था कि कक्षा के श्रेष्ठ विद्यार्थियों में मेरी गिनती की जाएगी, यहाँ तो पास होने के लाले पड़े हैं। हाथ के काम में तो मैं बिलकुल अच्छा नहीं हूँ; वर्कशॉप में फेल भी हो सकता हूँ। फिर मैंने अपने आपको ढाढस वँथाया।

आत्मबल ने कहा, "उदय, गणित में तू मज़बूत है। कम से कम इसमें अच्छा कर पायेगा। बाकी विषयों में ज्यादा परिश्रम करना होगा।" मैंने उसी दिन निश्चय किया कि अब से गणित की तरफ मैं उतना ही ध्यान दूँगा, जितना अभी तक हिंदी को देता था, अर्थात् परीक्षा के एक दिन पहले पढ़ा करूँगा। अपनी ज्यादा उर्जा ड्राइंग और वर्कशॉप में लगाऊँगा।

कक्षाओं का बुरा हाल था। प्रोफेसर लोग अंग्रेजी में जाने क्या बोल जाते थे? मैं तो कक्षा में प्रश्न भी नहीं पूछ सकता था, अंग्रेजी बोलनी जो आती नहीं थी। मैंने अपने रूम पार्टनर से अनुरोध किया कि वह मुझे अंग्रेजी बोलना सिखा दे। तय हुआ कि रोज़ शाम को आधा घंटे बैठकर मेरे साथ अंग्रेजी में बात करेगा। यह नियम दो-चार दिन में ही टूट गया। लेकिन मुझे शीघ्र ही कुछ हिन्दीभाषी मिल गए और हम सबने मिलजुल कर अपनी अंग्रेजी सुधारने का संकल्प किया। दिन में सिर के ऊपर से निकल जाने वाले व्याख्यान, कमरतोड़ प्रायोगिक कक्षाएँ और तिस पर रात को सीनियरों की रैगिंग, जिसे इन्ट्रोडक्शन कहते थे, इन सबके बीच होमसिकनेस हवा हो गयी। सरकार ने रैगिंग को अपराध घोषित कर रखा था, इस कारण कुछ राहत थी; फिर भी रोज़ घंटों नए छात्रों का समय तो जाया हो ही जाता था।

# इंजीनियरी पढ़ाई के चार साल कुछ यादें

वर्कशॉप की कक्षा में पहले मुझे फोर्जिंग (लुहारी) करनी पड़ी। मैं और मेरा पार्टनर कुमार इससे त्रस्त थे। हममें से एक को संडासी से गर्म लोहे को पकड़ना था और दुसरे को हथौड़ा चलाना था। हम दोनों का वजन लगभग पैंतालीस किलो था। पाँच किलो के हथौड़े को भाँजते-भाँजते हम दोनों के हाथ दर्द से बेहाल थे। शाम को दोनों ने एक दूसरे के हाथों में आयोडेक्स की मालिश की। इधर सीनियर रैगिंग के दौरान यह सिद्ध करने में लगे थे कि मैंने अपनी इंजीनियरी की शाखा का चयन ठीक से नहीं किया है।

"इलेक्ट्रॉनिक्स का ज़माना है, तूने मेकैनिकल क्यों ली?" कुछ सिविल के सीनियर कहते 'अबे तू तो घिस्सू (पढ़ाकू) लगता है, तूने सिविल क्यों नहीं ली? रूइकी की सिविल एशिया में टॉप है।"

मैं बोला, "मुझे मशीनों में रुचि है। फिर सुना है सिविल में ड्राईंग काफी करनी पड़ती है।"

"ड्राईंग तो मेकैनिकल में भी काफी है। मगर तू ड्राईंग से डरता क्यों है? मिनी ड्राफ्टर के सहारे ड्राईंग बनाने में क्या मुश्किल है?" उन्होंने कहा।

कहना आसान है, करना कठिन। सीनियरों के मुताबिक ज्यादा पढ़ने की ज़रूरत नहीं थी, पर मेरी हालत खराब थी। मशीन ड्राईंग के तीन घंटे तीन युग की तरह बीतते। मुझे कुछ समझ में न आता। तीन विमाओं वाली किसी वस्तु को दो विमाओं के कागज़ पर उतारना या कागज़ पर बनी आकृतियों से वस्तु के स्वरूप का पूरा ज्ञान हो जाना मुझे जादू सा लगता था। मैं हताशा हो जाता था, पर इंजीनियर बनने की अदम्य इच्छा मुझे प्रयास करने को प्रेरित करती। कुमार का भी बुरा हाल था। अंग्रेजी माध्यम से पढ़कर आये स्मार्ट छात्रों के बीच हम हीन भावना से ग्रस्त हो जाते। एक दिन मैंने कुमार से कहा, "मुझे यहाँ पढ़ने में बहुत दिक्कत हो रही है, मगर मैं परिश्रम करना जारी रखूँगा यदि मैं अच्छा करने में कामयाब रहा, तो भविष्य में मेकैनिकल इंजीनियरी का शिक्षक बनूँगा।"

"यहाँ तुम्हारा हाल बेहाल है। असाइन्मेंट्स और टेस्टों में कक्षा भर से नीचे नंबर ला रहे हैं। इसके बावजूद प्रोफेसर बनने का ख्वाब देख रहे हो?" कुमार बोला। "मैं ज्यादा अच्छा प्रोफेसर बनूँगा और कमज़ोर विद्यार्थियों की समस्याएं भी हल कर सकूँगा, क्योंकि मुझे कमज़ोर विद्यार्थी होने का अनुभव मिल रहा है", मैंने कहा।

सेमेस्टर मध्य में होने वाली परीक्षा के नतीजे आये। बमुश्किल सभी विषयों में मैं पास था, मशीन ड्राईंग को छोड़कर। गणित ने ज़रूर मेरी इज्जत रखी थी जिसमें लगभग पूरे नंबर मिले थे मुझको। शाम के समय कमरा नंबर पाँच में बैठकर मैं मशीन ड्राईंग का मातम मना रहा था। श्रीनिवासन भी उसमें फेल था, लेकिन वह मस्त था।

"अबे चिंता मत कर। हम लोग जैसे-तैसे इसमें पास हो जायेंगे। सेमेस्टर एकजाम में अच्छा किया जायेगा।" श्रीनिवासन ने मुझे उत्साहित किया।

"बात वह नहीं है, श्रीनिवासन। तू तो केमिकल में है, अगले साल मशीन ड्राईंग से छुटकारा पा लेगा। मुझे तो मेकैनिकल में रहना है। मशीन ड्राईंग में इतना कमज़ोर होकर मैं कैसा मेकैनिकल इंजीनियर बनूँगा।" क्रोध और हताशा मिश्रित स्वर में मैं बोला।

"चिंता मत कर। दस-पंद्रह साल बाद ड्राईंग कंप्यूटर से बनेगी और कंप्यूटर थी डाइमेंशनल चित्र भी स्क्रीन पर बना देगा। अब मुँह लटकाकर बैठने के बजाय सिनेट हाल में जा। वहाँ एकस्टेम्पोर कम्पटीशन (आशु-भाषण प्रतियोगिता) हो रहा है। तू हिंदी में अच्छा बोल लेता है, क्या पता तुझे कोई ईनाम मिल जाये?", श्रीनिवासन ने लगभग मुझे धक्का देकर भेज दिया।

