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AMEN

The Association of Mechanical Engineers

NewsLetter

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The voyage of discovery is not in seeking new landscapes but in having new eyes

As the new year dawns, may it open for you more opportunities, lead you onto the path of success, happiness and prosperity.
AME wishes you a "HAPPY NEW YEAR"

WINTER ACADEMY '05

On the lines of 'Summer Academy" – an academic program in Europe, 'Winter Academy' is held in India. The purpose is to motivate students to take up research as their carrier and contribute to the development of science and technology. This year the Academy was organized by IITK. It was held at TATA STEEL, Jamshedpur from the 11th to the 17th of December. Prof. G. Biswas was the organizing professor. The participating institutes were University of Erlangen-Nuremberg, Germany, the IIT's at Kanpur, Kharagpur, Delhi, Mumbai and the Lucknow University.

In all 10 students (out of which 5 were from the ME Dept.) and 4 professors from IITK attended the Academy.

Each of us had to deliver a lecture on pre-determined topics in the field of heat transfer, fluid flow, polymers and semiconductors. There were informative general lectures by the professors and representatives of Tata Steel that gave insight into the latest research and the emerging areas of research. A visit to the steel plant was also organized. We were also told about the opportunities of higher studies in Germany.

However, the most important thing was the interaction with the professors and students from Germany and other IIT's. In a span of 6 days we got a good insight into the world of research and the industrial application of research.

Parth Srivastava

WINTER INDUSTRIAL TOUR

The AME organised an Industrial trip for the third year students to Mumbai, Pune and Goa during the winter vacations. The students were accompanied by Dr. Prashant Kumar and his assistant Mr. Anurag.

The trip started on the 4th of December. Mumbai was the first destination. In Mumbai we visited the Larsen and Toubro factory. Here the group was given a briefing on heavy machinery. After that, we were shown the various floor shops and the machining processes. The sizes of jobs and machines took most of the students by surprise! Also there were some processes like Plasma Arc Cutting which we saw for the first time. The next day we visited the Bhabha Atomic Research Centre where we were given insight into the functioning of a nuclear reactor using a simulated model. Unfortunately we could not see the reactor due to high radiation levels during that period. Next on the itinerary was Pune where we visited Geometric Software Solutions and Fluent India Ltd. Both the companies had a host of IIT Kanpur alumni and so we received a very warm welcome. There were presentations on development of softwares related to Engineering Design and Computational Fluid Dynamics. The last leg of the tour was Goa where we visited the Western India Shipyard Ltd. The working of docks, mounting and repairing of ships was explained to us.

There was ample time for sightseeing- the beaches and churches of Goa, various tourist attractions in Mumbai and Pune, which made the trip even more enjoyable.

On retrospection, the tour was a lifetime experience in terms of exposure to different work atmospheres in different firms. Finally we left for IIT on the 14th with some wonderful memories we will always cherish.

Hemant Kumar Singh

FROM THE DEPARTMENT

- Dr. Sameer Khandekar has been granted the DAE Young Scientist Award of BRNS, DAE to work on the research project entitled, "Development of a Novel Pulsating Heat Pipe-based Compact Heat Exchanger".
- Dr. Anupam Saxena has been granted the AICTE Career Award for Young Teachers for a period of three years.
- A workshop on Mechanics, Machines and Manufacturing was organized on the 9th and 10th of December in honour of Professor Amitabha Ghosh who has been a faculty member in the department since 1971. Professor Ghosh has made great contributions to these areas. The workshop was inaugurated by the Director of IITD.

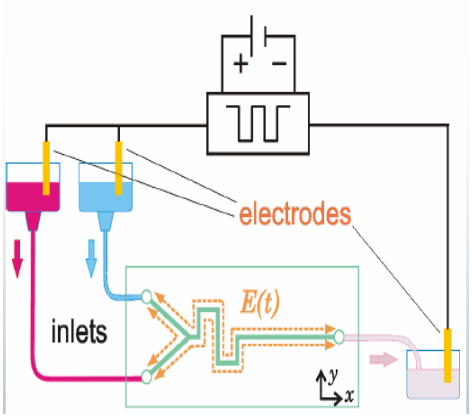
SCOPE OF FLUID FLOW STUDY AT SMALL SCALES: (A MULTIDISCIPLINARY OUTLOOK)

