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AMEN

The Association of Mechanical Engineers

NEWSLETTER

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The beginning of knowledge is the discovery of something we do not understand.

INTERVIEW

An AME team caught up with Dr. Gangan Prathap, Director, CMMACS (Centre for mathematical modeling and computer simulation) - a CSIR laboratory, who was here to inaugurate the departmental distinguished lecture series. Excerpts from the interview:

AME: *You have been involved in R&D for more than 3 decades. What changes do you find in this field in terms of facilities, funds, attitude of the people and government support?*

GP: Well I don't think there has been any perceptible change except that in our times the brightest kids used to go for research. The trend today is quite different. But yes, the commitment from the government and the industry is gradually increasing. Some sectors are opening up of late.

AME: *Why do you think a change has occurred in the attitude of the students?*

GP: This is all governed by societal pressures....The students can't be blamed for that. …Money is the driving force today….We are being driven by our middle class hangover. Students are more focused on their careers than gaining knowledge. Look at Bill Gates, Michael Dell and Steve Jobs. Despite being college drop-outs, they have still attained such great heights. On the other hand, we study so much but end up serving these people!

AME: *So what do you think needs to be done to improve the research opportunities in India?*

GP: Basically we can't depend upon the government for research activities. Support from the Industry is a must. Unfortunately that is missing in India.....In the US companies like Microsoft, IBM, and Bell have their own research facilities which are much bigger than most of the facilities available here. They set aside large fraction of their budgets for research. The industry has to take the initiative.

AME: *How do you think mechanical engineering has evolved over the past 20-30 yrs and what sort of developments do you foresee?*

GP: Modern engineering has mostly shifted to mathematical modeling and computations. Computers have changed things significantly. This has been a great leap for science and engineering....There is greater integration today. Engineering has become more multi-disciplinary…..

AME: *Some words of wisdom for the prospective mechanical engineers here*.

GP...be less selfish, less focused and more open-minded. Lay greater stress on assimilation of knowledge than on career goals as the final aim.

(The complete interview is posted on our website)

FROM THE DEPARTMENT

- **Dr. P. K. Panigrahi**, a faculty member at the department has been selected for the **Swarnajayanti Fellowship** which was launched in 1997 on the occasion of the 50th anniversary of India's independence. Dr. P. K. Panigrahi from has been involved in development and implementation of various emerging optical techniques i.e. liquid crystal thermography, particle image velocimetry, laser schlieren and colour schlieren. He is actively involved in the development and implementation of various techniques useful in aeronautics, naval, laser and nuclear engineering as well.

- Another faculty member, **Dr. Avinash Agarwal** has been honoured with the **INAE Young Engineer Award-2005**. This award of the Indian National Academy of Engineers will be presented to Dr. Agarwal on December 10 at the Annual Convention of the Academy at Bangalore. Dr. Agarwal is working on the production of biofuels from vegetable oils and its characterization, combustion phenomenon study in IC engines, automobile emissions, alternative fuels for diesel engines, lubricating oil consumption phenomenon, lubricating oil tribology, development of micro sensors and laser diagnostic techniques.

- **Coming up:** The AME is organizing a seminar on crash worthiness on 10th November at 6 pm in L9.The speaker, Dr. Sudipto Mukherjee, an IITK alumnus, is an Associate Professor at IITD and is presently a visiting faculty at IITK. The topic of the talk is "Towards safer vehicle design ".

Vehicle research in the past two decades has been driven by safety considerations. Dr. Mukherjee will explain the demands of vehicles and safety systems in crashes using the basics of mechanics. He will also enlighten us on the ongoing research on Vehicle Crash Simulations, Human Body FE simulations, Tissue Characterization and Crash reconstruction at the Transportation Research and Injury Prevention Programme (TRIPP), IIT-D.

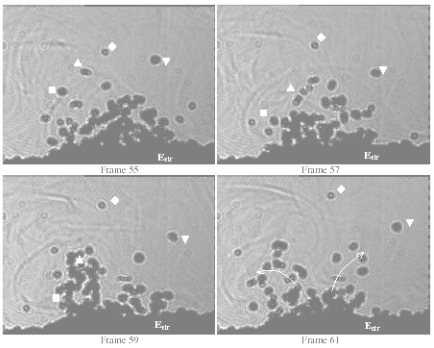
DID YOU KNOW?

The safety pin was invented by Walter Hunt while he was twisting a piece of wire, trying to think of something that would help him pay off a fifteen dollar debt. On April 10, 1849, the safety pin was patented. Walter Hunt also thought little of his safety pin as an invention and soon sold the patent for four hundred dollars.