सिनेट हॉल में बीस-पचीस प्रतियोगी थे। मुझे तृतीय पुरस्कार मिला। प्रथम व द्वितीय पुरस्कार विजेता अंग्रेजी के वक्ता थे। अब मुझ पर छात्रों का दबाव पड़ने लगा कि मैं सांस्कृतिक कार्यक्रमों खासतौर से वाद-विवाद या भाषण प्रतियोगिता में हिस्सा लूँ। मगर मैं तब तक उसमें हिस्सा नहीं लेना चाहता था, जब तक पढ़ाई में औसत दर्जे का न हो जाऊँ। हर शनिवार को एन० सी० सी० की परेड और खेल के नाम पर योग की कक्षाएँ ही काफी थीं मेरे लिए। इन सारी परेशानियों के बीच मेस का साप्ताहिक रात्रि-भोज ही कुछ राहत देता था।

एक दिन मेरे पड़ोसी छात्र की साइकिल चोरी हो गयी। वे गरीब परिवार से थे और उन्हें पैर की कुछ तकलीफ थी। सब लोग उन्हें सांत्वना दे रहे थे। मैंने कोरी सांत्वना न देकर कुछ सकारात्मक करना चाहा। अपनी विंग के सभी लोगों से दस-दस रुपये इकट्ठे किये। 180 रुपयों में एक पुरानी साइकिल खरीद कर उन्हें दे दी। यह मेरा समाजवाद का पहला प्रायोगिक पाठ था। इसके बाद मैंने मित्रों के सहयोग से बहुत से गरीब विद्यार्थियों की मदद की।

पहले सेमेस्टर का नतीजा आया। मैं सभी विषयों में पास था किन्तु कक्षा के नीचे के 4-5 विद्यार्थियों में से एक था। मेरा मज़ाक उड़ाया गया। इस सिद्धांत को थोपने की कोशिश की गयी कि घिसने से कुछ नहीं होता और मैं कभी अच्छा नहीं कर पाऊँगा। सफल छात्र अप्रत्यक्ष रूप से मुझे चिढ़ा रहे थे कि प्रतिभा जन्मजात होती है और इंजीनियरी में अच्छा करना मेरे बस की बात नहीं है। मशीन ड्राईंग में दूसरे सेमेस्टर भी मेरी हालत खराब थी। अंततः मैं एक प्रोफेसर के पास सलाह माँगने गया।

"क्या मैं ब्रांच चेंज कर लूँ? भले ही मुझे किसी भी ब्रांच में क्यों न जाना पड़े। इलेक्ट्रॉनिक्स तो अब मुझे वैसे भी नहीं मिलेगी।" मैंने प्रोफेसर से पूछा। प्रोफेसर ने सलाह दी कि सिर्फ ड्राईंग से डरकर भागना बुद्धिमानी न होगी। "मेकैनिकल इंजीनियरी केवल ड्राईंग नहीं है। इसमें बहुत से विषय हैं। ड्राईंग ऐसी चीज नहीं है, जिसे तुम सीख न सको।" उन्होंने मुझे ड्राईंग सीखने के कुछ टिप्स दिए, जिनसे मुझे काफी फायदा हुआ। प्रथम वर्ष के परिणाम निकले। मैं सभी विषयों में पास था, पर शायद चालीस लड़कों में मेरी तीसवीं रैंक थी। इलेक्ट्रॉनिक्स विषय में संस्थान भर में कई विद्यार्थी फेल थे। उनकी पुनः परीक्षा होनी थी। पुनः परीक्षा की तैयारी में कुछ विद्यार्थियों की मैंने काफी मदद की।

# कुछ यादें इंजीनियरी पढ़ाई के चार साल

तभी रैगिंग को लेकर मेरे बैच के कुछ विद्यार्थियों और प्रथम वर्ष के विद्यार्थियों में जबरदस्त झगड़ा हो गया। दोनों वर्षों के विद्यार्थियों ने अपने-अपने संगठन बना लिये। मेरा दुर्भाग्य था कि जब दोनों गुट आपस में लड़ रहे थे, तब मैं वहां से गुजर रहा था। मेरे बैच के लोगों ने डीन से प्रथम वर्ष के छात्रों की शिकायत की और मुझे गवाह बना लिया। शायद मेरी सीधी छवि का फायदा उठाना चाहते थे। डीन ने मुझे और मेरे बैचमेट मनीष को लिखित शिकायत देने को कहा। इस बीच दोनों वर्षों के छात्र उत्तेजित थे। कुछ कक्षाओं का भी बहिष्कार हुआ, जिसमें मैंने हिस्सा नहीं लिया। इस पर मेरे बैचमेट छात्रों ने मुझे फटकारा और मेरे बहिष्कार की धमकी दी।

मैं भी तैश में आ गया और बोला, "तुम लोग मेरा बहिष्कार क्या करोगे? मैं खुद ही तुमसे बात नहीं करना चाहता हूँ।"

मैंने डीन को पत्र दिया, किन्तु प्रथम वर्ष के छात्रों की निंदा नहीं किया। डीन ने सुनवाई करने का आश्वासन दिया। कब? पता नहीं!

इधर छात्रावास का माहौल गर्मा रहा था। मेरी पढ़ाई चौपट हो रही थी। रोज़ शाम को लड़कों का झुण्ड मेरे पास पहुँच जाता और डीन से मुझे कैसे बात करनी है, इसकी ट्रेनिंग देता। उन्होंने सिखाया कि प्रथम वर्ष के छात्रों की बढ़-चढ़कर शिकायत करूँ। "मैं झूठ नहीं बोल सकता हूँ।" मैंने कहा। "तू झूठ नहीं बोलेगा तो हममें से कई लोगों को यहाँ से निकाल दिया जायेगा। मनीष पर तो अवश्य अनुशासनात्मक कार्यवाही होगी और मुमकिन है कि तू भी न बचे", एक दादा टाइप छात्र बोला।

छात्रों के चले जाने के बाद जब मैं कमरे में अकेला रह गया, तो मेरा सिर तनाव से फटा जा रहा था। "हे भगवान! मेरे कैरियर को बचा लो। अनुशासनात्मक कार्यवाही से मेरा भविष्य चौपट हो जायेगा।"

पहली बार मैंने इतने तनाव का सामना किया था। मुझे नींद नहीं आ रही थी। अंत में मैं बाथरूम चला गया और पानी की तेज़ धार के नीचे सिर रखकर करीब आधा घंटे बैठा रहा। फिर भी मुझे शान्ति न मिली। मैंने निश्चय किया कि सुबह होते ही मैं डीन के घर जाऊँगा और उनसे अनुरोध करूँगा कि इस मामले का फैसला जल्द किया जाये। घड़ी में देखा। दो बज रहे थे। कब चार बजे और कब मैं कमरे से निकलूँ? इंतज़ार कठिन था। साढ़े तीन बजे ही मैं डीन के बंगले के बाहर पहुँच गया, पर इतनी सुबह उनके घर जाने की हिम्मत नहीं हुई। आखिर साढ़े चार बजे भगवान का नाम लेकर मैंने घंटी बजायी। डर था कि डीन या तो मुझे झिड़क देंगे या दिल का कमज़ोर विद्यार्थी मानेंगे। डीन महोदय नाईट ड्रेस में निकले। मैंने अपना परिचय दिया और उनसे अनुरोध किया कि इस मामले का फैसला जल्द करें क्योंकि मैं पढ़ाई में ध्यान केन्द्रित नहीं कर पा रहा हूँ। मुझे तब एक सुखद आश्चर्य की अनुभूति मिली जब डीन साहब ने कहा "बेटा! तुम्हारी तरह के लोग इस दुनिया में बहुत कम होते हैं। मगर ऐसे लोगों का दुनिया में रहना बहुत ज़रूरी है। तभी संतुलन कायम रह सकेगा। तुम गीता के सिद्धांत के अनुसार बिना डरे अपना कर्म करते रहो।"

"सर! आप इस मामले का फैसला जल्दी निपटवा दें।" मैंने अनुरोध किया।

"ठीक है। आज तो रविवार है। अगले सप्ताह एक-दो दिन में कमेटी अवश्य कोई फैसला कर लेगी। अब तुम छात्रावास जाओ।" डीन ने कहा।

