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FITT FORUM

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Newsletter of Foundation for Innovation and Technology Transfer, Indian Institute of Technology, Delhi

French inter-ministerial delegation on Innovation visited FITT, IIT Delhi on 25-5-11.

Mr. Hirayama, Director, Global R&D and Mr. Kakimoto, Director, R&D Operation India of M/s Panasonic visited FITT, IIT Delhi on 7-6-11.

Inauguration of the "India Wallonia Tech Program" at IIT Delhi on 23-5- 2011 where H.E. Mr. Pierre Vaesen, Ambassador of Belgium to India was the chief guest.

At the MoU signing of FITT with PGCIL

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Dreaming big.....

The economic growth story of China has moved beyond the manufacturing trajectory. The world is increasingly seeing its forays in the knowledge economy, more particularly its thrust towards Research and Development as evidenced by galloping output in papers and patents alike – having bested the yesteryear leaders! Is there a lesson for us ? Yes – to recreate the China story here tailored to our needs and in sync with our ethos to put us on the accelerator. The key driver has to be the leadership nudge to the plethora of organisations here to dream big and work to actualize the same. Let the oft repeated catch word "demographic dividend" be put onto productive pursuits! Whether it is development or innovation, sustained efforts and targeted solutions can help us address our huge challenges and tend towards an inclusive society. The country has a huge potential to deliver. But, empty sloganeering does not help – there has to be motivation, disowning of bureaucratic shackles and creation of conducive ecosystems to push the slumbering giant into global reckoning as an innovation powerhouse.

FITT emphasizes partnership. This industry-academia working model has been at it for 18 years now. While, the verticals of technology, consulting, training and enterprise continue to define our profile we are ever on the look out for opportunities to bring innovations to the fore. That includes, inter alia, encouraging the academics here to engage in large co-development projects and / or create technology ventures. We have a few of them but, there is need for greater participation. Importantly, we need to scale up IP creation to reflect the size of our research and development. Professional capacity building is one huge opportunity- the industry and the research world ought to capture the value from our programs. We are always open to dialogue and we swear by our mission to reach out to business and community.

-Anil Wali

FITT Team

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Technology Transfer to Industry

(i) Miniaturized Michelson Interferometer with three control variables
(ii) Coated mirror integrated Miniaturized Michelson Interferometer with two level control variables

Dr D S Mehta, IDDC

MoU...

FITT signed an MoU with Power Grid Corporation of India Ltd. (PGCIL) for a Professional Development Program on 27-6-2011. The MOU was signed by Shri V M Kaul, Director (Personnel), PGCIL and Dr. Anil Wali, MD, FITT. Shri R P Agrawal, Chairman, BOG, IIT D, Prof. S. Prasad, Director, IIT D and other senior persons from IIT D and PGCIL were present on the occasion.

FITT extends following supports for Technopreneurship under approved Government Schemes:

Technological Incubation and Development of Entrepreneurs (TIDE), DIT: to financially support technology ventures(IT and IT& ES) at incubators during early stages of their development, *(www.mit.gov.in)*

Seed-Support to Incubatees, TDB: for addressing the varied development needs of the start-ups at incubators. *(www.tdb.gov.in)*

Technopreneur Promotion Programme (TePP), DSIR: to enable innovators to become technology entrepreneurs through financial support / mentoring – upto Rs 15 / 45 lakh *(www.dsir.gov.in)*

Entrepreneurial and Managerial Development of SMEs through Incubators, MSME: to nurture / promote technology / knowledge - based innovative ventures through financial / incubation support *(www.msme.gov.in)*

Radioactive Particle Tracking for Flow Mapping in Multiphase Reactor Vessels

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The design, scale-up and troubleshooting of chemical reactors is a problem of pressing interest to chemical and process engineers. In spite of more than 150 years of organized effort in the chemical and oil industry, and the corresponding advancements, this continues to be more of an "art" rather than a "science". As their name suggests, chemical engineers are primarily employed in translating the laboratory scale chemistry (in case of reactions) and physics (in case of both reactions and separations) to industrial scale reactors and separation equipment. The chemistry and physics, which operates at a molecular scale and shows its intrinsic behavior in the laboratory, often shows significantly reduced activity in the large scale plant because of the masking inefficiencies of the flow pattern and transport phenomena. Assessment of these inefficiencies and corrective follow-up actions are of prime importance both at the design and scale-up stage, as well as during the actual operation of an industrial unit (trouble-shooting).

In the industry, simply owing to the huge sizes involved and also our limitations on experimentation in a running plant, popularly radioactive isotopes are used as dispersed tracers (the so-called "radio-tracer technique") for assessment of pathological flows (stagnancy, bypassing and improper mixing situations). In this, a radioactive tracer is introduced into a process stream at the inlet of the vessel of interest, and photon counts are recorded by placing scintillation detectors at the inlet, exit and other locations around the vessel. While this is perhaps the only technique which works in an industrial environment, which justifies its use in spite of severe difficulties in their implementation, this technique too has limitations and cannot be used for fundamental investigations into the fluid mechanics of multiphase vessels.

As a response to this need, in recent years the Radioactive Particle Tracking (RPT) technique is becoming increasingly popular. This communication presents some recent innovations in the RPT technique and a demonstration of its accuracy and versatility.

Radioactive Particle Tracking Technique (RPT) is a unique non-invasive methodology for measuring velocity fields and mixing patterns in multiphase vessels [1]. In the RPT technique, a single radioactive particle (which is a gamma ray emitter) is used as the marker of the phase whose velocity field is to be mapped. The tracer particle motion is interrogated by an array of scintillation detectors which are strategically placed around the vessel of interest. Subsequently, the Lagrangian trace of this particle is used to decipher the instantaneous position time series of any "typical" fluid element and from that the instantaneous velocity time series. From this information, a rich database of flow quantities such as mean velocity fields, kinetic energies of the turbulence and other parameters that represent the prevailing flow regimes and flow characteristics can be extracted. Fig. 1 shows a

Fig. 1. Radioactive particle tracking (RPT) setup at IIT Delhi.

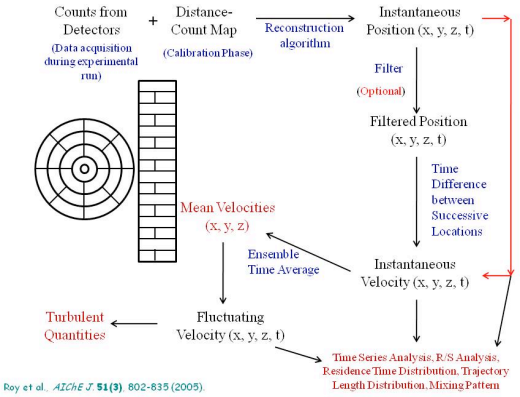

Fig. 2. Steps for reconstruction and data processing in RPT.

picture of the setup developed and installed in IIT Delhi, and Fig. 2 shows a summary of the experimental steps.

For tracking solid particles in RPT (such as in a fluidized bed), a tracer particle is prepared which has the size, shape and density same as the particles constituting the solids phase. For tracking liquid eddies, the tracer particle has to be made neutrally buoyant with respect to the liquid and of small size. Further, we have innovated to be able to study size distributions as well as flow of dissimilar particles (differing density) in the same system, and hence can address the role of polydispersity of the dispersed phase in a multiphase flow situation. Some work is also underway to develop a methodology that "bridges the gap" between laboratory scale radioactive particle tracking (which is a highly versatile, robust and accurate technique that has been benchmarked against other independent velocity measurement techniques) and industrial scale radioactive (which has much less accuracy but the only doable experiment in large industrial units).

Typical Results

In what follows, some typical results are being presented from two different flow situations, viz. a gas-liquid system (in which liquid is tracked), and a pilot plant scale bioreactor (in which solid wagon-wheel shaped biofilm substrates are being tracked).