SCOPE OF FLUID FLOW STUDY AT SMALL SCALES: (A Multidisciplinary outlook)

(**By Dr. P.K.Panigrahi**)

Introduction: Micro Electro Mechanical Systems (MEMS) (length scale of the order 1μm) and Nano Electro Mechanical (NEMS) (length scale of the order of 1 nm) are no more considered as futuristic technologies. They represent technology of the present and their potential applications have grown tremendously in recent times. According to a recent survey by Systems Planning Corporation, fluid flow critically influences the performance of about 30% of small-scale devices. This article concentrates on small scale devices and phenomena in which fluid flow plays a critical role. The study of fluid flow phenomena in these small scale devices is quite challenging from both modeling and experimental point of view. The traditional model i.e., the continuum approach, Newtonian laws of motion, Fourier law of heat conduction and others used for engineering/scientific analysis break down for small scale devices. Similarly, intrusive techniques for measurements are not ideal for small scales from system complexity point-of view. Optical techniques are ideal for the study of these devices due to their non-intrusive nature, high spatial and temporal resolution and field measurement capability. However factors such as Brownian motion and wall effects significantly increase noise in the device output. We need a fresh outlook and rigorous approach to study these problems. The techniques for study of these small scale devices are useful for study of both industrial and fundamental applications in multi-disciplinary areas. This article outlines how the PIV (particle image velocimetry) technique is capable of characterizing flow phenomena of small scale devices and can have applications in diverse areas of engineering and sciences.



Video sequence of sediment erosion diagnostic study

An application of flow field characterization related to the *sediment erosion diagnosis* for civil engineering has been shown in Figure 16. The particle locations at different instant of time can provide valuable information about the sediment erosion process. (*To be continued*……)

SPEAK OUT

TA201 is the machining and manufacturing course being offered to students in their 3rd semester. The course is different from rest in respect that it involves practical application along with bookish knowledge. The major onus of the projects lies on the students themselves, giving them a brush to deal with machines to manufacture the various components. Innovation met with time and ability constraint is a trying situation indeed. So what we are left with is redundancy, the old ideas being modified a bit. In the end students have gone for the time tested ideas. Nevertheless, the students are working enthusiastically on the project. But can the project be truly called as an 'innovation'? The answer to this question lies in the hands of time.

Seeing from our perspective, the labs are quite interesting and exciting, despite an apprehension arisen after the frequent questioning," How would you (being girls) manage in the labs?" As for now it looks more of skill than mere brawn work. It's a myth that girls find it difficult working in TA labs. We have no less interest or enthusiasm than our peers. (**Isha Ghai & Surbhi Goel**)

जनता के जीवन का कथा सार

रात्रि की नीरसता जाती स्मृति के पार ,
खग-वृन्द का प्रभात वन्दन , भरता हृदय में चीत्कार,
में चेतना का संचार करती मन्द बयार ,
पलकों मे अपलकता पिरोती आती रश्मि फुहार ।

मन में निर्मित होता संकल्प का पहाड ,
कक्षा में चक्षु की निद्रा-उन्मुक्ति का दृढ विचार ;
किन्तु अक्षि-सेवा बिना लगता सब बेकार ,
मानो ज्ञान की प्रचन्डता से बचाती यह शीतल फुहार।

श्रान्ति की निरंतरता होती सदा अविराम ,
सांध्य की कीडा-बेला लाती थकान का पारावार ,
किन्तु फिर अगले प्रभात , आते ऐसे ही विचार ,
यही हम जनता के जीवन का संक्षिप्त कथा-सार ।

-- *मानव*

SUPERSTRUCTURES

A **geodesic dome** is an almost spherical structure based on a network of struts arranged on great circles (geodesics) lying on the surface of a sphere. The geodesics intersect to form triangular elements that create local triangular rigidity and distribute the stress. It therefore resembles a golf ball. It is the only man made structure that gets stronger as it increases in size. Of all known structures, a geodesic dome has the highest ratio of enclosed volume to weight

It was Buckminster Fuller who popularized these domes and patented them in 1951(The buckminsterfullerene has the same shape as the geodesic dome and therefore its name). One of the ways Buckminster would describe the differences in strength between a rectangle and a triangle would be to apply pressure to both structures. The rectangle would fold up and be unstable but the triangle withstands the pressure and is much more rigid–in fact the triangle is twice as strong. This principle directed his studies toward creating a new architectural design, the geodesic dome, based also upon his idea of "doing more with less." Fuller discovered that if a spherical structure was created from triangles, it would have unparalleled strength.

It was put to its first practical use in 1953 when Ford Motor Company used it to cover its headquarters in Detroit. A conventional dome would have weighed about 160 tons and was technically unfeasible. The materials on the Ford project weighed only 8.5 tons. In addition to being structurally sound, the geodesic dome offers virtually no resistance to the wind. For this reason, it is used to house sensitive radar equipment along the Defense Early Warning (DEW) line in the Arctic and in other areas harsh environments. They are capable of withstanding winds exceeding 332 kph. Also, because of its lack of wind resistance, a geodesic unit can be transported by helicopter even under windy conditions. The largest one today is the Fantasy Entertainment Complex, Japan with a diameter of 710 feet.

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