दिन के दो बजे छात्रावास में एक कार आई। मुझे और मनीष को भूतपूर्व डीन के ऑफिस में बुलाया गया था। भूतपूर्व डीन जाँच कमेटी के अध्यक्ष थे। वे एक अंतर्राष्ट्रीय ख्यातिप्राप्त वैज्ञानिक थे, लेकिन अनुशासन के मामले में काफी सख्त। मैं और मनीष कुछ भयभीत थे। भूतपूर्व डीन के ऑफिस में पहले से कुछ प्रथम वर्ष के छात्र मौजूद थे। हम लोगों को कुछ इंतज़ार करना पड़ा क्योंकि रविवार के दिन भी वे अपने पी० एच० डी० छात्र से तकनीकी वार्तालाप कर रहे थे। उसको निर्देश देने के बाद वे हम लोगों की तरफ मुखातिब हुये। मेरा दिल दहल उठा।

"मुझे इस अनुशासन कमेटी का अध्यक्ष बनाया गया है। मैंने सभी की लिखित शिकायतें पढ़ी हैं। मैं इस मामले की तह तक जाकर फैसला कर सकता हूँ, लेकिन मेरे अन्दर एक अध्यापक का दिल है। मैं नहीं चाहता हूँ कि किसी का कैरियर खराब हो। जो हुआ, सो हुआ। तुम लोग आपस में सुलह कर लो, तो मैं मामले को रफा-दफा कर सकता हूँ।"

मैंने और मनीष ने एक-दूसरे को देखा। प्रथम वर्ष के छात्रों से भी हमारी नज़रें मिली। मनीष ने कहा, "सर! प्रथम वर्ष के विद्यार्थी हमारे छोटे भाई जैसे हैं। हमें इनको माफ़ करने में कोई आपत्ति नहीं है।"

इसी तरह प्रथम वर्ष के छात्रों ने भी भावुकता भरी बातें कीं। सर के सामने हमने एक-दूसरे से हाथ मिलाये। सर ने कहा-"तुमको छात्रावास में छोड़ने के लिये बाहर गाड़ियाँ तैयार हैं। फिर भी मेरी सलाह है कि तुम सब लोग एक साथ पैदल हँसते-खेलते जाओ।"

हम भी ऐसा चाहते थे। सभी छात्र पैदल छात्रावास आये। मेरे सिर से भारी बोझ उतर गया था। उस दिन से रैगिंग और छात्रों का वैमनस्य दोनों खत्म हो गए।

इस घटना से मेरा सामाजिक दायरा बढ़ गया था, जो पढ़ाई में बाधक था। मेरा एक पढ़ाकू मित्र किशोर गोविन्द भवन में था। उसके बगल वाले कमरे का छात्र गंगा भवन आना चाहता था। मैंने उससे कमरा बदल लिया और किशोर का पड़ोसी हो गया। मैंने संकल्प लिया कि गीता के सिद्धांत के मुताबिक मैं पढ़ाई करूँगा। फल को लेकर चिंता नहीं करूँगा। मैं कभी किसी कक्षा में अनुपस्थित नहीं रहूँगा और आगे की सीट में बैठने की कोशिश करूँगा। कक्षा में दिए गये हर व्याख्यान को मैं कमरे में किताबों की मदद से रिवाइज करने लगा। ध्यान केन्द्रित न होने पर भी एक व्याख्यान का रिविजन 1 घंटे अवश्य करता। धीरे-धीरे मुझे कक्षाओं के व्याख्यान समझ में आने लगे। मेरी स्थिति सुधरी और तीसरे सेमेस्टर के परिणामों ने मुझे एक औसत विद्यार्थी बना दिया।

# इंजीनियरी पढ़ाई के चार साल कुछ यादें

मेरे भ्रातातुल्य सीनियर राजेश मेरी प्रगति देखकर खुश हुए। उन्होंने मुझे चौथे सेमेस्टर में और मेहनत करने को कहा। चौथे सेमेस्टर का नतीजा आने से तहलका मच गया। मैं कक्षा के पहले 2-3 विद्यार्थियों में एक था।

इस बीच मैंने डिजाइन और फैब्रिकेशन के छोटे-छोटे प्रोजेक्ट करने शुरू कर दिये। सौर उर्जा में मेरी विशेष रुचि हो गयी। प्रोजेक्टों के आखिरी नतीजे से ज्यादा महत्वपूर्ण था कि अब मैं मशीन ड्राइंग और वर्कशॉप में दिनों-दिन कुशल हो रहा था। प्रोजेक्टों के माध्यम से इन विषयों में मेरी योग्यता निखर रही थी। छात्रावास व विश्वविद्यालय स्तर की हिंदी पत्रिकाओं का संपादन भी करने लगा। इससे मेरी लोकप्रियता बढ़ी और पढ़ाई में दक्षता भी।

कक्षा के टॉपों में आ जाने के बावजूद मैं अपने प्रथम वर्ष के दिन नहीं भूला था। अतः कम अंक पाने वाले लोगों के प्रति मेरी सहानुभूति कम नहीं हुई। मैं उनकी मदद को तत्पर रहता। वे लोग अक्सर मेरे कमरे में आकर पढ़ाई में मुझसे मदद लेने लगे। तीसरे और चौथे वर्षों में खुद पढ़ाई न कर अपने सहपाठी मित्रों को पढ़ाया है, ऐसा मुझे लगता है। गोविन्द भवन के सहपाठी भाई-भाई की तरह रहने लगे। मेरा नारा था: "प्रतियोगिता से नहीं सहयोग से प्रगति होती है।" मैंने कभी किसी सहपाठी को कोई किताब देने या मुश्किल विषय समझाने के लिये मना नहीं किया। इसलिए कई लोगों का चहेता बन गया। कोई कहीं से अच्छी किताब पाता, तो मुझे जरूर दिखाता। मेरे कमरे में मित्रों की कितनी ही किताबें पड़ी रहतीं। रात को मेरा समय मित्रों को पढ़ाने में बीतता।

सहपाठियों से मुझे जो प्यार मिला, उसे कम शब्दों में बयान करना मुश्किल है। कई बार सामूहिक त्यौहार मानाने के लिये सब मिलकर मेरे पास पैसे जमा करते। मैं पैसे खर्च करता, लेकिन हिसाब देखने को कोई राजी न था। मेरी बात ही उनका विश्वास थी।

चौथे साल में दो कम अंक पाने वाले विद्यार्थियों ने बी० ई० प्रोजेक्ट में मेरा पार्टनर बनना चाहा। उनका मानना था कि इससे उनके अंकों का प्रतिशत बढ़ेगा। मैंने उन्हें पार्टनर बना लिया। हम लोगों ने विकलांगों के लिये एक तिपहिया साइकिल का निर्माण किया। सबको खूब मेहनत करनी पड़ी, पर साइकिल अच्छी बनी थी।

