



KALIEDOSCOPE

In this issue :-

**KALIEDOSCOPE
BACK-YARD
NEWS FROM THE DEPT
GEAR UP**

Interview with Dr. Prakash M. Dixit

Good Evening Sir, the first part of the interview will be a peek into your life. So starting from earning a B.Tech in Aeronautical Engineering from IIT Kharagpur to becoming HOD of Mechanical Engineering at IIT Kanpur, how has the journey been so far?

PMD: After passing out from IIT Kharagpur, studying Aeronautical engineering, I went to University of Minnesota for doing PhD in mechanics; the knowledge I gained there helped me develop a good background in the area of mechanics and gave me the ability to do independent research.

Then I joined IIT Kharagpur as a lecturer in 1980, where although I enjoyed teaching I found it difficult pursuing research due to paucity of time and full time research students in the department of aerospace engineering. After which I joined the department of Mechanical engineering in IIT Kanpur. Here faculty members get lot of time to do research, so the experience here has been good.

Since most of the readers of the newsletter are going to be students, yours poses a curious example to them. So after completing Bachelors in Aeronautical, that too with an outstanding

performance, how and when did an inclination to Mechanical Engineering take place, major research areas being metal forming and ductile fracture?

PMD: I wanted to study Aeronautical Engineering because I found it analytical and

quite practical in nature. After that I found that in India, there were two kinds of aerospace hubs, one was in HAL, Bangalore-where it was mostly making aircrafts based on designs which were imported, and the other one was the Vikram Sarabhai Space

Center in Trivandrum- but there I needed a higher degree. So I decided to go abroad to study mechanics which is a more basic concept common to all-Mechanical, aerospace, civil or even chemical for that matter.

As a faculty member, what are your concerns regarding the state of Mechanical engineering in IIT Kanpur? And as an HOD, what visions do you have for the same?

PMD: First let me talk about concerns, and that I would like to express not only for Mechanical engineering department in particular but the students in general. As I have observed lately, probably in the last 6-7 years students have been attending less and less number of classes, also the motivation level has gone down.
(Continued to Pg#3)



“...that at IIT we are taught certain paradigms- given a problem how are we suppose to approach it rationally...”

Formula SAE is a student design competition organized by the Society of Automotive Engineers. The competition was started back in 1978. It is held each year in seven different countries. The prototype race car is to be evaluated for its potential as a production item. Each student team designs, builds and tests a prototype based on a series of rules, whose purpose is both ensuring on-track safety (the cars are driven by the students themselves) and promoting clever problem solving.

**-Akshay
Chawla**

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The Story of SAE-IITK

Let me start with a question. How many of you wanted to be a mechanical engineer because of your love for automobiles? I guess more than half of you will fall in this category, and I am no different. My passion for cars was the reason I opted for Mechanical Engineering. But by the end of my first year here, I had realized (quite sadly) that there is no course offered in our institute related to automobile engineering.

Sometime in October 2010, a group of Y8 students started the SAE IITK Chapter, with the aim of promoting activities related to the automotive sector in the institute and participating in competitions like BAJA, FSAE etc. I became a member of the society and started working in the vehicle dynamics department.

The work gained momentum during the winter break. At that time the main focus was on gaining

“...the joy of building something from scratch, watching it grow and finally work is feeling that can't be described in words...”



the needful amount of knowledge in order to be able to build a car from scratch. The extensive literature available on the subject and the absence of an expertise made this process rather slow and taxing. In the summers of 2011, the work made a lot of progress. The chassis was designed in Autodesk Inventor & SolidWorks and analyzed the suspension in software like OptimumK, MSC Adams etc. The whole process is highly iterative and involves a great deal of analysis at each stage and is thus highly time consuming.

Although I joined the IITK Motorsports team because of my love for cars, working for this competition involves a lot more. The joy of building something from scratch, watching it grow and finally work is a feeling that can't be described in words. But the competition is not just about building and racing a car. You learn to work in a team (which gradually becomes a large family), face challenges and deadlines and overcome them. You spend hours with your team, scratching your head over something trivial, but the joy you get on finally solving the problem (and realizing how stupid all of you were!) is unparalleled. All this will help you evolve and mature in a way that no curriculum can offer you.

New courses developed:

- Dr. B.L. Sharma, Hamiltonian Mechanics and Symplectic Integration: ME726Calculus of Variations: ME624 (this is a combination of two existing courses that were offered over a duration of one year in sequence).
- Dr. B L Sharma and A Gupta, ME 726, Hamiltonian Mechanics and Symplectic Algorithms (other faculties involved.)
- Dr. Malay. K. Das Applied for the Senate approval: Combustion and Reacting Flows.
- Dr. Ishan Sharma, ME 698G Special Topics: Granular Materials.

NEWS FROM DEPT.