Laboratory Scale Gas-Liquid Bubble Column (2D)

A reference is made to the 2D bubble column experiments of Pfleger et al. [1] (which is a literature standard), in which the overall gas volume fraction is less than 5%, so that a reputedly accurate technique Laser Doppler Anemometry (LDA) could be used for accurate measurements of liquid velocity [2]. As a challenge to the RPT technique, experiments with that technique

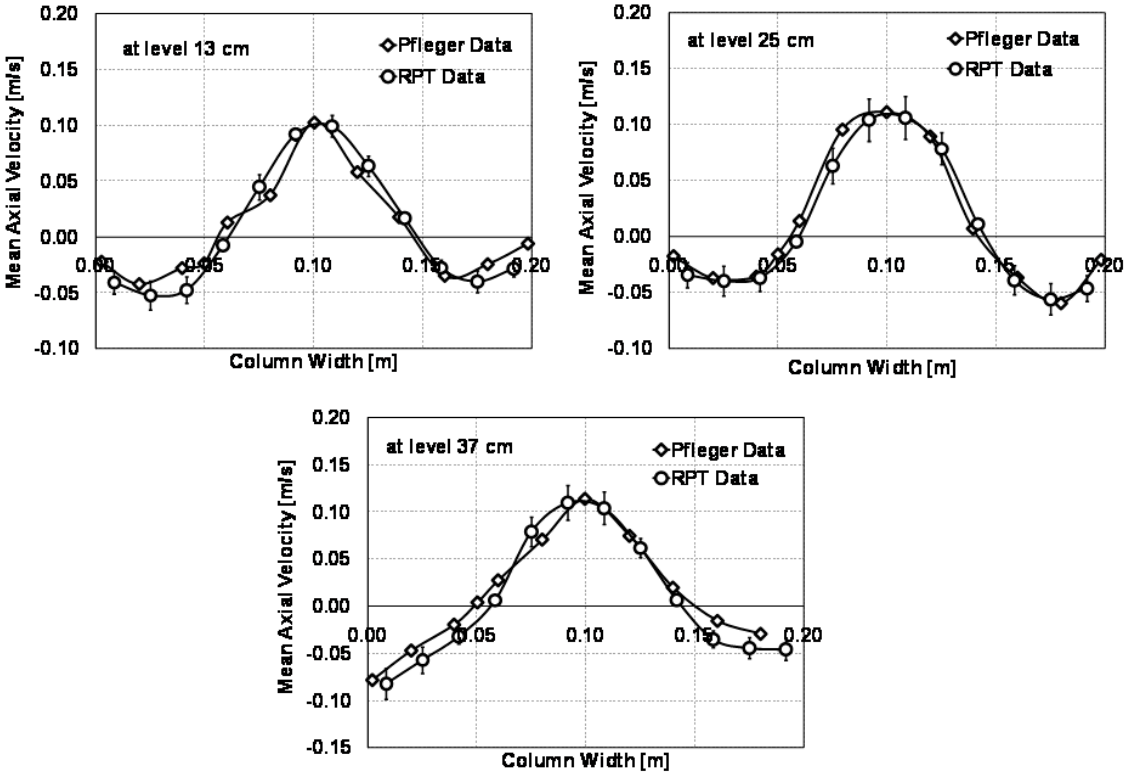

Fig. 3. Comparison of mean axial velocity at different levels obtained by RPT and LDA

were performed in the same setup as that reported in [2], and the liquid velocity profile was compared at three elevations, as shown in Fig. 3. In Fig. 4, comparison of the mean fluctuating kinetic energy of liquid phase eddies is shown. RPT reports a profile, while the LDA experiments could be only performed at a point in the vessel.

The results (Figs. 3 and 4) indicate that at all levels the quantitative comparison is very promising. What is remarkable that this good agreement in the two measurements is not only at one particular location, but at multiple levels in the column. Thus, if one rests confidence in a technique like LDA, we believe it is fair to say that the RPT technique is at least as accurate. In fact, the data from Pfleger et al. [1] serves as reference data for benchmarking models and CFD codes. Thus, it is only fair that we use that for benchmarking the accuracy of RPT. It is also seen that the kinetic energy of flow calculated by RPT and LDA clearly are of the same order of magnitude. Total kinetic energy found by LDA is 0.0016 m2/s2 while at same position total kinetic energy found by RPT is 0.0021 m2/s2. The two values are clearly in fair agreement, which seems to suggest that the accuracy of RPT involving second moments of velocity are also fair and acceptable. RPT of course provides a full profile, while LDA has to be performed point-by-point.

Thus, it would be no exaggeration to state that RPT is definitely as accurate as the state-of–the-art LDA technique. Further, it is much more versatile, in that it can be employed in high holdup systems where LDA or other comparable technique simply would not work.

Pilot-plant Scale Aerobic Bioreactor

Recently, our team from IIT Delhi successfully implemented RPT for the first time in a pilot plant scale unit, an aerobic bioreactor. Fig. 5 shows a schematic.

As shown in Fig. 5, wastewater enters into the reactor from one side and exits from the other side. Air enters from the bottom of the reactor through the small holes made on 5 stainless steel rods which are placed along the reactor length. The holes are placed off-centre on these stainless steel rods such that the air enters in the reactor tangentially and with its angular entry is able to rotate the wastewater and media azimuthally, along the circular periphery of the reactor. The vessel also contains wagon-wheel shaped "media", made of polypropylene, on which the bio-film is grown which eventually does the waste-water treatment. It is of priority to "mix" the media (which are in batch) with water and air to the highest extent possible, so that the water treatment can take place in an optimal fashion, and there should be no localization of stagnancy in the media.

To create more turbulence and for better mixing, air enters counter-clock-wise through four rods and in clock-wise direction from one rod. Other than rotating the wastewater and the media along the periphery of the reactor, air also fluidizes the media for better mass transfer. However, doubts remained with the manufacturers whether the media mixing was adequate, and whether there were any stagnancies or dead zones. RPT came to their rescue.

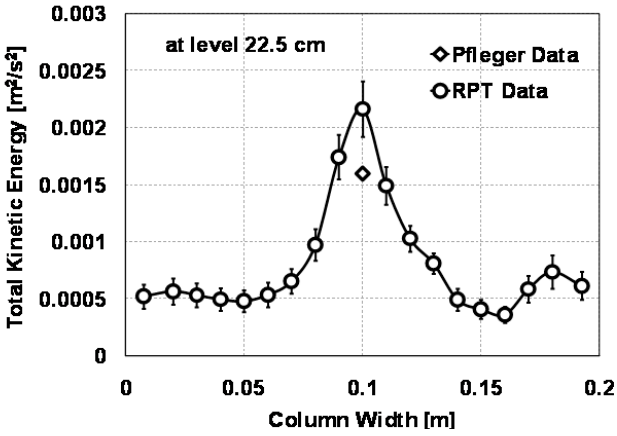

Fig. 4. Comparison of mean axial velocity at different levels obtained by RPT and LDA

For better performance of the bioreactor, it is desired that media should well mixed in the whole reactor volume and should available for the waste water coming into the reactor. This information regarding the mixing of the media in whole reactor volume could be deciphered by monitoring the visits of the tracer particle, which is tracking the media, at different

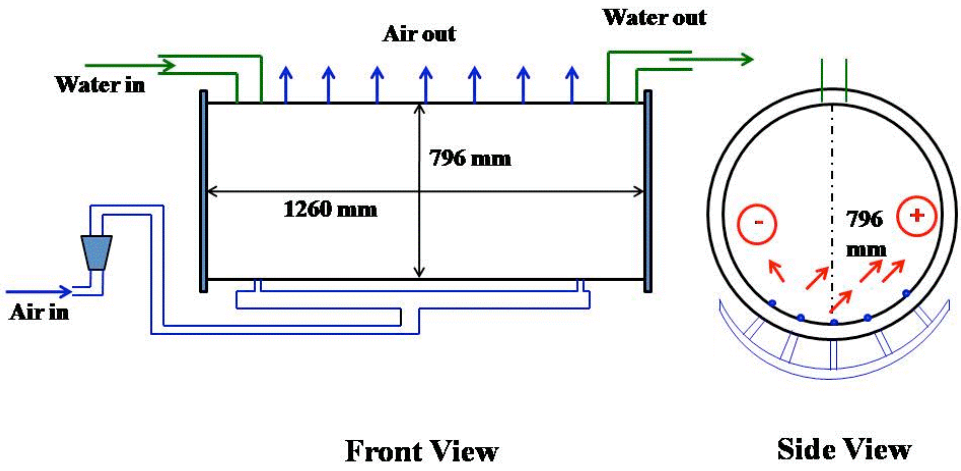

Fig. 5. Comparison of mean axial velocity at different levels obtained by RPT and LDA

locations inside the reactor. If the data is acquired for a sufficiently long time (in this case data is acquired for 15 days), then one can find the number of occurrences of tracer particle at different locations inside the reactor. A high occurrence shows that the phase that is being tracked by the tracer particle is dominant in that part of the column. Fig. 6 shows the occurrences of the tracer particle along the axial direction (z-axis) for all the investigated flow conditions. Results indicate that at low air flow rate and low water flow rate, no occurrences are recorded on the extreme ends of the side walls of bioreactor.