मुझे अपने गुरुओं पर सदैव भरोसा रहा और उन्होंने भी मुझे आगे बढ़ने में बड़ी मदद की। तृतीय वर्ष की परीक्षा में एक विषय का प्रश्नपत्र बहुत कठिन आया। शत-प्रतिशत तो कोई हल न कर सका, जिसने 60 प्रतिशत हल किये थे, वह अपने को भाग्यशाली मान रहा था। कुमार का बुरा हाल था। वह रो रहा था। उसने लगभग सभी प्रश्नों के गलत उत्तर दिये थे। फेल होना निश्चित था। मैंने उसे सलाह दी कि वह उस विषय के अध्यापक से मिल ले, मगर दूसरे लोगों का कहना था कि इससे प्रतिकूल प्रभाव पड़ेगा। वह कुंठाग्रस्त अध्यापक है, फेल न भी होते होंगे, तो भी फेल कर देगा। लेकिन मैंने कुमार को लोगों की बातों में न आने को कहा। "अध्यापक कभी मेहनती, अनुशासित और सीधे विद्यार्थियों को नापसंद नहीं करता।" अलसुबह कुमार उन अध्यापक के घर गया। उसने बताया कि वह सभी कक्षाओं में उपस्थित रहा था, तथा असाइमेंट भी समय से जमा किये थे, किन्तु दुर्भाग्य से प्रश्नपत्र खराब हो गया था। अध्यापक ने सहानुभूति पूर्वक उसकी बातें सुनी और यथासंभव मदद का आश्वासन दिया। लौटकर कुमार ने बताया, "सर ने मुझे पास करने का वायदा तो नहीं किया, लेकिन मेरा मिलना सार्थक रहा। उन्होंने मुझे बड़े प्यार से बैठाया, डॉटा बिलकुल नहीं, बल्कि सहानुभूति दिखायी। लोग उन्हें कठोर कहते हैं, पर मुझे मोम जैसे लगे।"

तीन महीने बाद नतीजा निकला। कुमार पास था।

चार साल कैसे बीत गये, पाता ही न चला। अपनी अंतिम अंकतालिका लेकर मैं शैक्षणिक विभाग से आ रहा था, तभी मेरे मशीन ड्राइंग के अध्यापक मिल गए। उन्होंने मेरी अंकतालिका अपने हाथ में ले ली। प्रशंसात्मक स्वर में बोले, "बड़ा अच्छा हुआ। तुम ससम्मान प्रथम श्रेणी में उत्तीर्ण हो गये। आगे के जीवन में भी विजेता बनो, ऐसी मेरी शुभकामना है।"

गुरु के अपनत्व भरे शब्द सुनकर खुशी से मेरी आखें भीग गयीं। मेहनत व लगन से व्यक्ति अपनी प्रतिभा तक बदल सकता है, इसका सफल प्रयोग मैं कर चुका था।

रुड़की में मैंने बहुत कुछ सीखा, पर कुछ चीजें मेरे व्यक्तित्व का अभिन्न अंग बन गयीं। अपने छात्रों को मैं निम्न सलाहें देना चाहूँगा:

1. अपने गुरुओं पर भरोसा रखें। सभी कक्षाओं में उपस्थित रहें। याद रखें गुरु का व्यक्तित्व नारियल जैसा होता है, ऊपर कठोर, भीतर कोमल।
2. आप छात्रावास में घर जैसा माहौल बना लें। बिना किसी भेदभाव के, पढ़ाई में कमजोर विद्यार्थियों की मदद करें। गलत आदतों से दूर रहें। अपना व्यक्तित्व इतना प्रभावशाली बनाने का प्रयत्न करें, कि आपके प्रभाव से दूसरे लोग भी अच्छा आचरण करें।
3. लगन और परिश्रम से सब संभव है, इसको जीवन का मंत्र बना लें। क्षणिक असफलताओं से मत घबरायें। देर से ही सही, आप अवश्य सफल होंगे और उस सफलता की मिठास ज्यादा होगी।
4. नींव की ईंट बनने की कोशिश करें। नींव की ईंट बनने में कँगूरु के पत्थर बनने से ज्यादा आनंद है, ऐसा मेरा स्वयं का अनुभव है। आप भी ऐसा अनुभव कर के देखें।
5. जीवन में आशावादी बनें। इस हेतु मैं अपनी कविता की कुछ पंक्तियाँ प्रस्तुत कर रहा हूँ—  
रात गहन है, मत घबराओ, कभी सवेरा होगा ही। पथ लम्बा है, चले चलो प्रिय, कहीं बसेरा होगा ही।।  
चलते-चलते धीरज रखकर, नदिया भी सागर पा जाती। शीत-दैन्य का मर्दन करके, है बसंत की देवी आती।।  
दुखों के तूफान बीच भी, तुम आशा का दीप जलाओ। मन से जीता कभी न हारे, सदा विजय संगीत सुनाओ।।

# Three Arrows Of Time

- VIBHOR KALRA

What is time? Will time flow backwards one day and its effects precede causes? Why do we only remember the past and not the future? These are some of the questions mankind has been asking for quite some time now, in an attempt to understand the cosmos, God's mind when he created the heaven and the earth, whether he had any choice, and the way the universe is as it exists today.

Up to the beginning of the previous century people had believed in absolute time. That is each event could be labeled by a unique number called time in a unique way, and all good clocks would agree on the time interval between two events. However the discovery of the fact that the speed of light is same observed in any reference frame came as a major blow to the concept of absolute time. When one tries to unify gravity with quantum mechanics one has to introduce the idea of "imaginary time". It has been proved that there is no important difference between the forward and the backward directions of imaginary time. On the other hand, when one looks at "real" time, the backward and forward directions of time differ greatly.

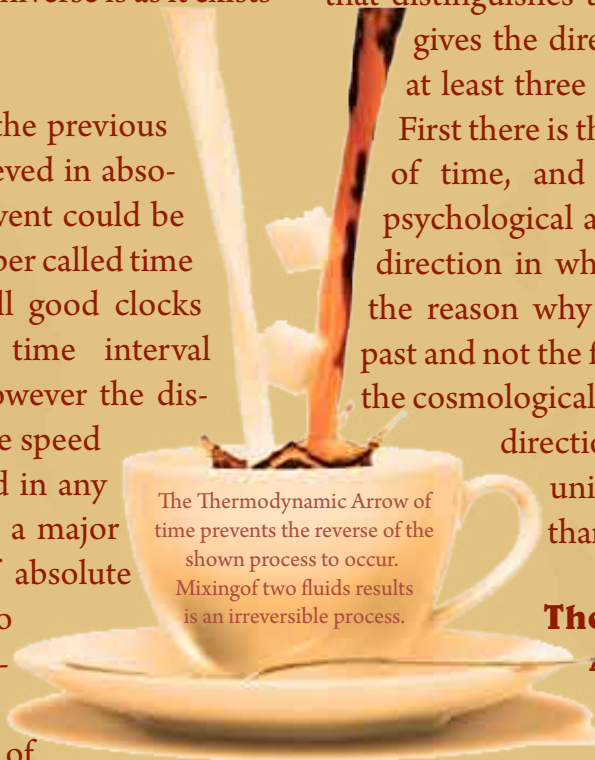
Imagine a cup of coffee that is pushed off the edge of a table and shatters into pieces. Such an incident might have occurred frequently in your home, but yet little thought is given so as to why the broken pieces on the floor

don't gather and form the refilled coffee cup that was initially undisturbed. If it were to happen, crockery makers would go out of business. The explanation that is generally given to counter the question is that the reverse process is forbidden by the 'Second Law of Thermodynamics' that dictates the increase of entropy of a system. Something that distinguishes the past from the future, gives the direction of time. There are at least three different arrows of time.

First there is the thermodynamic arrow of time, and the second being the psychological arrow of time. This is the direction in which we feel time passes, the reason why we only remember the past and not the future. And lastly, there is the cosmological arrow of time. This is the direction of time in which the universe is expanding rather than contracting.

## The Thermodynamic Arrow of Time:

The second law of Thermodynamics is based on the fact that there are many more disordered states than ordered ones. Consider a system that starts its existence in a few ordered states, as time progresses according to the physical laws that govern our universe, the state of this system changes. There is high probability that the new state of the system is much more disordered than its initial state. The Thermodynamic Arrow of time is in essence the second law of Thermodynamics that states that the entropy of



The Thermodynamic Arrow of time prevents the reverse of the shown process to occur. Mixing of two fluids results in an irreversible process.

