

*From the Desk of Chairman***Innovation : Part 3-72**

In the present era of open market and intense competition, innovation is crucial to sustain growth and profitability of a venture, more so for SMEs. Though breakthrough innovations occur sparsely, but when they do occur, they lend a competitive edge to the concerned company for years to come. All innovations, however, may not always result in significant improvements in a product or service, yet many of these could bring in incremental betterment and result in increase in productivity, efficiency and in revenues. In a way, innovation is the primary driver of business, financial and economic growth. It needs to be managed not as a mechanical process but as a flexible social process pliant to the emerging consumer needs and aspirations, and should incorporate a global perspective.

The Special Feature in the present issue of **WISTA: Innovation** covers innovation as a key contributor to economic growth and to develop solutions that integrate with societal parameters, business ethics and care for the environmental aspects.

Innovation finds its best reward in its success in commercialization and the impact it creates in the society it serves. The Indian Chemical Council has long been honoring outstanding innovations in the field of chemicals and has Constituted Acharya P C Ray Award, that is conferred every year for innovative technologies. Similarly, Government of India through the Department of Science and Technology has been administering awards across a wide spectrum of industries.

'In Focus' in this issue deals with innovations in the chemical industry and gives brief of corporates and the awards they have bagged for the year 2009.

Other features covered are: Scan Around Us; Frontier S&T; S&T for Basic Needs; Technology Development; Experts Converge; and Scan Around the Globe.

We welcome comments and suggestions.

*Dr K V Swaminathan***CONTENTS**

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This publication aims at disseminating information on pertinent developments in its specific field of coverage. The information published does not, therefore, imply endorsement of any product/process/producer or technology by WITT.

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SCAN AROUND US

Coal-to-Liquid Technology

The Centre for High Technology (CHT), an arm of the Petroleum Ministry, has signed a memorandum of understanding (MoU) with Engineers India Ltd. (EIL) and Bharat Petroleum Corporation Ltd. (BPCL) to develop an indigenous coal-to-liquid (CTL) fuels technology. The major activities that will be undertaken under the MoU are:

- (i) Mathematical model for Fischer Tropsch (FT) reactor and basic flow sheet development;
- (ii) Hydrodynamics simulation using computational fluid dynamics (CFD);
- (iii) Syn gas clean up and conditioning and preparation of process design package; and
- (iv) Costing of demonstration plant.

There are only a few companies in the world who have requisite technology to convert coal to liquid fuels, such as Sasol and Lurgi.

The CHT is also planning an ambitious energy performance audit of public sector refineries to identify technology gaps and performance, which can be subsequently improved. The proposal is for formation of joint audit teams with experts from industry and EIL to develop the requisite methodology for data formats, data collection and validation, program finalization and audit. The CHT has conducted energy audit and hydrogen management studies jointly with EIL. The idea of performance audit came about from this exercise and also from various benchmarking exercises conducted through Shell Global Solution's Integrated Refinery Business Improvement Program and suggestions from various activity committee meetings.

(Chemical Weekly, Oct 27, 2009)

Energy Guzzlers

The government has finalized a blueprint to reduce energy consumption in the nine most energy intensive industrial sectors of the country. The plan mooted under the national Action Plan on Climate

Change will soon regulate the energy guzzled by railways, aluminum, cement, pulp and paper, fertilizers and steel industries besides also covering power generation plants.

The plan will cover roughly 750 large industrial installations. Only those plants that consume more than specified levels of energy annually will be targeted. Industrial plants will be expected to attain targets assigned to them within a 3-year period. The target for each plant would be based on the average specific energy consumption.

(Indian Building Congress, Aug 2009)

Innovation Centres for Clean Technologies

The approval of India's technology transfer proposal to establish a global network of climate innovation centres for developing and deploying clean technologies at the just concluded climate change talks in Copenhagen should cheer businesses. 'In its submission to the UNFCCC, India had suggested that climate innovation centres be located in various parts of the world for undertaking development and deployment of clean technologies suited to their respective regions. The centres would do so by forging private and public sector partnerships. The centres would undertake R&D after identifying the local needs and appropriate technologies, and develop and deploy them after undertaking capacity building to enhance their faster absorption. The Indian Institute of Technology, Delhi and UK-based Carbon Trust have estimated that five regional centres would entail an initial investment of \$2.5 billion, and potentially trigger an investment of \$2.5 billion by the private sector.