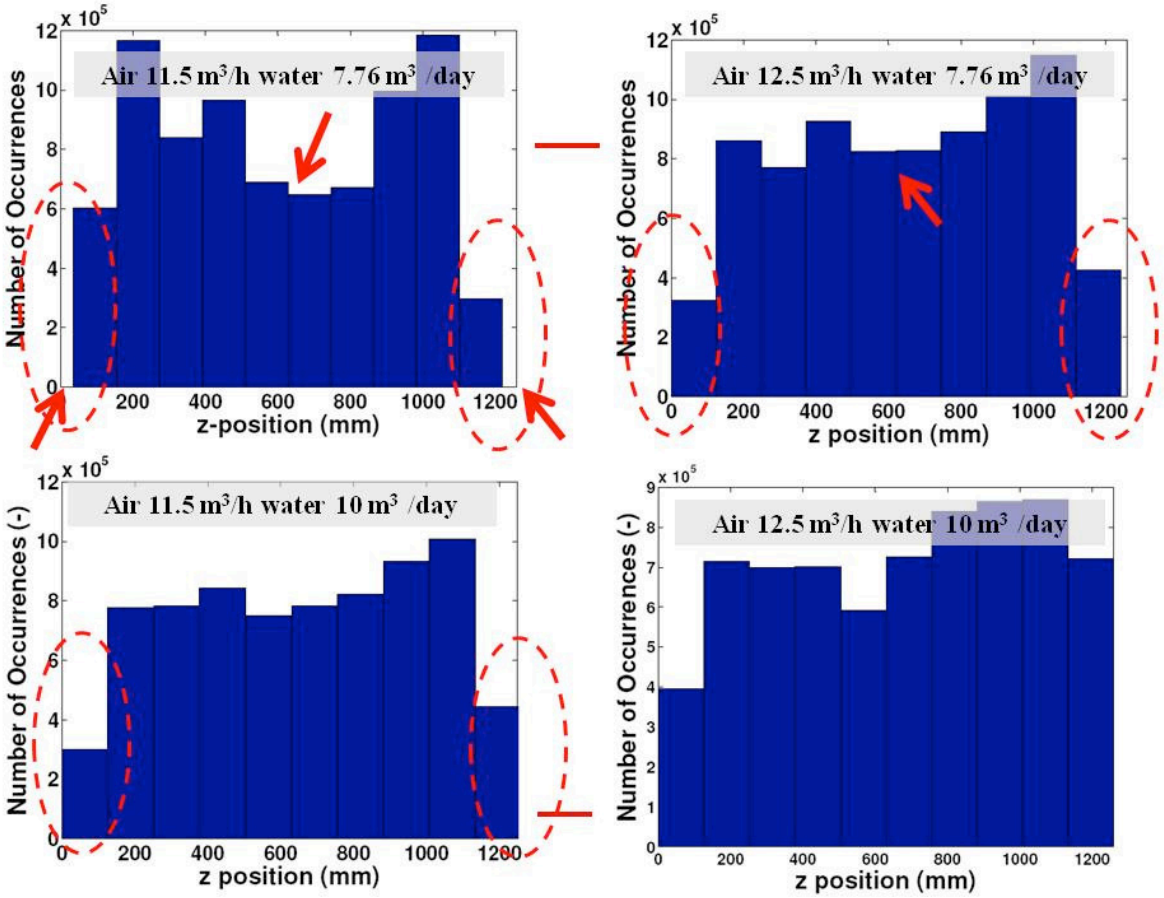

Fig. 6. Tracer particle occurrences at various flow conditions, indicating segregation towards ends and middle of bioreactor.

This does not mean that there is no media present near the side walls of the bioreactor. However, it does indicate that these media are changing their positions in the vessel and are relatively stagnant. In other words, there are dead zones near the side walls. Results (Fig. 6) also indicate that at low flow rate, middle of the column is also not well utilized. The increase in air flow rate by keeping the waste water flow rate constant improves the situation and now media reaches the end walls (flat surfaces). The increase in liquid flow rate while keeping the air flow rate at minimum (bottom left histogram), further improves the condition. Now at the centre part of the reactor, media is relatively well mixed along the z-axis. However, at wall the number of occurrences is still low which shows that even at this operating condition also wall is not well utilized. When the reactor is operated at high water and high air flow rate, as indicated in the last figures (Fig. 6 – bottom right graph) the situation is markedly improved and media is relatively well mixed along the z-axis. However, before making definitive conclusions even in this case, it is required to quantify the mixing in radial direction.

As a consequence of this study (which could be done in no other way in a pilot plant), the designers could implement modifications in the gas-entry tubes so that a state of uniform occurrences and media mixing could be achieved.

Summary

We believe that our studies demonstrate beyond doubt that RPT is not only a versatile technique (which of course was known in the past [1]), but also at least as accurate as the more "common" and commercially available techniques like LDA [2]. Furthermore, good agreement was also obtained amongst higher order moments of velocity fluctuations. What adds to the versatility of the technique that not only can it be used in different kinds of systems, but also accurately at larger scales, as the study of the bioreactor reveals. Indeed the possibilities RPT opens up for investigations of flows in "real" systems are many, and thus links fundamental science with real industrial applications.

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Laser Camera Action: Watching Molecular Motor Live!

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If DNA is a storage disk of all the information about who we are then protein is the work horse of the cell. Proteins practically carry out every kind of work inside the cell from metabolism to synthesis to complex cell-cell signaling. Proteins are polymer of amino acids that self assemble into unique 3D structure and undergo conformational changes while executing all the above mentioned functions. These conformational changes are of the order of few nanometers and happens as fast as few microseconds. Experimental observation of these conformational changes is a challenge; development of techniques with nanometer resolution and microsecond dynamics is an active interdisciplinary research topic (Katherine & Dorothee, 2007).

One of the characteristic feature of living systems is their ability to move, proteins responsible for locomotion and force generation are called Molecular motors. Molecular motors, commonly dubbed as molecular machine (in analogy to manmade machines) use chemical energy stored in ATP molecule and convert it into mechanical work. Different kinds of molecular motors participate in motility of all dimensions in living systems (Vale and Milligan, 2000). If you consider the macroscopic movements; like moving your finger, blinking your eye or wonder how Usain Bolt is so fast there is a motor called muscle myosin II behind. At single molecule level these nanometer sized motors generates few pN forces or nm displacement with each individual ATP hydrolysis. With millions of myosin's working in parallel we are able to lift load or run a 100m track in 9.58 seconds.

At microscopic level; Prokaryotic cells

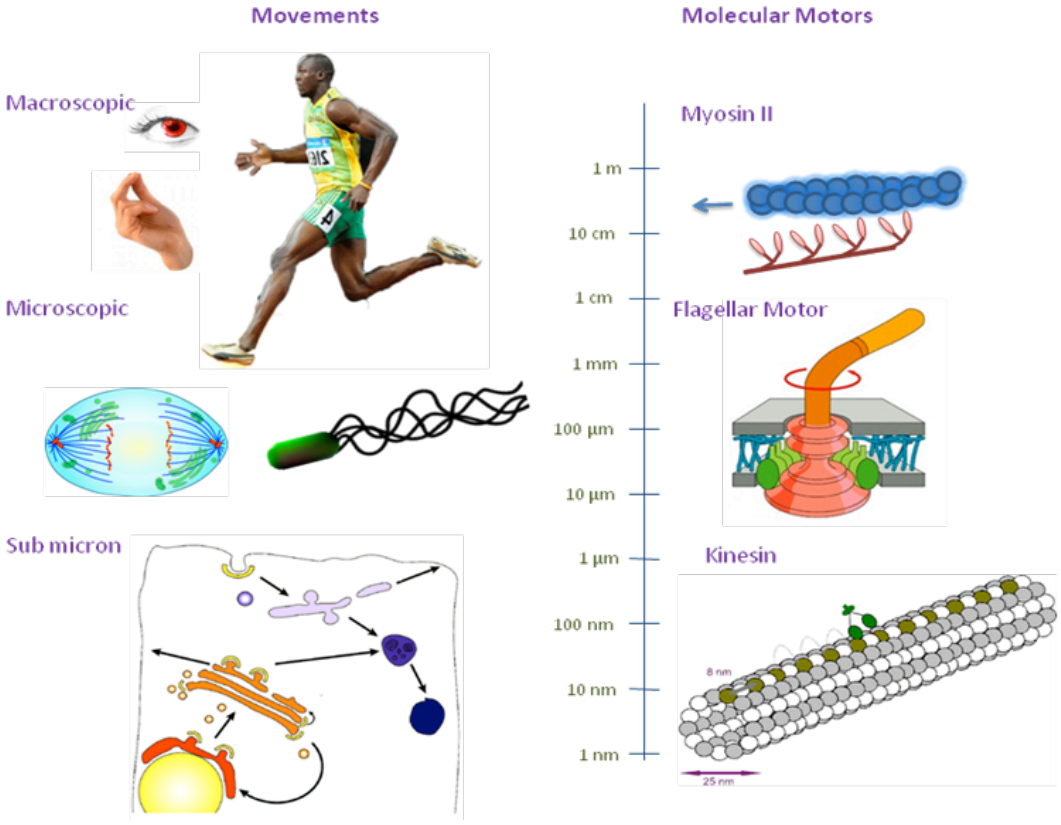

Figure 1: Pictorial representation of different kinds of movement at various dimensions. On the right are the motors responsible for displacement.