# Three Arrows Of Time

an isolated system tends to increase with time. Entropy can be viewed as a measure of the microscopic disorder in a system. Thus the Thermodynamic Arrow of time dictates that the disorder of a system increases with time.

## The Cosmological Arrow of Time:

We have come definitely a very long way from the time of the Big Bang. We now know that the universe is expanding. It is also widely known that at the time of the Big Bang the universe was expanding at an exponential rate, thereafter it has slowed down. It is still expanding but not as fast as it once was. It follows

that the universe someday must collapse into a single point (or singularity), the event which we popularly know as the Big Crunch! Because entropy continues to increase in the contracting phase, the contraction would appear very different from the time reversal of the expansion. Eventually all matter will disintegrate and would collapse into black holes, which would then combine to form a single black hole or a Big Crunch singularity. However it is to be noted that the big Crunch is only one possible fate of the universe that has been theoreticized. Time still may continue to exist but scientifically it would have come

to an end.

## The Physiological Arrow of Time:

Things we remember make up the past, while the future consists of those events that cannot be remembered. Our subjective sense of the direction of time, the Psychological Arrow of time, is therefore determined within our brain by the Thermodynamic Arrow of time. It is rather difficult to talk about the human memory, as we know

little about how the brain works. It is reasonable then to assume the arrow for computers is same for that of humans. If it were not, one could

make a killing on the stock exchange by having a computer that would remember tomorrow's prices. Just as a computer, we remember things in the order in which entropy increases. This makes the 'Second Law of Thermodynamics' almost trivial. Disorder increases with time because we measure the time in the direction in which disorder increases. We cannot have a safer bet than that.

“Equidistant from the atoms and the stars, we are expanding our exploratory horizons to embrace both the very small and the very large.”

-Stephen.W.Hawking



The Big Bang: The event that gave birth to time. In other words even if time existed before the big bang it has no consequence as of today.

# Automobiles What Lies Ahead?

- RAVISH VASAN

Automobile derived from the Greek word “autos” (self) and Latin word “mobilis” (movable), meaning a vehicle that moves itself, rather than being pulled or pushed by a separate animal or another vehicle. The history of automobile dates back to 1752 A.D. when a Russian proposed a modification of the horse drawn cart, which made it possible to be paddled by human beings. Since then, Automobile sector has seen rapid and significant advancements surpassing all the development scales set by any other industrial sector. No wonder a life without automobiles now a days is almost unimaginable.

Since then, the society has been benefitted enormously by the advent of automobiles in context of ride comfort, passenger safety, time of transport and travel distance reduction. The world has shrunk and the intercontinental boundaries are easily surpassable now with the recent advancements. So much development has taken place that people are now saying that the golden days of this sector are gone and it is moving towards its decline. What is more interesting about this misconception is that they say automotive developments are now more focused towards alternative fuel application and improving efficiency of engine exhausts. The whole sector is not just limited at this! A whole revolution in chassis design to “nullify collision effects on passenger making zero impact on the driver”, suspension design improvisation to nullify unexpectedly larger bumps,

exceptional powered steering mechanization, driver ergonomics enhancement etc. are the few areas in which research is being carried out. This field is interspersed with all kinds of improvisation in cost of production, waste management, exhaust control, after sale features, maintenance standards and working life of the vehicle.



ing student design initiatives. In this way, students get to apply their knowledge and interest in the field as per industry guidelines thereby making themselves professionally enhanced as well as technological sound. The internship opportunities provide the students with real time interface in the assembly and R&D section of an automobile firm. Meanwhile, the industry is in constant search of dedicated and motivated guys towards automobiles. So, guys who get deep into it by being involved in the practical student design competitions have a higher chance of getting good placement opportunities. One of the most interesting points about such automotive firm jobs is that you are asked to continue your design research which we were doing in the college, thereby making our job a fun rather than a liability. The companies that visited IITG campus last year were searching for automotive oriented guys among a crowd of



# What Lies Ahead? Automobiles

whole IITG junta and apprehended as to why there is no keen interest in automotive engineering in the campus. Now, after the SAE Club is open, there is no doubt in the mind of the companies to think about inducting a lot of guys inclined towards automotive engineering. The sector is virtually open and there are expectations from core automotive companies (other than those that didn't visited till now) to visit the campus for placements in coming years to provide with placement opportunities. For students interested in research opportunities in this, there are numerous foreign universities offering grants and attractive research projects to work upon. Even if you do not do any of the above, the sector has more than enough potential to be utilized for entrepreneurial startups.

Society of Automotive Engineers (SAE) is a global society dedicated to automotive engineers both working as well as aspiring student engineers. This society is one of the benchmark societies which establish automotive standards and patents validation. Among its branches in different countries viz. UK, USA, Brazil, China and India, we are part of SAEINDIA with more than 25000 student members and more than 150 Collegiate Chapters at different campus across the country. There are different student design competitions organized by SAEINDIA which includes BAJA (off road terrain alternative vehicle design and

fabrication), FSAE(Formula type racing) and SupraSAE (street buggy racing). Also, this year EFFICYCLE has also been launched involving innovative bicycle renovations to improve its efficiency. These provide student communities an opportunity to directly apply the concepts learnt by them in the class in real practical environment, making them skilled and effective engineers ready for induction into the automotive firms.

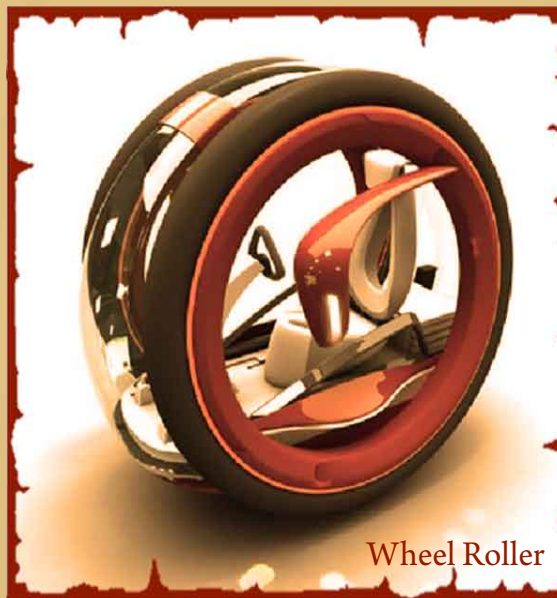
Also by participating in these design competitions, the students develop a very

healthy relations among students and professors of other participating colleges, thereby facilitating an exceptional youth enthusiasm and subsequent national growth in technological as well as psychological terms. The feeling of designing and fabricating a buggy/vehicle which you can

drive in the campus in front of a strong 6000 home crowd is a jubilant feeling. The project, no doubt takes extremely tiring efforts and unswerving dedication along with lots of patience and brainwork obviously. So, this is obviously not a place for weak and fearing. A lot of time aside classes goes into car building and for a time it seems the car is all what you have.... dreaming cars...

sleeping cars... thinking cars.... working with cars.

If such things happen ... Rest all they say for the team is a History!!!



Wheel Roller

# Alumni Speaks

**Shamit Shrivastava**, an alumnus of the batch of 2008, is currently pursuing his PhD at Boston University, USA in the area of Biomedical Engineering. He passed out as a Mechanical Engineer from IITG and was the Head of Event Management Team Alcheringa 2007. In the pursuit of increasing popularity of research as a career option, he is unveiling before us his invaluable experiences and views on the higher education abroad and how MS differs from PhD!