While the centres may not deliver breakthrough technologies in geo-engineering or carbon capture and storage, they are expected to deliver utilitarian technologies like development of cleaner cooking ranges and deployment of energy efficient lighting solutions, catering to the existing market and beyond. Today, the global low carbon and environmental goods and services sector is estimated to be worth more than \$4 trillion. It comprises technological solutions for tackling pollution of air, water and land; renewable technologies for small hydro, wind, solar

etc and low-carbon technologies for construction, transport and energy sectors.

(The Financial Express, Dec 14, 2009)

Magnetic Superatom

Scientists, including those at an Allahabad based institute, have discovered a 'magnetic superatom' which could shrink the size of many electronic devices like computers, make them faster and pack more storage space. The magnetic superatom, a stable cluster of atoms that can mimic different elements of the periodic table, may have potential biomedical applications, such as sensing, imaging and drug delivery. The newly discovered cluster, consisting of one vanadium and eight cesium atoms, acts like a tiny magnet that can mimic a single manganese atom in magnetic strength while preferentially allowing electrons of specific spin orientation to flow through the surrounding shell of cesium atoms.

The study is led by the scientists from Virginia Commonwealth University, collaborators at the Harish-Chandra Research Institute (HRI), Allahabad and Naval Research Laboratory, US. Scientists at HRI and their team mates performed an elaborate set of theoretical calculations to study the properties of clusters containing a single vanadium atom and a number of cesium atoms. They found that when the cluster had eight cesium atoms, it acquired extra stability due to a filled electronic state. An atom is in a stable configuration when its outermost shell is full. Consequently, when an atom combines with other atoms, it tends to lose or gain valence electrons to acquire a stable configuration. The researchers believe that the superatom can have significant impact in the area of molecular electronics and spintronics in which attempts are made to use conducting properties of small molecules to design electronic devices. Such molecular devices are expected to help make non-volatile data storage, denser integrated devices, higher data processing among other benefits.

The researchers have proposed that by combining gold and manganese, one can make

other superatoms that have magnetic moment but will not conduct electricity. These superatoms may have potential application in healthcare. HRI is a research institute under the Department of Atomic Energy, and is involved in studies in the fields of mathematics and theoretical physics, including theoretical condensed matter physics and materials science.

(PTI Science Service, Jul 1-15, 2009)

Research Infrastructure

Recently, Honeywell has announced that it will invest \$34-mn in a new technology centre in Gurgaon, to expand its global research capabilities in refining, petrochemical and other technologies. The 400,000 square-foot centre will come up at an existing Honeywell-owned property. The centre will primarily house pilot plants for developing and demonstrating refining and petrochemical process technology developed by UOP, a Honeywell subsidiary that is part of its Specialty Materials Business group. The centre will also include labs for process and applications development for other speciality materials technology areas, including fluorine products and nylon materials.

This centre will allow to conduct development closer to end customers, while at the same time tapping the recognised engineering talent of India. It will strengthen product and process commercialisation capabilities globally, but especially in Asia, where it will complement its research centre in Shanghai, China.

The new centre will also support other speciality materials businesses, conducting research and customer-specific engineering work in carpolactam, a key material used in nylon resin. The centre will support the fluorine business, doing customer application work in areas, such as blowing agents used in energy-efficient spray foam insulation.

With company's four technology centres already operational in the country for other businesses, proposed new technology centre will be dedicated to refining, petrochemical processes and speciality materials.

(Honeywell India, Dec, 2009)

FRONTIER S&T

AEROSPACE/SPACE**Environment Friendly Rocket Propellant**

NASA and the Air Force Office of Scientific Research, AFOSR, have successfully launched a small rocket using an environment-friendly, safe propellant comprised of aluminum powder and water ice, called ALICE. Using ALICE as fuel, a nine-foot rocket soared to a height of 1,300 feet over Purdue University's Scholer farms in Indiana earlier in August 2009. ALICE is generating excitement among researchers because this energetic propellant has the potential to replace some liquid or solid propellants. When it is optimized, it could have a higher performance than conventional propellants. ALICE has the consistency of toothpaste when made. The propellant has a high burn rate and achieved a maximum thrust of 650 pounds during this test. It can be improved with the addition of oxidizers to become a potential solid rocket propellant on Earth. Theoretically, ALICE can be manufactured in distant places like the moon or Mars, instead of being transported to distant locations at high cost.