randomly explore their surroundings for better environmental conditions. They are propelled by flagellar filament driven by membrane bound rotary flagellar motor, that rotates the flagella at 100-1500 Hz using trans membrane potential. Even cell division is accomplished by two distinct types of motors pulling the daughter chromosomes apart, separating into two daughter cells. At submicron dimension, cell itself is like a large factory; with material from outside needed to be transported to appropriate location inside the cell for metabolism and proteins/ signaling receptors need to be transported to cell membrane. To facilitate this process there are dedicated motor proteins which carry cargo of materials in and out of the cell along the tracks inside the cell.
If there is directed movement in living system then it is safer to assume there is molecular motor involved. With energy crisis blooming over mankind we need every kind of inspiration to improve our machines, given molecular motors work close to 90% efficiency there is definitely something we can learn from nature's machines.

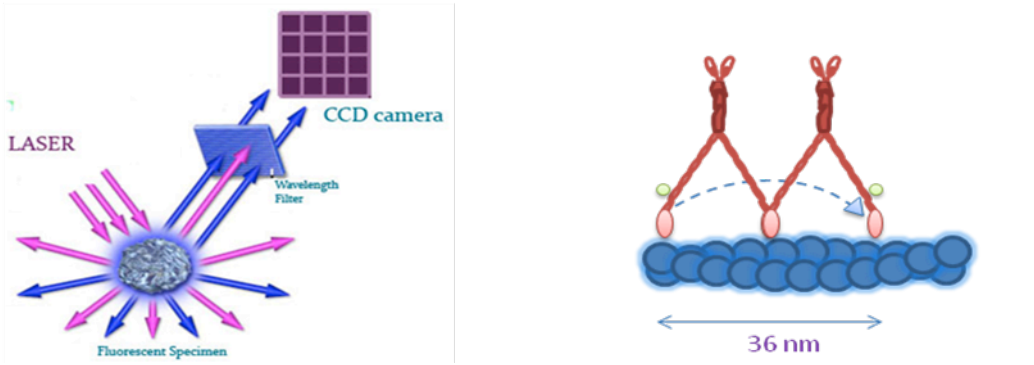

Figure 2: A. Laser induced fluorescence imaging, fluorecent probe is activaed by laser to emit light. Emitted light is imaged using CCD camera. B. Fluorescent probe (yellow dot) is attached to one head of motor, tracking the position of dot with high precision we can detect conformational change of 36nm step with each ATP hydrolysis.

How these molecular motors convert chemical energy in ATP molecules into mechanical energy is not yet understood. Study of molecular motor has been difficult considering they are few hundred nm in size and make conformational changes in nanometer scale. Traditionally we use microscope to see things smaller than resolution of our eyes (<100 μm). Because of diffraction limited optics, first observed by Ernst Abbe in 1873, the maximum resolution we get using light of wavelength is approximately /2. E.g., using visible spectrum we can achieve a maximum resolution only up to 200nm, its bit unfortunate because all the interesting biological behaviors happen below this limit. Though with electron microscope we do get information with <20 nm resolution, because of harsh conditions and sample fixation dynamic information is not available.

However recent advances in laser induced fluorescence microscopy like TIRFM and PALM, STROM and STED have successfully broken the difraction limit (Chirlmin et al., 2008). In laser induced Fluorescence microscopy, a fluorescent probe is attached to a specific target molecule under study. With laser excitation the probe emits light in all direction; emitted light is collected and imaged using a high quantum efficient camera (Figure 2A). With advanced illumination technique like Total internal reflection; laser beam is reflected back to produces evanescent wave that only propagate up to 100 nm from the illumination interface. Evanescent wave excites the fluorescent probes within this limit, excluding all the background noise. With low background noise, the signal to noise ratio is high enough to detect a single fluorescent molecule with a spatial resolution of 1 nm. For example by attaching a fluorescent probe to one head of the molecular motor (yellow dot, Figure 2.B), researchers have successfully measured conformation changes of 36 nm with millisecond time resolution. Some disadvantages of this technique are difficulty in labeling the protein molecules with fluorescent probe and we can track only one point in the protein at a time.

Today live telecast has improved the way we watch NEWS or enjoy sports. In a way we are biologically programmed to believe better when we see it by our own eyes. Life science is no exception, seeing is believing! There is lot of scope for improvement in temporal and spatial resolution in fluorescence microscopy; with continued innovation it's not a distant future where new techniques will allow us to directly visualize the whole protein in action.

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Sustainable Development - The Concrete Challenge

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After water, concrete is the most used material in the world and India is the second largest producer of concrete, second only to China. As we move more towards taller office and residential buildings that can house more people in dense cities, concrete roads that need less maintenance and bridges and flyovers that make it easier to travel between these tall buildings, the demand for concrete is set to rise even further. The production of cement in India, which is the key and usually the most expensive ingredient in concrete, has therefore grown at an unprecedented rate. It has been predicted that it will surpass the production in China within the next 40 years. Still, the per-capita consumption of cement in India is much lower than most developed countries and even several developing countries such as Mexico and Brazil. As cement is not only required for new construction, but also to maintain the existing buildings and infrastructure, its per-capita consumption can be used as one of the indicators of the average standard of living in a country. In order to achieve the same standard of living that most of the developed countries have enjoyed for decades, we have to ensure that the current rate of growth is sustained over the decades to come.

The sustainability of an activity is its capacity to continue over an indefinite period in its current state. Although it is often described as the ability of an activity to not harm the environment, it is in fact its ability to not harm our standard of living in the long-term. The sustainability of cement and concrete production faces several challenges globally and in India. Globally, cement has been recognised as the most polluting material in the world, contributing to about 7% of the global CO2 emissions. In India, while the shortage of coal, which is the primary fuel used in cement production, has already started affecting our capacity to expand, the availability of limestone and other raw-materials is also likely to come into picture within a few years. To add to this, despite being over a billion-strong, there is still a shortage of people with the training to ensure proper production at the new cement plants we will have to build and proper use of the material at the larger number of construction sites we will have to undertake. All this makes it critical for us to take urgent steps ensure the sustainability of our construction.

At this point, perhaps, it is worthwhile mentioning that despite the high cost and energy requirements of cement, concrete is still the cheapest and most low-energy material with its per kilogram cost and energy being lower than even timber and masonry. Furthermore, it can be produced almost anywhere using locally available materials and compared to steel and timber, concrete buildings are also likely to consume less energy for heating and cooling during their lifetime. Therefore, attempts at replacing of concrete with other materials will not only be impractical but also ineffective as sustainability measures.

The sustainability of any process has to be ensured at each step in that process. In the case of construction, the procurement of raw-materials, the production and transportation of cement, efficient use of the material in concrete and the efficient use and recycling of concrete itself are all essential. India already has strict laws governing mining and most of the cement plants in India are amongst the most energy-efficient in the world. The use of cement and concrete, however, is often inefficient. The efficient use of cement would ensure that we use the minimum possible amounts of cements in our concrete, increasing the amounts aggregates (sand and gravel), which are usually the cheaper and stronger ingredients of concrete. One of the most widely used ways of reducing cement contents in concrete has been through the use of supplementary cementitious materials (SCMs),also known as pozzolanic materials, such as blast-furnace slag, fly-ash and rice-husk ash. These materials take advantage of the alkaline environment provided by cement and react with water to produce hydration products that are similar to those produced by cements. The hydration products from SCMs help those from cement in binding the cementitious and aggregate particles together and filling the spaces between them often producing stronger concrete with more cement in the absence of SCMs. To add to this, concretes produced using SCMs are more durable under most severe conditions and require lesser repair, improving the efficiency of use of the concrete itself.

