



KALIEDOSCOPE

Interaction with Dr. Kalyanmoy Deb

In this issue :-

KALIEDOSCOPE
GEAR UP
THE INK FLOWS

First of all, congratulations for the Infosys prize for engineering and computer science. Let's go a little back in your life, when after graduating in Mechanical Engineering from IIT Kharagpur, after which you joined Engineers India Limited, served there for two years and then chose to pursue your masters in University of Alabama. What motivated you to make this decision?

KDEB: Frankly, when I was doing my undergraduate degree I wanted to have some experience, because I believe engineering is such a field where unless you experience the real world you don't really know the application potential of what you are learning. So I was always hungry for that, I wanted to go out and see what they do in practice. When I was graduating I didn't think of higher studies, at that point of time I wanted to pursue design in applications- where you come out with dimensions and shapes of component for a problem. I was looking for a company that could give me this option- I learnt that out of many companies that were coming, Engineers India Ltd was one doing real design calculations from scratch, unlike others who were importing. As soon as I joined I was placed in Surat where a whole new petro-chemical industry was to be set up, there I designed lots of pressure vessels, storage tanks etc. The first year was interesting to deal with new problems every day but subsequently it became repetitive, but I wanted to do more. The experience there was however



"...With PhD you go beyond, narrow down further, it is when you show the world how deep you can go and unveil some stuff that people did not know before ..."

very good, it was there I learnt about the difficulties in implementing a design that includes human error, measurement error etc. And there was always another person to put the blame on. There was a big difference between making decisions on a drawing board and on ground.

What about choosing your research area in Genetic Algorithms, did you anticipate that?

KDEB: You never do. After a B.Tech degree you know only a little about lots of stuffs- fluid mechanics, solid mechanics, manufacturing, robotics. But if you want to do more that's where the higher studies comes in.

But still there are many other areas which could not be fit in your undergraduate curriculum, so actually you don't even know the whole gamut of Mechanical Engineering. At Alabama, I had to take four courses, three of which were compulsory and the other one was elective. When I was browsing through the options I bumped into Prof. Goldberg who was working in genetic algorithms- sounded peculiar to me in mechanics department. So I approached him and got to view lot of his papers and was impressed that how the evolutionary ideas could be applied to lot many engineering applications. I started putting in lot of time in it; mid-way through the semester Prof Goldberg asked me if I was interested in working in this area.

After giving it a proper thought and realizing that I actually was interested in working in that area there was no looking back. I really got engrossed into it, the reason I liked this area because the algorithm is free from any mathematical constraints, and which was mimicking the natural evolution. All you need to know is good programming so that you could code some of these ideas and ponder what would have been the outcome had the evolution not been this way or that way. And in that course you might figure out that this would have been a better design than that. So I figured out I have lots of freedom in this area [with gleam in his eyes], I can think and implement an idea- for example multiple modes come in with dynamic systems- you have 1st natural frequency, then 2nd natural frequency and so on, now this could be posed as an optimization problem in which all my optima would be the natural frequencies. So, on a simple spring mass damper system, with the help of this algorithm I could find all the natural frequencies in one run! Then came PhD and Goldberg was the best person around plus with same person as a guide and same place I thought I could reduce the overall time for my PhD, I did actually- it took me officially 1 year 3 months to complete my PhD, though main work was finished within a year!!

But I must say this, a lot of you stop after your bachelor's degree, in some since even I did but then it was an addition, as it reflects in my teaching and my research. And especially those of you who are capable of going all the way, when they stop it is kind of giving up. With masters you start focusing on one of the topics from your undergraduate studies and learn further. With PhD you go beyond, narrow down further, it is when you show the world how deep you can go and unveil some stuff that people did not know before. That is truly the highest degree one can earn, it means in that particular are you are the boss, you can probably be a good teacher, own a research organization and even prove to be a good entrepreneur. On top of that this gives you

respect anywhere you go. Its just that you should not stop, there is so much to discover, so much to learn, and so many opportunities to do new stuff. And thankfully the situation in India is now changed; this generation is not in too much pressure of finance or society, so you should think at least.

Actually in your case Sir, you always had a hunger for variety and applicability in your work, as in design, but not all of us know what really fascinates them.

KDEB: Indeed design always fascinated me. In fact according to my JEE score I could have got Computer Science in IIT Kharagpur, but I was always interested in machines and wondered how they work. So I chose Mechanical Engineering and in that design in particular. Who knows if I would have chosen fluid mechanics I could have done better. But what disappoints me that you

“...what disappoints me that you people don't even know what you want to do after graduation. What is worse is that students don't even attend lectures. ...”

people don't even know what you want to do after graduation. What is worse is that students don't even attend lectures. Especially by your third year, when you do most of the Mechanical Engineering courses you should know what interests you. At this stage you should browse through the various research area of the professors and see what you find interesting, then take electives accordingly to know more, that's how you should make full advantage of the IIT system. And that's how you develop respect for your profession. And in case you are not able to decide lets say between fluid mechanics or solid mechanics, still choose one and then go for it for you were okay with anyone of them anyways. Some people even come back to the beginning to change and then start all over again. Our topper in Kharagpur went on to study medicine to make his career in that, and now he is a well-established doctor in the US. The reason is that a good education here will always help you in your life. But not coming to class is never a solution as it does not help any body and certainly not the students.