(NASA, Aug 21, 2009)

Inflatable Heat Shield

An inflatable heat shield designed to slow and protect spacecraft as they blast through the atmosphere at hypersonic speeds, has been successfully tested at NASA. The 1400 lb Inflatable Re-entry Vehicle Experiment (IRVE) was vacuum-packed into a 15-inch diameter payload "shroud" and launched on a small sounding rocket from NASA's Wallops Flight Facility. The 10-foot diameter heat shield, made of several layers of silicone-coated industrial fabric, inflated with nitrogen to a mushroom shape in space several minutes after liftoff. The key focus of the research came about six and a half minutes into the flight, at an altitude of about 50 miles, when the aeroshell re-entered Earth's atmosphere and experienced its peak heating and pressure measurements for a period of about 30 seconds. An onboard telemetry system captured data from instruments during the test and broadcast the information to engineers on the ground in real time.

(NetworkWorld, Aug 17, 2009)

BIOTECHNOLOGY**Hereditary Diseases**

US scientists have found a breakthrough to replace genetically abnormal parts of an egg which may eradicate many hereditary diseases like cancers and diabetes passed from the mother to child. The finding, which reopens the ranging ethical debate over embryo research, allows the scientists for the first time to safely remove and replace genetically abnormal mitochondrial DNA from an ovum. The technique developed by Oregon National Primate Research Center and Oregon Health & Science University successfully carried out in monkeys, would need a controversial change in the law to be used on humans.

The scientists, who reported their findings in the journal *Nature*, said that the method involves removing nucleus of an egg from an affected woman with mitochondrial defects and transplanting it into a healthy donor egg. The egg is then fertilized in a test tube and transplanted back into the original donor. The resultant baby remains the woman's biological child but without her inherited defects to the mitochondria.

(PTI Science Service, Sep 16-30, 2009)

Regulation of RNA Fate

University of Wisconsin-Madison researchers have discovered that the RNA degradation, which when improperly regulated can lead to cancer and other diseases, can be launched in an unexpected location. The Wisconsin team also found that CRD-BP, a protein activated in colorectal and other cancers, can prevent RNA from degrading in the newly identified spot. The finding may have broad implications for cancer research as well as biology in general.

The finding is important for the proto-oncogenes, or precursor cancer genes, but it may be even more important for the thousands of other genes and proteins that are regulated in a similar way as advocated by associate professor of dermatology at the UW-Madison School of Medicine and Public Health.

(Science New, Aug 1, 2009)

DRUGS/PHARMACEUTICALS

Antidote Controllable Agent

US researchers have found a new compound that quickly counteracts the action of an emerging class of drugs, offering a way to reverse the drugs' actions if a patient develops serious side effects. The new compound is designed to work with a new blood-thinner being developed for heart patients undergoing angioplasty to clear out blocked arteries. Such patients need to take blood thinners to prevent blood clots during surgery, but bleeding is a common side effect. Having an antidote on hand would make the treatments safer, said Bruce Sullenger of Duke University Medical Center. The blood thinner, called REG1, is being studied in people through a company called Regado Biosciences in Durham, North Carolina. This advance is significantly expected to expand the number of diseases that can be more safely treated using antidote-controllable agents.

(ZeeNews Bureau, Oct 16, 2009)

Psoriasis Treatment

The US Food and Drug Administration (FDA) has approved Stelara (ustekinumab), a biologic product for adults who have a moderate to severe form of psoriasis. Plaque psoriasis is an immune system disorder that results in the rapid over production of skin cells. Plaque psoriasis is characterized by thickened patches of inflamed, red skin, often covered with silvery scales. This approval provides an alternative treatment for people with plaque psoriasis, which can cause significant physical discomfort from pain and itching and result in poor self-image for people who are self-conscious about their appearance. Stelara is a monoclonal antibody, a laboratory-produced molecule that mimics the body's own antibodies that are produced as part of the immune system.

However, since Stelara reduce the immune systems ability to fight infections, the product poses a risk of infection. The FDA is requiring a risk evaluation and mitigation strategy or REMS for Stelara that includes a communication plan targeted to healthcare providers and a medication guide for patients.