*1. What is the basic difference between the education system in M.S. and PhD abroad? How do you compare between these degrees in terms of the monetary and other benefits/returns they provide?*

MS is basically an extension to a B.Tech. degree in a specific direction, if you like. But in US, I think it has merely become a tool for international students to enter the country legally and compete for the jobs that are available here. The course structure in general is more consistent, relevant, thorough and better taught here. What you learn during an MS is more out of being (internship) in a new country, the work environment and professionalism that you come across etc. Even if you don't want to stay and

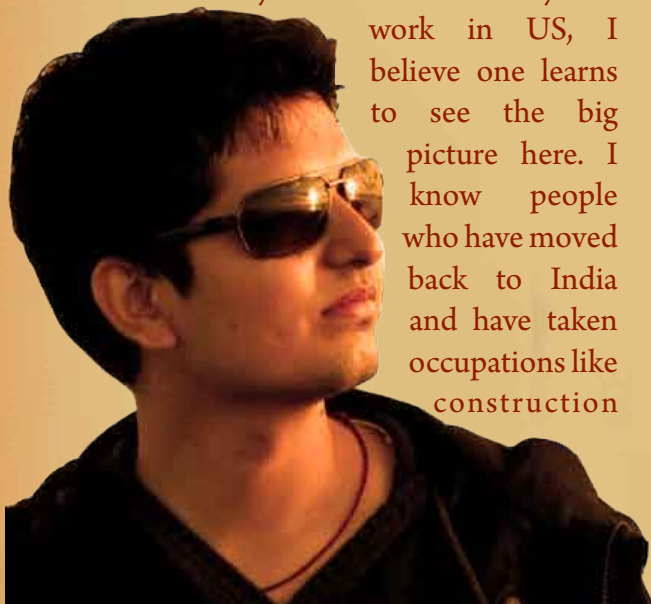
work in US, I believe one learns to see the big picture here. I know people who have moved back to India and have taken occupations like construction

and agriculture and they are doing it at a totally different level. These points apply to a PhD as well. The jobs that you get after an MS are similar to the advance jobs you can get after a B.Tech.

PhD I believe is for the more inquisitive minds. It is not something you should do because you applied to keep your options open and your PhD offer is better than the job that you have at your hand. You will be in for a lot of trouble if that is how you ended up doing a PhD. Then how do you know? You are supposed to learn this about yourself during the 4 years at IIT and the internship. The jobs you get after a PhD, at least at the beginning, pay the same amount as an MS (~65K) it's just that the profiles are different. If you want to go into academics, more often than not you need to add another 1.5-2 years of post doc before you can end up being an assistant professor with an average salary of ~60K. So the decision mostly depends on things other than money, as money is more or less the same in all the cases. Obviously, I have presented a simplified picture but at least at the start of the career this is how it is.

*2. What is the role of internship in all this?*

There is this general opinion that internships are just an opportunity to add some experience to your CV and have some fun in a foreign land. But out of that experience the most important thing is to understand your aptitude for research. What field you do your intern is irrelevant, even if you decide to apply for higher studies in a completely different field. Universities also look only for the recommendation that you earned and the aptitude you showed during the internship. They give little importance to the details of the work you did unless it was ground breaking. But one has to be careful that the experience totally depends on the environment and the problems you get to solve at the internship



# Alumni Speaks

and you should not judge yourself solely upon your experience of a single internship. That is why research at IIT becomes important because you can almost do whatever you want, although mainly in terms of the problems you choose and not the resources you get.

### 3. Why did you choose PhD over MS?

I was always interested in pursuing research. In my case, I knew it even before coming to IIT. But you don't really know much about the research fields at that time. By doing research in your undergrad you learn more about the fields, how to judge the research done by others. How to think about problems and how to ask "good" questions? No matter how certain you think you are about your interests, they keep changing with time and that too drastically. I started with electrical and mechanical properties of Carbon Nanotubes, and then moved to shape memory alloys, then drug delivery, microfluidics, tissue engineering and now biophysics.

### 4. In which research activity are you currently involved in?

After coming to BU, I joined a tissue engineering lab but then moved to another lab as I was not satisfied there. Over past one year I have built micro-photometric instruments (optics, physics and electronics) to observe acoustic waves in thin films (soft matter) and developed a theoretical model to explain the observations (mechanics and thermodynamics). The idea is

to use these observations to understand nerve propagation (Biology). I think that also explains how a mechanical engineer can end up in Biomedical engineering (another FAQ)!

### 5. How much does the choice of institute matter in pursuing higher education?

In India we learn to differentiate institutes based on the "ranks" that we get from different sources. We have similar ranking systems in US but apart from may be top 5 -10 schools which everyone knows about anyway, the ranks are

irrelevant. As unlike in India, all the established institutes aspire to be world class at least in some field and usually have great infrastructure, resources and opportunities overall. Especially for PhD as it is totally about the

lab but again one can imagine an average lab at MIT will be as attractive as a good lab in some other university. Still PhD is about the work and the publications and if those are good you won't have any problem in being super successful even if you are not from say MIT.

### 6. Which institutes are the best for pursuing higher education in US?

It depends completely on the field. Schools usually concentrate only on certain fields and have carved a niche for themselves in those particular fields. Expect for places like Berkley, Stanford and MIT, which are good for almost all the streams, other school have followed this approach but, sometimes schools about which you might have never heard of turn out to be the



# Alumni Speaks

leaders in a particular field. For example, RPI in polymer sciences, Case Western Reserve, Boston University for biomedical engineering etc.

**7. Do you find the academic environment at Boston University excellent for pursuing higher education?**

Boston University concentrated on Biomedical Engineering like CMU did on CS and is today the biggest BME department in the country. So, at least for the BME it is a great place to be in. Moreover being in Boston, its surrounded by all these world-class autonomous research institutes (Whitehead, Koch, BROAD) and there is basically no divide between the biomedical faculty of these institutes and other like MIT, Tufts, Harvard and you can pursue your PhD at

any of these places being a student of Boston University.

**8. What is your message to the juniors who want to make the research/academic field as their career?**

Life is fun because of the uncertainties it has to offer. Don't worry too much if you are not sure about something as no one is, just play your options out and do the best you can in given circumstances. No matter how sure you think you are about certain issues, your priorities, interests, strength, weaknesses all change with time. When it gets tough try not to feel sorry for yourself, if you work hard from there on, no matter how messed up the situation was -

"All is going to be well".

## Life of a Mechanical Engineer

*When round and round the machine goes,  
some smarty-pants does know,  
what science he should apply,  
to make the aluminium fly.*

*When the bud blossoms and grows into a rose,  
the time passes by and pendulum goes to and fro;  
one smarty-pants works day and night,  
still thinking about the aluminium flight.*

*Now you might wonder who this is,  
who's a genius and it's very clear;  
let me throw light on this humble me,  
I am a mechanical engineer!*

*If you think science is boring  
then pardon me! I beg to differ,  
because I could make levers and gears,  
and world of mechanics I have, to offer.*

*In a machine you could just see the levers move,  
but I see it dancing and do the groove  
on the music which you might think is just noise,  
but for me its as good as a girls' mellow voice.*

*So now there's more wonder as to who really I am  
Yeah! I am a mechanical engineer,  
and I am sure about this moment,  
I have added another fan!!*

**- Murtuza Shergardwala**

# Cam-Follower Theory

- JITENDRA BANSAL

Today I studied a chapter on CAM-FOLLOWER. And you know what, the CAM-FOLLOWER theory sounded to me like a MECHANICAL LOVE STORY.

FOLLOWER- Dear CAM, you are the only CAM in my life and I am your FOLLOWER.

CAM- No, you are not my FOLLOWER any more.

FOLLOWER- Don't you remember that we got married after having seven complete rotations around each other and then we had our little ROLLER?

CAM- FOLLOWER, now you have changed a lot. LUBRICATION of love is missing between us. Sorry, this can't be helped.

FOLLOWER- Please don't leave me. I will oscillate, translate and even rotate around you and I will do anything you say. If you don't care about me then at least think that where our little ROLLER will go without us.