Although India was late to widely accept these materials, most of the blast-furnace slag from iron production and a lot of the fly-ash from the coal-fired thermal power-plants which used to go into land-fills, is now blended into commercially available cements. Still, many clients and contractors hesitate in using these materials in new construction, mainly due to unpredictability of these industrial waste-products and the slower strength gains in concrete containing SCMs. Strength development in concrete happens through a set of complex reactions, happening at the micro and nano scale, where oxides of mainly calcium, silicon, aluminium and iron hydrate through the same solution, making it difficult to predict and model. The process is so complex that at times the addition of trace amounts of some chemicals can affect it significantly. The addition of SCMs adds to this complexity making it practically impossible to predict the properties of the resulting concrete even if the entire chemical composition of all its components were known.
In the recent years, a lot of research has attempted to better understand the process of hydration and the development of microstructure of cements. Thermodynamic calculations are being used to try to predict the quantities of various hydration products formed based on the composition of the cements and SCMs used. Microstructural models use this information to recreate three-dimensional numerical images of developing cement microstructures to try to predict important properties such as strength and permeability of concrete. At IIT Delhi as well, we are in the initial stages of using these approaches to better understand the chemical interactions between cement and SCM hydrations. Although such models are still in their nascent stages, they represent important efforts towards improving the efficient use of cement and concrete.

Durability of concrete also has an important role in ensuring its sustainability. Currently, in most developed countries, over half of the investment into infrastructure goes into the repair and maintenance of structures. This problem is often worsened by the fact that since a lot of infrastructure was built during relatively short periods of economic growth, a lot of them reach the end of their 'low-repair life' almost at the same time, making the task of maintenance even more difficult.

Given the increase in construction activity in India during the last decade, India is bound to face similar problems in the near-future. Like many of the developed countries, India also has to move towards what is known as "Durability-based design", where structures are designed not just for the physical, but also the environmental loads they bear.

Understanding and improving the durability of concrete is much more difficult that predicting its mechanical strength. By definition, durability problems occur over several years or even decades, and these periods are much longer than what most engineers and Ph.D. students will be willing to wait for laboratory results. The use of accelerated tests in order to assess the durability of concrete under specific conditions has therefore been prescribed by most standards. However, these accelerated tests are often carried out under conditions which often modify the process being studied, rendering the test results unreliable. Once again modeling has an important role to play here as models can use our understanding of the individual processes that occur during the life-cycle of a structure and the interactions between the processes, and then try to simulate the effect of these processes on the structure. For example, a reinforced concrete bridge-deck subjected to harsh marine conditions could be simulated for the diffusion of chlorides into the concrete and the reactions of these chlorides with the elements in concrete until they initiate corrosion in the steel bars, to predict its service-life costs or even the most economical maintenance strategies for the structure. Although, currently such attempts still rely on accelerated empirical measurements, sufficient understanding of the processes behind deterioration of structures could make this unnecessary. For many years, a lot of research at IIT Delhi has focused on gaining this knowledge.

As mentioned above, India may soon face a time when its investment into maintenance of infrastructure will be more than that into building new infrastructure. Apart from developing better repair technologies and strategies, India will also have to invest into training the people it will require to build and maintain this infrastructure. With the construction industry in India already facing a shortage of skilled man-power and the number of structures requiring maintenance bound to go up, an impending crisis can be averted by ensuring that we impart the right set of skills and knowledge to our engineers, technicians and foremen. An increased investment into research in these areas will be one of the easiest ways to achieve this objective. Higher education and research will improve the knowledge of our engineers to help them deal better with real-life situations. At the same time, it will provide us a bigger and better pool of prospective teachers needed to train the larger number of engineers required in the future.

Concrete is often viewed as the ubiquitous grey material that has existed and performed without problems for centuries. However, the challenges for the use of the same material today are those that have never been seen before. There is a clear and urgent need to use much more of this material in a much better way through further development of our knowledge about this material and the technology around this material. Only then can we ensure our continued growth in the quest to provide world-class standards of living to our people.

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LICENSING OPPORTUNITIES

A method for direction of arrival estimation, beam forming, source tracking and interference mitigation by nodes in a wireless network based on Swarm Behaviour,	**R. Bose, Elect.**
Design of a Dishwasher for low volume usage,	S. N. Singh, App. Mech.
Contra lateral limb controlled prosthetic knee joint,	S. Anand, Biomed.
An Improved MRF finishing apparatus for stable, scalable and continuous process finishing application,	S. Jha, Mech.
Template for Nucleation of Secondary Structures in Proteins,	**V. Haridas, Chy.**
Formulation for Inhibition of Japanese Encephalitis Virus- Potential Drug,	**V. Haridas, Chy.**
Expedient Keyboard,	M. Balakrishnan, Comp. Sc.
A method of near ML low complexity decoding of layered space-time block codes,	M. Bhatnagar, Elect.
A novel Swirl rotor assembly to be used as a mixer,	S. N. Singh, App. Mech.
Triple layer dressing for wound healing,	V. Koul, Biomed.
A System and method for obtaining Continuous pattern blending in Textile Strands,	**S. M. Ishtiaque, Textile**
A synergistic process for submerged and solid state fermentation for higher yield/efficiency in Trichoderma,	V. Sahai, Biotech.
Tertiary butylation of phenols with tertiary butyl alcohol using sulfonic acid functionalized ionic liquid catalysts,	S. Upadhyayula, Chem.
A test kit and method for measurement of metals in biological fluids,	**N. Karmakar, Biomed.**
Eco Toilet design for segregation of solid and liquid excreta.,	V. M. Chariar, Rural Tech.

India, China fast emerging as new tech powerhouses; to drive IT growth this decade
16 Apr, 2011, 09.50PM IST, IANS

India and China coming up fast as new tech powerhouses will drive much of the growth in information technology over the next ten years, according to a new report. Though a big gap still exists between these emerging markets and developed nations, that gap is bound to narrow over the next decade, the Forbes magazine said citing a recent Global Information Technology Report by the World Economic Forum. Out of 138 countries tracked and ranked by widespread use of mobile phones , Internet, personal computer as well as regulatory environment and IT infrastructure, China ranks 36th and India 48th.....

China Patents A New Direction in Patents
January 3, 2011, Global Crisis Blog, Innovation Blog By Shlomo Maital

In this blog, I have consistently argued that China is fiercely determined to move up the value-chain ladder into the realm of innovation-intensive products and services, and is acting aggressively to implement this policy.

Writing in today's International Herald Tribune, Steve Lohr reports on a Chinese government document defining goals for drastically raising China's production of patents. US PTO's David J. Kappos, the Director, says the Chinese targets for 2015 are 'mind blowing numbers'.
China's goal for annual patent filings by 2015 is … two million, including 'utility-model patents' or design patents, which cover items like engineering features and are less ambitious than invention patents. In contrast, in 2009, there were about 300,000 applications filed for utility patents, about equal to the total of invention patents.
Patent filings in the U.S. totaled about 480,000 in the year up to September 30.
China's patent surge has been evident for many years. China has been expected to overtake the U.S. in patents this year, but it has happened faster than expected, Lohr reports.....

An Innovation-led growth model
R&D subsidy to industry and protecting indigenous innovation can give India competitive edge. Nagesh Kumar / April 29, 2011

The economic growth experience of countries suggests that in the early stages, growth is based on exploitation of natural resources and labour. Subsequently, capital accumulation leads the process. Beyond capital accumulation, the growth process is driven by productivity enhancement through innovation. The innovative activity is widely seen as an important influence on a country's international competitiveness and growth prospects in an increasingly globalising and knowledge-based world economy.....

Big push for electronic hardware manufacture on the cards
G. Srinivasan (geeyes@thehindu.co.in), New Delhi, May 19:

Plans are afoot to accord "a major push and impetus" to the electronic hardware manufacture industry in the country "as cheap hardware, easy to procure and use is crucial to bring about the huge challenge of bridging the digital divide between rural and urban India." Disclosing this to Business Line here, the Minister of State for Communications & Information Technology, Mr Sachin Pilot, said the country's electronic hardware industry which is $40 billion today would become $400 billion in the next five years and the industry "needs all the support from the Government of India and the States".

To meet this huge demand today we depend on importing cheap equipment from overseas, he said, adding that is why "manufacturing of electronic hardware would be given a big impetus as the Ministry of Finance, Commerce and our ministry are working together to have a new roadmap for manufacture of electronic hardware". Stating that manufacture of electronic hardware is where the job opportunities would lie, with young people getting absorbed with due skills, Mr Pilot said that "even as the focus is on software of IT, the hardware sector perhaps needs more impetus and more push because that is where the demand is heading".