-**Dr. P.K.Panigrahi**

Continued…

CHEMICAL SCIENCES

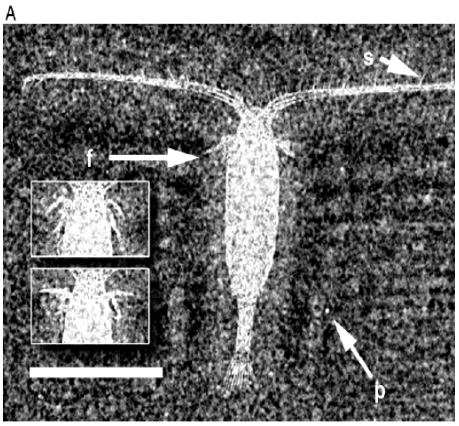
Micro-mixer and micro-chemical-reactor are two applications related to chemical sciences. The micro-mixer works on the principle of electro-osmosis. *Micro-mixer* is an integral component of chemical reactor. One of the characteristics of small-scale devices is high surface to volume ratio. Therefore, the *micro chemical reactor* is highly effective with significant high rate of reaction. The performance improvement of micro-chemical reactor and micro-mixer can benefit significantly from the flow field characterization of small scale devices.



An electro-osmosis based micro-mixer

ENVIRONMENTAL SCIENCES

Two applications of fluid flow characterization related to environmental sciences: (a) the convection around the micro-organism and (b) a swimming copepod has been shown in the figures. The microorganism has been effective in control of pollution in wastewater and hazardous waste. The study of flow field around these microorganisms helps improve the environment control strategies. Copepod is a source of food for fish and its population is crucial for marine environment. Copepod has antennules, which respond to the fluid deformation, and the flow field that the swimming animal generates is a lens through which the copepod views its surroundings. The details about flow fields provide crucial information on the ability of copepod in finding food, avoiding predators and finding mates. Locomotion and generation of feeding currents increase the encounter with food and prey. Motionless sinking can make the copepod less conspicuous with prey. The fluid flow characterization of these small scale phenomena has great scientific and technical value.



An image of a swimming copepod

BIOLOGICAL SCIENCES

The concentration of oxygen and nutrients in the cell is the best indication of patient's health. Blood flow measurements correlates to the concentration of oxygen and nutrients. The successful blood flow measurements are essential for explanation of *localized diseases* and the characterization of *biomedical materials*. Shear sensitive genes play a definite role in developing the cardiovascular system and therefore the near wall blood flow measurements is essential for genetical studies. The shear stress from blood flow plays an important role in modulating the cell behaviour. The flow around the RBC can demonstrate the transport of nutrients in the near wall region of the cell.

THE PERSON

Willis Haviland Carrier is known as the man who invented modern air conditioning. He is considered to be at least partially responsible for the economic boom of the American Southwest as his invention meant that people were able to move into areas previously considered uninhabitable in the summer months.

In 1902, at the age of 25, only one year after graduating from Cornell University, he devised a system to control heat and humidity for a Brooklyn firm. The firm had been unable to print reliable colors at times because of the effects of heat and humidity on paper and ink. In 1906 Carrier received a patent for his method. In 1911, Willis Haviland Carrier disclosed his basic Rational Psychrometric Formulae. The formula still stands as the basis in all fundamental calculations for the air conditioning industry. Carrier said he received his 'flash of genius' while waiting for a train. It was a foggy night and he was going over in his mind the problem of temperature and humidity control. By the time the train arrived, Carrier had an understanding of the relationship between temperature, humidity and dew point.

Film, tobacco, processed meats, medical capsules, textiles and other products acquired significant improvements in quality with air conditioning. Willis and six other engineers formed the Carrier Engineering Corporation in 1915 with a starting capital of $35,000. In 1921, Willis Haviland Carrier patented the centrifugal refrigeration machine. The 'centrifugal chiller' was the first practical method of air conditioning large spaces. Cooling for human comfort, rather than industrial need, began in 1924 spreading from departmental stores to movie theatres. In 1928, Willis Haviland Carrier developed the first residential 'Weathermaker', an air conditioner for private home use. 'Carrier', even today, remains the pioneer in air conditioning.

DID YOU KNOW?

Henry Ford installed the World's first moving assembly line on December 1, 1913, as one of several innovations intended to cut costs and permitting mass production. The idea was an adaptation of the system used in the meat processing factories of Chicago, and the conveyor belts used in grain mills. By bringing the parts to the workers considerable time was saved. The idea was first developed in Venice several hundred years earlier, where ships were produced using pre-manufactured parts, assembly lines, and mass production; the Venice Arsenal apparently produced nearly one ship every day, in what was effectively the world's first factory.

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