(Centocor Ortho Biotech Inc, Oct 16, 2009)

ELECTRIAL/ELECTRONICS

Harnessing Tree Power

Scientists at University of Washington (UW) have developed electrical circuits that run entirely from power in trees. A study last year from the Massachusetts Institute of Technology (MIT) found that plants generate a voltage of up 200 millivolts when one electrode is placed in a plant and the other in the surrounding soil. Those researches have since started a company developing forest sensors that exploit this new power source. The UW team sought to further academic research in the field of tree power by building circuits to run off that energy. They successfully ran a circuit solely off power for the first time.

The system could provide a low-cost option for powering tree sensors that might be used to detect environmental conditions or forest fires. The electronic output could also be used to gauge a tree's health.

(University of Washington, Nov 5, 2009)

World's Smallest Laser

Researchers at Purdue University have created the world's smallest laser, more than 1 spaser million. It could fit inside a red blood cell that could help speed computers, sensors and imaging all by using light instead of electrons to process information.

Laser device is dubbed "spasar" because it generates a form of radiation called surface plasmons. The idea is that such light-based nanophotonic circuitry could replace existing transistors in all manners of electronic equipment. Current lasers can't be made small enough to integrate them into electronic chips, researchers stated.

Nanophotonics may usher in a host of radical advances, including powerful "hyperlenses" resulting in sensors and microscopes 10 times more powerful than today's and able to see objects as small as DNA; computers and consumer electronics that use light instead of electronic signals to process information; and more efficient solar collectors.

(NetWorkWorld, Aug 20, 2009)

S&T FOR BASIC NEEDS

BUILDING/SHELTER

Green Building Technology

r3 Building Systems has completed its first building utilizing a new construction technology specifically designed to provide a green building solution that is less expensive and quicker to build versus traditional construction. This patent pending technology, was exclusively used recently to design and construct the new LEED™ Gold Certified Fresh & Easy Neighborhood Market in Cathedral City, California. Due to r3's unique custom building system, the new store consists of 84 percent recycled content that garnered a 10 percent savings in construction / consulting costs. On an ongoing basis the store will net a 42 percent savings in energy cost netting an anticipated savings of \$75,000. The store will also see a 59 percent reduction in water use. The unique design is a solution to the inherent problems of building occupancy separation and load capabilities. The all steel components provide the system with a high fire resistance rating which will result in lower insurance costs.

(Building News, Sep 28, 2009)

Prefabricated Roof

Precast or prefabricated building components have been established in the development world as a means of achieving efficiency, economy and quality in the construction sector. In India, the 'precast' approach is yet to achieve adequate maturity in the housing sector, and needs to be pursued at a large scale. If adopted, it can be of particular benefit to the rural building segment, specially in improving quality, productivity, material use, speed, cost and social benefits. Precast roofing system is a combination of precast beams and smaller roofing elements to span between the beams. There is good range of options available in precast roofing technologies. These are brick arch panel / brick panel roofing, plank & joist roofing and precast joists/beams systems. These have been successfully tried and tested in both residential and institutional buildings.

(Development Alternatives, Jul-Sep 2009)

CLOTHING/TEXTILES

Growth in Technical Textiles

It is felt that public-private partnership will very much help in the growth of technical textile industry. It is expected to grow from Rs 227 crore to over Rs. 2000 crore in the next few years as revealed during "Geo-synthetics: Opportunities and Challenges" meeting organised by the Federation of Indian Chambers of Commerce and Industry (FICCI) and the Bombay Textiles Research Organisation (BTRA). Ministry of Textiles is in the process of building 'Centres of Excellence,' such as NITRA, SITRA and BTRA in the different parts of the country.

Technical textiles are gaining more and more importance in areas of roads, rail, aviation, riverbeds, agro-tech and meditech. There, however, is need to move onto more sophisticated methods and processes to build infrastructure through geo-synthetics.

In India, technical textiles have a very low contribution amongst the total textiles produced estimated at about 3-4%. As the economy improves, technical textiles consumption will increase to 10%. In order to meet this demand, Clariant has set up a Competence Centre at Kolshet in Thane, which will contribute by way of training and on a pilot plant level to develop the coating effects for technical textile end-users.