Mr Pilot said that the National Knowledge Commission, the national e-governance programme and connecting every Panchayat in the country with broadband all point to the need for "cheap electronic hardware, easy to procure and use". .....

IP Forecast: Blue Sky with Scattered Clouds
Business Line : 27.06.2011

Given its highly-skilled technical workforce, India is at the right place and time to contribute to intellectual rights-protection along with innovation in cloud computing.There was a time when cloud was nothing more than the result of water droplets suspended above the surface of the Earth. Today, it is a sophisticated term for one of the most-sought-after technology propositions for businesses. For over a decade and a half, cloud technologies have been quietly transforming our private lives with free and paid online mail and storage services, and more recently with social networking services.

Cloud computing involves providing software functionality over a network from remote servers possibly located down the street, across the country or on the other side of the globe .It is now a viable business option for corporations and industry, the reasons for which are many: decreased costs, usage-based pricing, increased functionality, improved collaboration and communication, resource pooling, and anywhere access to applications and data. Interestingly, as computing moves to the cloud, this major technological shift as with past innovation leaps will usher in an evolution in intellectual property (IP) law.....

Nanotechnology comes of age
http://www.inclusiveplanet.com/en/channelpost/997815
Bhaskar Balakrishnan

Nanotechnology, the application of science to materials of the size of 1-100 nanometres (one billionth of a metre) in at least one dimension, has come of age. Twenty five years ago, fullerenes, made of carbon atoms arranged in the shape of a football, were discovered, and the 1996 Nobel Prize in Chemistry went to its discoverers.

The 2010 Nobel Prize in Physics was awarded for the discovery of graphene, a form of carbon in a sheet one atom thick.

These are two examples of nanomaterials – nanometre sized in three dimensions, and one dimension respectively -- with remarkable properties. Also remarkable is that these novel forms of carbon took so long to be discovered, while graphite and diamond, conventional forms of carbon were known for long.Between these two Nobel prizes is a long period of steady and rapid development of nanotechnology and nanomaterials. Strange things happen in the nano world. Nanomaterials have very large surfaces and can become very reactive chemically. The nano size results in quantum effects becoming important. This is a no man's land in between the atomic and nuclear world where quantum physics reigns and the normal macroscopic world of ordinary materials where classical physics prevails.....

TECHNOLOGY DEVELOPMENT/ CONSULTING

S. No.	Title	PI	Deptt.
1	Analysis of two-phase flow through fine channels of porous substrates	Dr Shantanu Roy	Chemical Engg
2	Design of RF MEMS switches as per Waterloo foundry rules	Prof S K Koul	CARE
3	Development of standard cross-section for urban roads	Dr Geetam Tiwari	CiviL Engg
4	Finished goods inventory management system	Dr Nomesh Bolia	Mech Engg
5	Design and Development of RF MEMS switches phase shifter and tunable filters as per VTT foundry rules	Prof S K Koul	CARE
6	Flow visualization study for ED paint flow problem	Prof S V Veeravally	App Mech
7	LED based street light meeting IP-65 standards	Dr L K Das	IDDC
8	DPR for the scheme of up-gradation of tanneries CETP at Kanpur	Dr A K Mittal	Civil Engg
9	Startegic assessment of the Ganga	Prof A K Gosain	Civil Engg
10	Technical due diligence of deployment of solar panel and electrical fixture / design for fountain at central park, sector-95, Noida	Dr Sukumar Mishra	Elect Engg
11	DPRs for 6 towns of Punjab for pollution abatement of river Ghaghghar in Punjab under NRCP programme	Dr A K Mittal	Civil Engg
12	Design & development of MIC and Antenna Trainer Kit at J-Band	Prof S K Koul	CARE
13	Design and characterization of SPST shunt switch, SPST series switch and SPDT switch	Prof S K Koul	CARE
14	Abdomen / Thorax model building / validation	Prof Anoop Chawla	Mech Engg
15	Leak proof universal tap adapter	Dr Jyoti Kumar	IDDC
16	Conceptualization, design and development of third party virtual inspection portal	Prof A K Gosain	Civil Engg
17	An investigation into shrinkage of core/wrap yarns based on changes in structural characteristics	Dr Amit Rawal	Text Tech
18	Humming – based music information retrieval for provision of know-how, algorithms development and prototype development	Dr Sumantra Dutta Roy	Elect Engg
19	Integrity analysis of pipeline weld joints and process parameters development using FM approach	Prof R K Pandey	App Mech
20	Polymer nanocomposites: application and development	Prof A K Ghosh	CPSE
21	CARS – Development of a methodology and its validation for vibration analysis of multi-stage isolation system for raft mounted equipment using MDOF approach	Prof S P Singh	Mech. Engg
22	Study to reduce technical losses in BYPL	Dr Sunil Jha	Mech Engg
23	Development of nanocoatings for application in coated fabrics	Prof Ashwini K Agrawal	Text Tech
24	Assessment of alternative technologies for waste management to be used by urban local bodies	Dr V M Chariar	CRDT
25	Development of Thermal Sensation Index based controller card for air-conditioning coaches of Indian Railways	Prof I N Kar	Elect Engg
26	Algorithms for inertial sensor-based pedestrian navigation	Dr Manish Sharma	CARE
27	Investigations on worn surfaces	Prof Jayashree Bijwe	ITMMEC
28	Consultancy in developing long-term monitoring techniques using underwater acoustic technology	Prof R Bahl	CARE
29	CARS – application and optimization of FMTWI on thick composites	Prof Suneet Tuli	CARE
30	Development of practical oriented teaching manual and set of MIC devices	Prof S K Koul	CARE
31	Enabling activity for preparation of India's second national communication to UNFCCC	Prof A K Gosain	Civil Engg
32	Development of Data Analytics Technology for mobile marketing	Prof S Chaudhury	Elect Engg
33	Design of Coaxial to Waveguide transition	Prof S K Koul	CARE
34	Setting up of RF characterization laboratory and development of microwave integrated circuit components	Prof S K Koul	CARE
35	Hypersonic high vacuum coal conveying system	Prof V K Agarwal	ITMMEC
36	Technical support for design and patent examination of Ultra Tribolt Lock	Prof Anoop Chawla	Mech Engg
37	In-Silico optimization of derivatives of peptide NuBCP9 inhibitor of BCL2 and evaluation of their anti-cancer properties	Prof Harpal Singh	CBME
38	Public health impacts in Urban environments of Greenhouse gas Emissions reduction strategies - PURGE	Prof Dinesh Mohan	TRIPP
39	Fundamental studies on Droplet Coalscence and Re-dispersion in liquid – Liquid dispersions	Dr Shantanu Roy	Chemical Engg.

Prof. Anurag Sharma

Dr. Anurag Sharma is currently a Professor in the Physics Department at Indian Institute of Technology Delhi. He did his B.Sc. from Agra University (Hindu College, Moradabad), joined IIT Delhi in July 1972 and by August 1979, he had obtained M.Sc. in Physics, M.Tech. in Applied Optics and Ph.D. in the field of fiber optics. While pursuing Ph.D., he joined as a Senior Research Assistant in the Laser Application Programme at the Department. Subsequently, he joined the Physics Department as a lecturer in 1981. He served as the Dean of Students during 2006-2009. Currently, he is the Chairman of the IIT Delhi Golden Jubilee Committee.

During 1982-83, he did his post-doctoral research as an Alexander von Humboldt Fellow at the Institute of High Frequency Techniques and Quantum Electronics at University of Karlsruhe, Germany. He visited the Telecommunication Research Laboratory (CSELT) of the Italian Telephone Company at Turin, Italy during May-December 1988 under the Training & Research in Italian Laboratories (TRIL) Programme of the International Center for Theoretical Physics (ICTP), Trieste, Italy. He was as Associate of the ICTP during 1988-1999 and a Senior Associate (2001-2008) and visited the Centre several times. He also visited Brazilian institutions under the South-South Fellowship from the Third World Academy of Sciences (TWAS). He also spent several short terms (1-2 months) at the Saint-Etienne University, France during 1995-2007.

Since 1975, Prof. Sharma has been engaged in the analysis and modelling of optical wave guiding and imaging devices. The work has resulted in more than 80 research publications in international journals of repute, over 15 review/invited papers and more than 100 papers in international and national conferences including over 15 invited papers. In the course of this work he has gained from the association of number of doctoral students, ten of whom have received the degree and over 100 master and undergraduate level project students.