CAM- You should have thought that earlier. I can't have motion of life in this broken frame of commitment.

FOLLOWER- I accept that I haven't paid much attention to you because I have been under heavy load these days. I accept that LUBRICATION of love has decreased between us, but how you could you leave me (worn and torn FOLLOWER starts crying like a crack ing rod under tension).

After a long period of DWELL....

CAM- OMG! How I can be so selfish? How can these VIBRATIONS shake our love, you took every IMPACT on us and you never let me hurt. Oh.. now I have realized how much you love me.

After that there was a new LUBRICATION of love between them and they along with their roller had motion of life happily ever after.

:P

## ONLY IF YOU TRY .....

*Came rolling down a hill quite rough,  
an eagle's egg which was equally tough.  
After the fall, which eggs could not stand,  
it finally reached the softer land.*

*It then lay on a lonely way,  
sitting still throughout night and day.  
One day, It got caught in a hen's sight,  
which just could not stand its plight.*

*The egg now was not alone,  
as she had put it with her own.  
All the eggs cracked one day,  
dormant lives got set into play.*

*So be strong enough to give it a go,  
you may be the eagle you never know.*

*Faster than ever the time flew,  
along with it the chickens grew.  
Time, you see, spares no one,  
little eagle also grew like every one.*

*One day, Little eagle saw an eagle in the sky.  
He asked everyone-"Why can't we fly that high"?  
One of the chickens said in a high pitched voice,  
"we are just chickens we have no choice".*

*So the little eagle never gave it a try,  
thinking that for a chicken, it is too high.  
He stayed on ground and never got any closer to sun,  
he lived a chicken's life and died like one.*

- Nitin Khola

# Commonwealth Games Village

- HEMANT AGRAWAL

New Delhi, a business and political hub for India, hosted the XIX Commonwealth Games from 23 September to 18 October 2010. This was the first major "hallmark event" to be hosted by New Delhi since the 1982 Asian Games. Hallmark events have the ability to transform the urban landscape of a city. The enormous expenditure on these is spent largely on the development of civic infrastructure, beautification, transport and sports facilities. If spent effectively, the event can be a catalyst in a much-needed urban regeneration of the city. But even after the 1982 Asian Games, which gave a dramatic boost to sports facilities in the country, our performance is yet to match international standards. The Indian capital had to come up with five new stadiums and a Games Village for the Commonwealth Games 2010. Commonwealth Games Village is Delhi's only purpose-built, self-contained premium residential community. It is located on the National Highway - 24 adjacent to Akshardham Temple, New Delhi and just minutes away from the central business district - Connaught Place, and will be a gated residential community where the towers will be between 6 levels to 9 levels. The Commonwealth Games Village: global living inspired by an international event, developed by Emaar MGF\*, India's premier real estate and infrastructure development company.

The Games Village is an expression of the hospitality being offered by Delhi to approximately 8,000 athletes and team of officials from the 71 nations and territories of the Commonwealth. Spread over an area of 63.5 hectares (157 acres) and surrounded by a dense green natural cover, it is designed to merge traditional Indian hospitality with international standards of comfort and

excellence, to provide a 'home away from home' during the XIX Commonwealth Games 2010 Delhi. It will undoubtedly be one of Delhi's finest concepts in luxury living with natural greens and open landscape.

Comprising five main zones — the Residential Zone, the International Zone, the Training Area, the Main Dining and the Operational Zone — the Games Village, which was a non-smoking zone, was universally accessible particularly to accommodate para-sport athletes.



## •The Residential Zone

It has 14 blocks, 34 towers and 1,168 air-conditioned apartments. Each apartment had two to five bedrooms, giving 4,008 bedrooms in total; each bedroom accommodated two residents which differed from the traditional practice of providing athletes with a bedroom each. The entire zone itself was divided into four

zones, styled after four unique folk art styles found in India as identified by a colour and an image: warli (red), gond (blue), madhubani (green) and sanjhi (purple). Nine Resident Centres, each serving hundreds of residents, were spaced across the residential towers, and they provided key services and facilities as well as entertainment. It also includes the CGA office spaces, the Polyclinic and the Casual Dining. After the games, Emaar has the rights to sell 66% of the "luxury" apartments.

## •The International Zone

The International Zone served as the hub of the Games Village, offering retail and entertainment services as well as a rendezvous for visitors and Games participants. This zone includes bank, post office, retail shops, TV lounge, games room,

# Commonwealth Games Village

internet café, village bar etc. It also includes the Guest Pass Centre, the VIP Waiting Area, the Chefs de Mission Meeting Hall, the Mayor's Office, and the Media Center.

## • Training Area

There are training areas for Athletics, Aquatics, Weightlifting/ Para-sport Powerlifting and Wrestling. There is an eight-lane 400 m Synthetic athletics track and an Olympic-size swimming pool. It also has gymnasium and fitness centre, steam and sauna facilities, physiotherapy rooms.

## • Main Dining

The main dining service is opened 24 hours and provides free meal service. It has the capacity to accommodate 2,300 of the total residents.

## • Operational Zone

It includes -Access Control Point, Vehicles Check Point, Village Operations Centre, Security Command Centre, Workforce Centre, Waste Management Compound, Transport Mall, Village Arrivals and Departures Accreditation Centre.

## Transportation

Two transport systems, provided free of charge, served athletes and team officials in the Games Village. The Internal Village Shuttle provided internal movement within the Games Village, operating 24 hours daily. Bus services linked the Games Village to competition and training

venues, the airport, and the city centre, Connaught Place.

## COMMON AMENITIES

Swimming Pool, Gymnasium, Kid's Play Area, Wi-fi Connectivity, Sports Facility, and Multi-purpose Room etc. The Club house has amongst other facilities – Health Club facility with fully equipped gymnasium, Multi-purpose hall,



Sports facility with Tennis Courts, Basketball court, 30 M Swimming pool, Kids crèche and many more facilities. The other amenities are 100% Power back up, treated water supply system, CCTV in

basement and main entrance lobby and Intercom facility.

The Games Village was said to have adopted green features, in line with the 'Green Games' principle of the 2010 Commonwealth Games, and it showcased and practiced sustainable development principles and practices. An in-house waste water treatment and reuse facility, organic waste treatment facilities, and solar powered energy were among the environmentally friendly practices adopted by the OC CWG Delhi 2010. At the same time, most of the transport fleet provided for the Games ran on green fuels such as battery electric vehicles and compressed natural gas. Construction of the Games Village as a whole however was marred by delays and organisational inefficiencies, leading to concerns as expressed by athletes and the Commonwealth Games Federation (CGF).

Courtesy: [http://www.cwgdelhi2010.org/games\\_village](http://www.cwgdelhi2010.org/games_village)

# Leonardo da Vinci The Greatest Engineer of All Time

- ANUPAM SINGHAL

We say that we live in an era of inventions, inventions of the superlative degree that have been instrumental in taking us several steps further from where we were. It is sometimes imperative to assume that no era before this could result into so many inventions. But there was a man in the 14th century who proved all our assumptions to be wrong. He was none other than the Great, **Leonardo da Vinci (1452-1519)**. Born in Italy, he is the definition of an ideal Engineer. Coupled with technical intellect and inventive creativeness he is undisputedly **'The Greatest Engineer of All Time.'** He is probably the most intelligent human that has ever lived. He had an estimated IQ of 220 (Albert Einstein-180, Charles Darwin-165, and Galileo Galilie-185).