Further, Institute of Environmental and Human Health (TIEHH) at Texas Tech University USA had planned a conference on 'Advances in Textiles, Machinery, Non-Wovens and Technical Textiles (ATNT) in December 2009 in Tamil Nadu, India. The conference was to feature papers from natural fibres to fashion design and non-wovens to technical textiles. Also it, aimed at seeking enhancement in professional interaction, enable future collaborations and improve business opportunities in fibre and textile disciplines.

(FICCI, Nov 17, 2009)

ENERGY

Chicken Waste to Biofuel

Chicken-feather meal is a byproduct of large-scale poultry production. It often includes blood and offal, and contains about 11 percent fat. Researchers at the University of Nevada, USA, boiled the feather meal to extract the fat and then processed the fat into biodiesel using potassium hydroxide as a catalyst. The process produced 7–11 percent biodiesel, of good quality, comparable to biodiesels from soybean and palm oil. As claimed, this process is very economical and does not use expensive or toxic chemicals. It will benefit both developed and developing countries.

To implement this technology in developing countries [where there are few large poultry farms], one may need an additional step to collect the poultry waste. If this can be done by a company and/or by government regulations, this technology will have a huge immediate impact on the economy. The researchers are developing a production process that could reduce the price of the feather meal biodiesel still further.

(Science & Development Network, Aug 12, 2009)

Energy Storage Flywheels

Energy storage flywheels are currently being developed as a viable solution for megawatt-scale back-up power and for frequency regulation on the grid. LaunchPoint Technologies' magnetically-levitated 'Power Ring' flywheel will rotate in a complete vacuum at tip speeds faster than Mach 2. Such speeds are extremely demanding on a system that require precise control of five levitation axes. LaunchPoint engineers are currently developing innovative adaptive control techniques that will enable the cost-effective and reliable operation of maglev high-speed energy storage flywheels.

To be effective, energy storage flywheels must be able to generate power on the megawatt scale which requires high rotational speeds and results in high centripetal forces. To achieve these speeds, the flywheel is constructed of a carbon composite material and is levitated using a magnetic bearing. It is claimed that research will also be applicable to reducing energy consumption in many of the high speed machines.

(Launchpoint Technologies, Inc, Aug 5, 2009)

FOOD

Organic Food

The study done by the London School of Hygiene and Tropical Medicine (LSHTM) and funded by the Food Standards Agency (FSA), claims that organic food is no healthier than normally grown food. A team of about 50 researchers reviewed all papers published over the past 50 years that related to the nutrient content and health difference between organic and conventional food. The team, led by Dr Alan Dangour, says it is the most comprehensive study in the area to-date. "Observations, as above, are based on systemic review of literature. A small number of differences in nutrient content were found to exist between organically and conventionally produced crop and livestock, but these are unlikely to be of any public health relevance," said Dr Dangour.

Further, researchers did not find any difference in the level of most nutrients, including vitamin C, calcium and iron in crops. The same result held for meat, dairy products and eggs.

(Business Standard, Aug 21, 2009)

Pneumatics for Food Packaging

AIR Springs Supply finds pneumatics the clean choice for food and packaging because it is a clean technology with minimal contamination risks. It offers many advantages over hydraulics for food and packaging. However, companies that continually process and pack food and beverages must frequently wash down their machines to ensure the proper sanitary conditions. This is especially important for the processing of meat and dairy products, for example, or the production of wine and beer or low-margin high-volume products where product recalls or production breakdowns could be catastrophic. In these situations, pneumatics can be a smart option to decrease downtime, lower maintenance costs, and, ultimately, increase production. Because fewer moving parts are nearly always better than more, one excellent solution for simplicity and reliability can be to employ actuators without seals, shafts or internal moving parts.

One of the beauties of Air Spring pneumatics is that it is easy to troubleshoot and to detect problems without downtime being an issue. Further, they withstand even the toughest environments.

(Hydraulicspneumatics.com, Jun 25, 2009)

HEALTH**Second-Hand Smoking**

A team of scientists at the University of California, Riverside has found that even second-hand tobacco smoke exposure can result in non-alcoholic fatty liver disease (NAFLD), a common disease and rising cause of chronic liver injury in which fat accumulates in the liver of people who drink little or no alcohol. In their study, the researchers focused on two key regulators of lipid (fat) metabolism that are found in many human cells as well: SREBP (sterol regulatory element-binding protein) that stimulates synthesis of fatty acids in the liver, and AMPK (adenosine monophosphate kinase) that turns SREBP on and off. They found that second-hand smoke exposure inhibits AMPK activity, which, in turn, causes an increase in activity of SREBP. When SREBP is more active, more fatty acids get synthesized. The result is NAFLD induced by second-hand smoke.