Prof. Sharma has made significant contributions in the area of Gradient-Index (GRIN) Optics. GRIN optics is an important area which came in to prominence with the development of fiber optics in early seventies. As opposed to the conventional optics where lenses are made up of uniform material such as glass, GRIN lenses have non uniform transparent material. In simple term, this means that the refractive index within a GRIN lens varies from position to position. As a consequence the light rays do not travel in straight lines and are curved according to the variation of the refractive index distribution. Such lenses are valuable components in micro-optics and have been used extensively in imaging systems of photocopying machines and for coupling light into small size components such as optical fibers and waveguides. One of the outstanding problems in the development of GRIN systems in the seventies was lack of an efficient method for ray-tracing through such systems which is necessary and time consuming part of the design of optical systems. **During 1981-86, Prof. Sharma developed a whole new method for ray-tracing and other related computations, which simplified these design computations by orders of magnitude and was immediately adopted by the GRIN researchers the world over. Almost all the professional and commercial users have incorporated this method, often termed as the Sharma method, in their GRIN system design softwares.** Since variation of index occurs in several other domains of science such as atmospheric physics, biological tissue optics and laser guidance, the method has been used in such areas beyond GRIN optics.

Another area in which Prof. Sharma has made notable contributions is the development of analytical approximate, yet reasonably accurate, models for the modes of single mode optical fibers and wave guides. The framework of developing such analytical models is based on the variational method. Prof. Sharma has used it extensively in developing many useful models. Optical waveguides are structures made up of several transparent materials such as glass, semiconductors (Gallium Arsenide, etc.), crystals (lithium niobate, etc.). Such structures support various modes, which are solutions of Maxwell's equations. Generally, it is not possible to obtain these modes in terms simple functions and development of simple analytical approximations has been an important subject of research. **Prof. Sharma developed the first non-Gaussian model for the mode single mode fibers. This model and its improved forms have been used extensively for studying characteristics of these fibers and devices based on such fibers.** In the late eighties, side-polished fibers were developed for making several fiber devices such as wavelength filters, directional couplers and channel dropping filters. However, due to lack of circular symmetry, it was difficult to model the characteristics of such fibers. Prof. Sharma developed a simple analytical model for such fibers which made modelling of side polished fibers and devices very simple. The model has been used extensively ever since.

With the development of optical fibers, the area of integrated optics also developed for generation, manipulation and detection of light in small dimensions compatible with fibers. The basic element in integrated optical devices is the single mode channel waveguide, which is much like the fiber, but has a structure which is layered and roughly rectangular in shape. Development of simple models for the modes of such waveguides was an important problem in the eighties and Prof. Sharma developed such models, once again based on the variational method. The procedure developed was termed as the CEVAR method.

In the mid-eighties, a new class of numerical methods gained importance. These were called beam propagation methods and relied on the total field picture of propagation rather than the mode based approach. This was necessitated by the fact that the integrated optical devices had many components and branches which were far from nearly straight waveguides in which modal picture was applicable. Prof. Sharma developed a whole new method based on the collocation method. The method was fully developed in all its forms applicable to two dimensional, three dimensional and nonlinear propagation. These methods, however, were based on the paraxial approximation, which was good for treating waves spread at moderate angles. In the late nineties, however, it became clear that this approximation was no longer applicable as the devices became more compact and it was necessary to develop methods, which could treat wide angled beams. At the same time many devices based on reflections became important. Prof. Sharma also developed a new concept in solving the scalar wave equation in its full form. This work spread over six years led to the development of two and three dimensional, Semivectorial and bidirectional propagation methods.

In recent years, microstructured waveguides have been developed. Typically these consist of a periodic array of very small air-holes in some part of the waveguide giving it unique waveguiding characteristics and very strong dependence on wavelength. Due to periodicity of the structure, these are often termed as photonic crystal waveguides. Such waveguides are made both in circular geometry (photonic crystal fibers) and in planar geometry (photonic crystal waveguides). Currently, these waveguides are a subject of study of Prof. Sharma. **He has recently developed a simple procedure to obtain unique reflection and transmission characteristics of photonic crystal wave guides. He has also developed a simple model for photonic crystal fibers.**

Prof. Sharma has been mentored and greatly influenced by Professor M.S. Sodha Professor A.K. Ghatak and Professor K. Singh who have

helped and guided him at various stages of his career since 1972. He was awarded the Indian National Science Academy (INSA)'s Young Scientist Medal in 1986, S.K.Mitra Memorial Award (1987) by the Institution of Electronics and Telecommunication Engineers (IETE), and A.K. Bose Memorial Award (1991) by the INSA. He was awarded the S.S. Bhatnagar Prize for Engineering Sciences in 1998 by the Council of Scientific and Industrial Research (CSIR) for having made pioneering contributions to the emerging field of optoelectronics and optical communication by developing efficient analytical and numerical methods for dielectric optical waveguides, single-mode fibers, GRIN devices and optical imaging systems. He also received the M.N. Saha Award for Research in Theoretical Sciences for the year 1999 by the University Grants Commission and Hari Om Ashram Trust. In 1990, he was awarded the Homi Bhabha Fellowship for two years. Prof. Sharma is a fellow of all the three science academies in India: the National Academy of Sciences, Allahabad (1998), the Indian Academy of Sciences, Bangalore (2002) and INSA (2004). He was elected to the fellowship of the Indian National Academy of Engineers, New Delhi in 2009. He has been a fellow of the IETE since 1991. The Optical Society of America, Washington DC (2004) elected him fellow in 2004. He is a fellow of the Optical Society of India and is currently serving as its Vice President.

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Prof. Huzur Saran

Prof. Huzur Saran is at present the Head of Department of Computer Science & Engineering at Indian Institute of Technology, Delhi. He received his B. Tech (Electrical Engineering) degree from IIT, Delhi in 1983 and his Ph.D.in Computer Science from University of California, Berkeley in 1990. He was awarded the Bernard Friedman Memorial Prize in Applied Mathematics for excellence in Graduate Study in the Area of Applied Mathematics by the Dept. of Mathematics, University of California, Berkeley in 1990 for his thesis work and in the same year he joined Department of Computer Science & Engineering, IIT Delhi as a faculty.

His area of research is Algorithms, Computer Networks, Wireless Communications and Network Security. He has made significant contributions in these fields and has been Project in-charge of 13 projects sponsored by leading agencies like Department of Information Technology-Ministry of Communication and Information Technology, Govt. of India, Microsoft Research Media Lab Asia, INTEL etc.

Among his more recent research activities, Prof. Saran has been actively involved with efforts focussed on Rural Communications including on e-government like WIPO (Wireless Internet Post Office) and E-governance Innovation Lab in IIT, Delhi. These projects focus on developing technology to support the kind of services needed in deep rural areas of India, The aim is to make available a disruption tolerant network with software systems and applications that continue to function under adverse conditions and provide context-aware services. There has been collaboration in these areas with University of Waterloo for more productive research.

Prof. Saran has supervised approx 10 Ph. Ds and 60 B. Tech/M. Tech projects where many of the projects resulted in publications. He has around 50 publications out of which 20 are in reputed journals and 36 in top notch conferences. He was on the editorial board of the Journal of Network and Computer Applications, Academic Press, UK from 1999 - 2010.

He also has six patents to his credit viz. Early Fair Drop Buffer Management Method (Alcatel Lucent), Methodology for Managing Power Consumption in Master Driven TDD Systems (IBM), Methodology for Improving TCP Throughput over Lossy Communication links (IBM), Management and Scheduling of Data for Wireless Mimo-OFDM Systems (Intel), Method of a Congestion Control System to Allocate Bandwidth of a Link to Dataflows (IBM) and Method and System for Management of Network SLA's (IBM).

In terms of technology development, Prof. Saran has been the Chief Scientific Advisor to Solidcore Technologies from 2003 to 2010. There he helped in building up an India based R&D team and mentored them as they tried to develop cutting edge security technology. At Solidcore, he experimented with the challenges of trying to do true system level work based on a novel concept – rather than using antivirus which is a black-listing based technology, the team investigated as how to invent a new way of doing security for highly mission critical scenarios. The challenge was made far greater by the fact that the technology began to be used by top tier data centres such as GM ONSTAR where millions of transactions were being processed and performance was critical as was reliability, uptime etc. Dr. Saran, along with a talented group of engineers succeeded in competing against seasoned teams. For example competing against well resourced startups from MIT [Determina inc]. Solidcore has since been acquired by MacAfee in 2009 for its Wireless Technology.