A famous Quote about him:

*"There may not be in the world an example of another genius so universal, so incapable of fulfillment, so full of yearning for the infinite, so naturally refined, so far ahead of his own century and the following centuries."*

His passion and the relentless inquisitiveness drove him to bring forth many of the world's best Engineering inventions. Five centuries ago, his unquenching thirst for knowledge led him to set out and discover many unbelievable phenomena. His work doesn't confine to a specific branch, but its expanse spread wide in the sectors comprising of mechanical, biomedical, chemical, civil, industrial, structural as well as aeronautical engineering. He is now credited as the founding father of the following branches of Science: **Aerodynamics**, **Hydraulics** and **Tribology** (the study of friction). Most of the inventions he did and papers he wrote were lost in history, only to be invented centuries

later by various scientists across the globe.

When he died in France in 1519, he left around 33,000 pages of unpublished notes to his student Francesco Melzi. Francesco looked after the notes as if they were his own. However, when Francesco died, his son Orazio broke the notebooks up into individual pages and sold them to anyone who wanted them for next to nothing. His notes were subsequently scattered all over Europe and lost to the scientific community. The combination of Leonardo not publishing his notes and Orazio losing them has set science and humanity back at least 100 years. 6000 pages were found in the 20th century by which time his discoveries had been rediscovered, usually hundreds of years later. Here are some of his Scientific Notes on Anatomy, Biology, Aerodynamics, Cartography, Geology, Hydraulics, Astronomy, Optics and Tribology, that can be found on the 6000 pages we are left with.

His notes include the structure of the arm and hand, the mechanics of the head and neck movement, the first full drawing of a skeleton, the mechanics of arm and shoulder movement, internal organs of the female body, the first images of a foetus in history, the Perfect Male (the Vitruvian Man) and the movements of horse and rider. He also describes hardening of the arteries (this condition is not rediscovered until 1930).

His knowledge about evolution is also testified by his note in which he said, "Nature being inconstant and taking pleasure in creating and continually producing new forms". He made drawings on birds in flight, a mechanical bat wing, the ornithopter and a mechanical stabiliser, eddy currents/ vortices etc. He often brought birds from the market and set



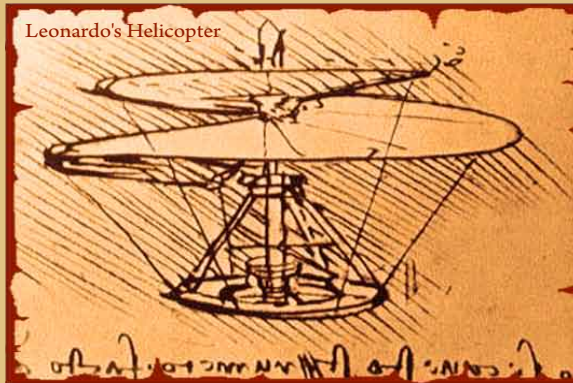
# The Greatest Engineer of All Time **Leonardo da Vinci**

them free after studying them, setting down the principles of aerodynamics. He explains that why the moon can still be seen while the sun is behind it, it is because the sunlight reflects off the sea and back to the moon. He calls it "Earthshine". He wrote, "Light travels in straight line and has a finite speed". He also wrote of a crude telescope, the refraction of light on a concave mirror and the relationship between light rays and shadows. On friction—"Friction is not dependant on the area of contact" which is now called "**Law of Leonardo**".

His engineering notes on military, civil and mechanical engineering consist of a large crossbow design, the first machine gun-powered by wheel rotation, chariots and blades, the tank (not seen again until World War I), a steam powered cannon, automatic ignition device for firearms, an anemometer (measures wind speed), machines for measuring friction, 360° rotating crane, a coin mint, bucket-wheel evacuator, water pump using Archimedes Screw, and the worm gear. He also designed the ball bearing, the roller bearing and the tapered bearing, cam operated hammer and scuba diving gear.

James Watt had so much trouble with his steam engine because he had never seen Leonardo's flywheels. He also made the designs for perpetual motion machines and after testing the perpetual motion machines and realizing that they would not work he said, "For every action there is an opposite but equal reaction" (which we now know as Newton's third law), 150 years before Newton was born. He is probably also the first Robotic Engineer. He created a robot that could sit up, wave its arms and move its head and neck, the robot was human sized and dressed in armour. The first automobile in

the history, this drawing was only found in 2003; the model named "Leonardos Automovile" has been successfully built and tested. On the 27,000 pages of his notes which remain lost, there could be



a rough understanding of evolution, a crude sketch of a steam engine and who knows what else. A steam engine can still be made by combining some of his existing notes. Now, you might be wondering that why much emphasis is laid on the steam engine? Because the steam engine

was the power source for the Industrial Revolution and it marked the start of our modern technological society. If Leonardo had the design of the steam engine in the year 1500, instead of James Watt's steam engine in the 1760s, we would have had the Industrial Revolution 260 years earlier and if we had it then, we would have been as advanced now, as we hope of being in the year 2271!

Among the other notable works created by Leonardo in the 16th century is a portrait known as The Mona Lisa. In the present era it is arguably the most famous painting in the world. Its fame rests, in particular, on the elusive smile on the woman's face.



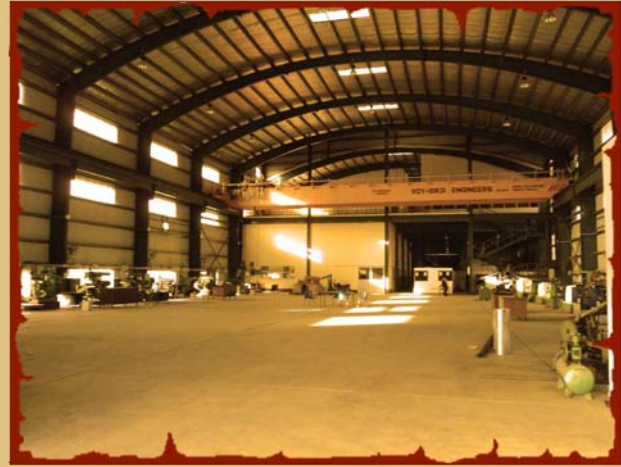
He showed the limitless possibilities for an Engineer. He was a visionary who looked way ahead of his times and showed us what Engineering is all about. Leonardo da Vinci, the man himself has said "Life is pretty simple: You do some stuff. Most fails. Some works. You do more of what works. If it works big, others quickly copy it. Then you do something else. The trick is doing that something else." That pretty much sums up his passion for the Engineering field and now knowing this little trick, let the unending fire ablaze your heart, and be driven by the True Engineering Spirit!

Courtesy: <http://www.leonardoda-vinci.org/>

# Central Workshop



The newly built "Central Workshop"



Inside view of the workshop which includes welding, turning, machine, toolroom, carpentry, fitting and sheet metal shop.

## A flexible manufacturing system (FMS)



A flexible manufacturing system (FMS) (currently being installed in the workshop) is a manufacturing system in which there is some amount of flexibility in managing manufacturing resources like time and effort in order to manufacture a new product.

The work machines which are often automated CNC machines are connected by a material handling system to optimize parts flow and the central control computer which controls material movements and machine flow.

# Central Workshop



Gas cutting by oxidizing flame which contains acetylene gas and excess of oxygen



Lathe machine

## 2.5 KW CO<sub>2</sub> Laser Cutting Machine



Recently, Advanced Manufacturing Laboratory of Mechanical Engineering Department has procured 2.5 KW CO<sub>2</sub> Laser Cutting Machine (Model: Orion 3015, Make: LVD, Belgium). The machine is suitable for cutting of steel sheets upto 16 mm thickness and aluminium sheets upto 6 mm thickness. The machine is equipped with GE Fanuc Laser package, CNC control, AC digital motors and with all necessary safety features. As a laser gas, the machine uses a mixture of 5% CO<sub>2</sub>, 60% He, 35% N<sub>2</sub>.

Although, the machine is mainly for cutting process, it can be used for microforming of sheets, welding of the sheets and localized heat treatment.

# SYNC

following excellence....

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