Source:
Annual Report of
Office of Research
and Development
2009-10(*last*)

Even during my times, after graduation people went for various kinds of jobs. So whatever they studied they didn't necessarily got jobs in that area. Still they attended classes seriously and followed sincerely whatever was being taught. Because there was always an underlying understanding that at IIT we are taught certain paradigms- given a problem how are we suppose to approach it rationally. And this training helps you in whichever job you go. I feel students today lack motivation, probably because they spend a lot of their energy in preparing for JEE. Or because, they don't see use of whatever is being taught in accordance with the job they will end up with after graduation. But even in that case I think they should religiously attend classes, because what we teach in the classrooms is that paradigm.

As far as the post graduate education is concerned, I think we should design more courses for ensuring proper training of their minds too. And about research, I am of the opinion that the faculty we have is very good

in diverse research areas and are carrying out really good work. I think we should continue with that and strive for excellence rather than imposing tasks on them which might not serve the purpose.

Sir, what do you feel about the student teacher relationship at IIT, is there a need for augmentation or do you feel it is satisfactory anyways?

“...happy hour is a good step towards strengthening student-teacher relationship...”

PMD: When I joined in 1984 I was satisfied with the relationship, one reason could be that there were less number of students. Apart from that more number of students used to ask questions inside and outside the class, that number, by contrast, has gone down. That was also the time when students

came to me even to discuss their personal problems but again that has finished. I am not sure who is to be blamed, but there is definitely a need to improve this relation.

But I think the last happy hour we had was a good step towards that. I would wish more students and faculty could turn up for such events.

THE INK FLOWS

दिन सलीके से उगा, रात ठिकाने से रही
दोस्ती अपनी भी कुछ रोज़ ज़माने से रही

चंद लम्हों को ही बनाती है मुसाफिर आँखें
ज़िंदगी रोज़ तो तस्वीर बनाने से रही

इस अँधेरे में तो ठोकर ही उजाला देगी
रात जंगल में कोई शमा जलाने से रही

फासला चाँद बना देता है हर पत्थर को
दूर की रौशनी नज़दीक आने से रही

शहर में सबको कहाँ मिलती है रone की फुर्सत
अपनी इज्जत भी यहाँ हँसने-हँसाने से रही



Dean Kamen's "Luke arm" the prosthesis, named for the remarkably lifelike prosthetic worn by Luke Skywalker in *Star Wars*, is agile because of the fine motor control imparted by the enormous amount of circuitry inside the arm, which enables 18 degrees of freedom

"You know, the first airplane went 100 feet in 1903 thanks to Wilbur and Orville. But it wouldn't have made and old pigeon jealous. But now we got Eagles out there, F15s, even that Bald Eagle. I've never seen a bird flying around at Mach 2" —Dean Kamen

-Pranay Agrawal

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Prosthetic Arm with mind control

Anthony Tether, an electrical engineer who runs Defense Advanced Research Projects agency had come to Mr. Dean Kamen's rural western Massachusetts workshop to persuade him to tackle a challenging engineering problem: a robotic arm that would make it possible for any of the 1,600 or more Iraq veteran amputees to resume a semblance of a normal life. The arm has motor control fine enough for test subjects to pluck chocolate-covered coffee beans one by one, pick up a power drill, unlock a door, and shake a hand. The different grips are shortcuts for the main operations humans perform daily. Deka engineers modeled the arm based on the weight of a statistically average female arm (about 3.6 kg), including all the electronics and the lithium battery.

Normally, the nerves travel from the upper spinal cord across the shoulder, down into the armpit, and into the arm. Dr. Todd Kuiken pulled them away from the armpit and under the clavicle to connect to the pectoral muscles. The patient thinks about



moving the arm, and signals travel down nerves that were formerly connected to the native arm but are now connected to the chest. The chest muscles then contract in response to the nerve signals. The contractions are sensed by electrodes on the chest, the electrodes send signals to the motors of the prosthetic arm—and the arm moves. With Kuiken's surgery, a user can control the Luke arm with his or her own muscles, as if the arm were an extension of the person's flesh. However, the Luke arm also provides feedback to the user *without surgery*.

Instead, the feedback is given by a tactor. A tactor is a small vibrating motor—about the size of a bite-size candy bar—secured against the user's skin. A sensor on the Luke hand, connected to a microprocessor, sends a signal to the tactor, and that signal changes with grip strength. When a user grips something lightly, the tactor vibrates slightly. As the user's grip tightens, the frequency of the vibration increases. "I can do things I haven't done in 26 years!", "I can peel a banana without squishing it." A user exults as he steers the Luke arm with joystick-like controllers embedded in the soles of his shoes. These customizable foot pedals are connected to the arm by long, flat cords. "When I push down with my left big toe, the arm moves out," he says, shifting to demonstrate. "When I move my right big toe, it moves back in." He shifts again, and the arm dutifully obeys.

When a kid said to Dean Kamen that "it's way way better than a plastic stick with a hook on it. But there is nobody in this room that would rather have that than the one you got", he simply said that "I think eventually we'll make these things extraordinary. I'll stop, when your buddies are envious of your Luke arm, because of what it can do, and how it does it. And I'll keep working. And I'm not going to stop working until we do that."