Prof. Huzur Saran has also carried out research on Wireless Integrated Networks and was invited by Prof. A. J. Paulraj to the Information Systems Lab, Department of Electrical Engineering at Stanford in 1999. There, he worked on developing a Wireless Mac for a novel Fourth Generation MIMO-OFDM system from 2000 to 2002. He was further invited to join Prof Paulraj's company (Gigabit Wireless – later Iospan Wireless) and led a team which actually implemented the Mac in custom hardware and demonstrated a full high speed wireless broadband system. Prof. Saran is in the expert panel on ISRO/ DOT Wimax Interoperability Committee.

His research on Quality of Service (QoS) Networks, Sensor Networks, ATM, MPLS, 4G Wireless Networks has given new dimensions to Computer Networks. In this regard he has been invited visit AT&T Bell laboratories, Murray Hill, USA; Lucent Laboratories, (summer 1997 & 1998); AT&T Research, Florham Park, NJ, USA (1993 & 1994).

In addition, Prof. Saran has worked on establishment of a Nation-wide QoS of networks test-bed. From 1990 to 1999, Prof. Saran along with Prof. Vijay Vazirani has made significant contribution to the area of Approximation Algorithms specifically for Graph Partitioning Problems. He has also worked on parallel and distributed algorithm design and algorithms for information coding applications.

Prof. Saran has always been actively involved in supporting the institute networking activity. During 1999-2000 he was involved with original Institute Network Architecture design and Selection.

He has been the co-ordinator and Head of Amar Nath & Shashi Khosla School of Information Technology, IIT Delhi from 2006 to 2010. Prof. Saran helped in establishing the school facilities & built up a MS & PhD Program as well a number of School of IT courses.

Apart from his excellence in teaching and research, Prof. Saran has also been a honorary co-ordinator of DEI ICT Distance Education Centre and served in the Management of DEI Schools in Soami Nagar, Delhi. Prof. Saran is a voracious reader and during his spare time he delves into the areas of macro economics and geo-political scenario.

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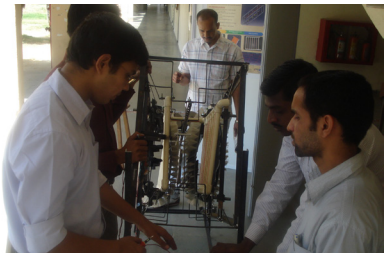
FITT / IIT D News

National Technology Day

National Technology Day Celebrations at IIT Delhi on 11-5-11.

FITT organized celebration of the National Technology Day at IIT Delhi on May 11, 2011. On this occasion a seminar was held in the Senate Room of the Institute. The speakers on the occasion were Prof. Rakesh Bhatnagar (Deptt. of Biotechnology, JNU) , Prof. Vikram Kumar (Deptt. of Physics , IIT Delhi) and Prof. B. Jayaram (Deptt. of Chemistry, IIT Delhi). The seminar was inaugurated by Prof. Surendra Prasad, Director – IIT Delhi and moderated by Prof. Ravi Chattopadhay (Professor-in-charge – Planning Unit). They spoke on "Recombinant Vaccine against Anthrax", "Genome to lead In Silico Technologies", "Monolithic Microwave Integrated Circuit" and highlighted various development challenges. The event was attended by several faculty members, students and some members of the industry.

IIT Delhi : "I² Tech -OPEN HOUSE, 2011"



I² TECH 2011 – IIT Delhi's Technology Open House held on 23-4-11.

IIT Delhi organized it's regular industry-academia program I² Tech – Open House, 2011 on April 23, 2011. The annual Open House is an attempt by IIT Delhi to demonstrate some of the most innovative and path-breaking projects to the public. This time over 200 student attended "Roboholix" (the hands on training workshop on mechanical and electronic aspects of Robotics), and scores of school and college students came to IIT D only to be enthralled by varied innovations.

TECHNOLOGY PROFILES

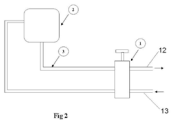
Protein Bio-factories

Present invention relates to obtaining correctly folded and biologically active recombinant proteins when over expressed in E.coli. The focus of the technology is mainly on an expression strategy by which mis-folding of proteins can be avoided.

Need for the technology: Most of the useful proteins occur only in small quantities which is the reason for obtaining them through recombinant engineering and over expression.

Drawbacks of Prior art: Most of the procedures available for solubilization and refolding make the recovery not only a tedious process but also a less efficient one.

Automatic Flushing System



This technology pertains to an automatic flushing system which can work either alongside manual flushing or independent of it. The said system can be used in any existing manual system as well. The technology works on a push valve which can get actuated when the toilet is being used and will flush the toilet when the user leaves the area. The technology finds use in a wide spectrum of places.

Advantages of the technology

1. No external power supply required
2. Flushing is manual as well as automatic
3. Low maintenance and less water wastage
4. Easy to install and use
5. No alteration in structural design is needed and the option of manual flushing is available

Advances over prior art:

1. Does not flush all urinals or toilets in a washroom at one time as the system is valve actuated and not door sensor based as described in prior art.
2. Does not need any external power supply like certain voice activated systems or infrared sensor activated systems.
3. It does not sense the movement of a person around the urinal but the actual usage thus circumventing a chance of a false alarm.

Applications

Public toilets, in offices, domestic use

The Interface

FITT organized an Industry – Academia meet on **Industrial Instrumentation, Power System and Control Engineering** on March 10, 2011. The meet was attended by senior IIT Delhi faculty, research scholars and FITT's Industrial Corporate Members and resulted in useful technical discourse.

FITT organised the thematic industrial clinic **"Addressing competitiveness issues through technology intervention"** on January 6, 2011 at the Institute to understand the technology gaps in industry units and to propose suitable intervention to improve competitiveness. Senior representatives from nearby industrial units attended the meet.

PROFESSIONAL DEVELOPMENT

Forthcoming Training Programmes

Sl. No.	Title	Date	Mode	Faculty/Dept.
1.	Short-term training programme on "Bioinformatics and Computational Biology"	4 - 25 July, 2011	PFB*	Prof. Tara C. Kandpal, Energy
2.	Short course on "Advances in Earthquake Engineering"	28- 29 Oct., 2011	-Do-	Dr. Dipti Ranjan Sahoo, Civil
3.	10th Indo-German Winter Academy (IGWA-10)	11 - 17 Dec., 2011	S	Dr. VV Buwa, Chemical
4.	Global Internship Program in Engineering Design and Innovation	Batches – 15 Jan. – 15 May 15 May – 15 July 15 July – 15 Dec. 15 Dec. – Jan. 15	PFB*	Prof. S Kar, Electrical
5.	Certificate Course on "Embedded Systems and Applications"	February, 2012	PFB*	Dr. B Lall, Electrical

**Participation Fee Based*

Honours

- Dr. V Matsagar, Asst. Prof. in the Department of Civil Engineering at IITD, has been conferred with the "DAE Young Scientist Award" by the board of Research In Nuclear Sciences (BRNS), Department of Atomic Energy (DAE), GOI in 2011.
- Dr. Sukumar Mishra, Assoc. Prof. of Dept. of Electrical Engineering has been elected as a Fellow of IET (UK).
- Prof Avinash Chandra of Centre for Energy Studies has been recognized as an International Fellow by the International Awards Committee on Electrostatic Precipitation

Professional Candidates' Registration Programme

Applications are invited from qualified professionals working in industry and Research Organizations for a unique knowledge augmentation and skill enhancement programme at IIT Delhi. This involves a semester-long registration for a regular PG course. Course fees range from Rs. 15,000/- to Rs. 20,000/- (industry professionals) and Rs. 6000/- to Rs. 8000/- (academic/government personnel) for a 42 hour lecture course. In the case of a few select courses, on-site course delivery using the two way video link systems can be considered. All major disciplines of Science and Engineering, and also relevant courses from the Humanities, Social Science and Management streams which are being conducted at IIT Delhi are covered.

Eligibility: Degree in Engineering or Masters Degree in Science, Management or any other Post Graduate Degree with relevant industry experience. The two semester sessions in the academic year start in the months of July and January, the exact dates being notified in advance. Contact: kirityroy@yahoo.com

FITT – Corporate Membership

FITT invites the industry / industry associations / R&D organisations and financial institutions to become corporate members of FITT at a nominal fee. A corporate member client can participate in technology transfer and joint R&D programmes of the Institute on a priority basis with FITT providing the interface. Membership Form can be mailed on request or can be downloaded from www.fitt-iitd.org. Contact: kirityroy@yahoo.com

The new Corporate Members (Jan-June 2011):

- Carborundum Universal
- Tata Chemicals
- Polyplex Corporation
- Anergy Instruments
- Star Wire (India Ltd.)
- Cenlub Industries
- Tata Industries
- DeCore

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