LASER Ignition in IC Engine



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

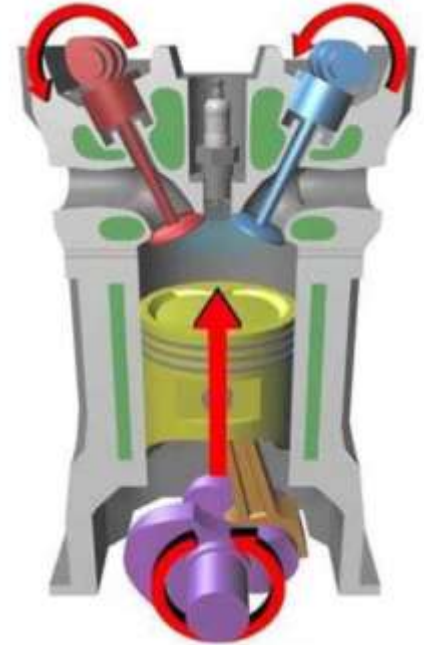
Starting with the invention of wheel in some 4000 BC, human race has never looked backwards. Now, with the development of high speed bullet trains, the journey that was completed in years can now be done in a few hours. In the complete development of Automobile industry, this one component "Engine" has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

A lot of problems are associated with the traditional methods like limitation on sparking position, high voltage breakdown, erosion and higher NO_x emissions. Lean combustible gas mixtures and increase in in-cylinder pressure poses problems for conventional spark plug. Higher voltage severely reduces the spark plug life and durability. Since, the engine field is very diverse the main emphasis and basis of operation boils down to lower power requirements, better output and reliability of the system.

It has been known for some time that when a short duration laser pulse is focused in air, a strong spark is generated by plasma formation. This plasma could be used to initiate the combustion in a spark ignition (SI) engine potentially. For any technique to be adopted universally, it is its implementation that has to be focused on. The implementation of any new system can be judged from its application, advantages and disadvantages. The use of Laser pulse as an ignition source is also associated with plethora of advantages:

- Feasibility to choose the position for plasma formation.
- Since there is no discharge between the electrodes, therefore absence of erosion effects and redundancy in plasma formation is ensured.
- The lifetime is expected to be higher than conventional spark plugs.
- Allows ignition of leaner mixtures and thus reduced NO_x emissions.
- Precise Ignition timings

Absence of erosion effects and reduced NO_x emissions could lead to higher engine efficiency. Concerns about energy availability and pollutant emissions, such as nitrogen oxides and particulates, have driven concerted efforts towards the design of the next generation of internal combustion engines, capable of higher efficiency and lower emissions. Among the various new designs and concepts, the Laser spark plug development is one of the promising approaches. The introduction of such new technique if implemented correctly could prove out to be a major breakthrough in the Automobile world.



Kewal is a fourth year undergraduate of the dual degree program. To add to his list of honors and awards earned he is being conferred with the 'Outstanding Passing Out Student Award' by the department, in recognition for bringing laurels to Institute and the Country in various National and International Competitions.

**-Kewal
Dharamshi**
kewal@iitk.ac.in

मेरी मंजिल

कभी इस डगर तो कभी उस डगर
मंजिल पर है बस मेरी नज़र

राह में कितनी अड़चने हैं यारों
पर मुझे नहीं किसी की फिकर

ना दिन का पता है ना रात का पता है
मंजिल कहाँ है बस ये है मुझे खबर

इस मंजिल की खातिर कितनो का दिल तोड़ दिया
दिल मेरा भी टूटा पर नहीं है मुझको असर

लोग कहते हैं कि मैं पागल हो गया हूँ
वो क्या जाने कि बस तू है मेरा सब्र

क्यों रुठी है अब तक मंजिल मुझसे
मैंने तेरे लिए कितना किया है तू मेरे लिए इतना तो कर

मैं हूँ मंजिल तेरी तुझ पर फ़िदा हो गयी
अब और ना कर आ गले लग आकर



Siddharth Kosti is
an M.Tech
Student who
believes :-

>> If you want
something in
your life, than
you have to work
hard.....there can
be some
delay..but surely
you will get it.

>> For getting
your मंजिल don't
break your
relations because
what they can
give to you, your
मंजिल can't.

**-Siddharth
Kosti**

skosti@iitk.ac.in

Ankit Mahato is a Third Year Undergraduate. He has several accolades to his name (including Gymkhana Science & Technology Excellence Award). Apart from being a programming geek he enjoys scribbling poetries too.

-Ankit Mahato
amahato@iitk.ac.in



I set my foot on the sandy beach,
Nervous coz i was just a novice;
It was then I first saw her,
The one who took my breath away;
Her mesmerizing beauty,
I couldn't understand;
There she was - The woman of my dreams,
A sight I couldn't believe.
Her eyes, captured in my mental pic,
And hair smoother than silk.
My words couldn't describe her
The angel, my eyes had never before seen.

The trumpet blew, the race began
Swiftly left the shore as fast as I can
Suddenly I was hit by the waves
All hopes lost as there was no escape
Eyelids closed, I was lost in this abyss
But there was someone waiting,
So I didn't quit.

Cycling race was soon to begin
The day was beautiful and i knew exactly where i was heading!

Down the lane and across the valley,
I biked with full spirit.
The day was mine, I was miles ahead,
But fate, my dear, had other plans,
I Stumbled, I fell, I remounted my bike,
And silently crossed the finishing line..

Final day had set in,
I entered the stadium packed to brim
And I saw her standing silent and still.
she neva looked at me, but I, I could feel,
I was still in love with her, in love with her,
indeed.
Soon there was a bang and race began,
She was smiling, cheering,
And amazing she looked in her white hat,
I ran in full spirit overtaking as many as i can
The final lap and there she was ,
Standing waiting for me with spread hands
I sprinted, crossed the line ,
Embraced her with a whole hearted smile,
I lost the race, still, nothing else I had wanted in
my life.

Let others cheer the winning man,
There's one I hold worthwhile;
It is he who does the best he can,
Then loses with a smile!