The study emphasizes that discouraging cigarette smoking helps prevent not only cardiovascular disease, pulmonary disease and cancer, but now also liver disease.

(Science Centric, Sep 11, 2009)

Smallest Artificial Heart Pump

Doctors in Germany have successfully implanted the world's smallest artificial heart pump, billed as more effective and unobtrusive than earlier devices. "It can fully replace the function of the heart's left ventricle and works particularly quietly and effectively," said the director of the cardiac surgery division of the University Hospital of Heidelberg Matthias Karck. The device can also help patients bridge the time until a heart donor can be found for a transplant. The pump is the fifth generation of the so-called DeBakey Heart developed by the late US cardiac surgeon Michael DeBakey in the 1990s. It can be worn adjacent to the ailing heart and allows for external electronic monitoring and adjustment.

The first recipient, a 50-year old woman, received the 92 gm pump made of plastic and titanium recently and is leading a nearly normal life with it at home.

(Science & Technology, Aug 18, 2009)

NEW MATERIALS**New Bone Adhesive**

A new adhesive which has the sticking power to adhere to bone could help orthopedic surgeons fix difficult breaks. Making glue that sticks to bone and other wet surfaces has proven a particularly complex task, either it slides right off, or it dissolves into the surrounding liquid. Russell Stewart of University of Utah and his colleagues have been successful in recreating a synthetic version of the tiny sandscale worm's adhesive—a polyacrylate glue that is water soluble but doesn't dissolve in liquid, is at least as strong as Super Glue, and is twice as strong as the worm's original glue. Besides bonding bones, adhesive may be used in a number of wet environment applications, everything from mending cracked teeth to repairing corrosive cracks on ships out of dry dock. Preliminary study of new material reportedly shows a lot of promise.

(MIT Technology Review, Aug 18, 2009)

Re-writable Photonic Paper

Photonic crystals are a new kind of material. They are similar to semiconductors where electrons are replaced by photons i.e light. In view of certain problems faced in practical application of photonic crystal based materials, researchers in California have now addressed some of them by reporting a new type of rewritable photonic paper on which a durable ink mark can be written or erased by introducing or removing a hygroscopic salt in the surface layer of the paper. The key point of their work is the use of hygroscopic salt solutions as 'ink' to swell the polymer matrix of photonic crystals and create a very durable contrast of diffraction colors on the photonic paper. The ink marks can be erased by rinsing the paper in water and drying there after. The rewritability of the photonic paper and low toxicity of the materials involved make this paper/ink system environment friendly, inexpensive, and useful for general applications, involving color writing and display. It is claimed that the new invention has several major improvements compared to existing photonic paper fabrication technologies.

(NanoWerk Spotlight, Aug 17, 2009)

SPECIAL FEATURE

INNOVATION, KEY TO DEVELOPMENT

Introduction

Innovation is always a hot topic. There are legions of books, articles, speakers, consultants, awards and more, all focused on innovation. But in the midst of all this noise, it is important to begin with the most basic question: Why does Innovation really matter. Innovation matters for two fundamental reasons: First, innovation is the key to improving quality of life for people in every part of the world. We face enormous challenges today-as individual companies and institutions, but also as nations, as societies and as planet. Most of these challenges can be highly responsive to innovation.

Second, innovation is the primary driver of business financial economic growth. In many companies, a single innovation has provided the spark and the fuel that launched them from start-up to success and from success to global impact. Besides, it is observed that continuous innovation is the key to sustainability and growth of any business.

Entrepreneurship & Innovation

Confronted with global competition, the ability to innovate in firms and nations is becoming critical. It has been observed that the successful companies are continuously 'innovating' to stay ahead. As such, practitioners of public and business leaders have to brace the moot questions: What facilitates innovation? What impedes it? Let's begin with innovation first. In simple terms, innovation is the successful exploitation of an idea to create a new and greater value. In broader sense, it encompasses virtually any new development in a firm which enhances values of its product or service. It can involve creating or re-engineering products or services to meet new market demand, introducing new marketing techniques to expand sales opportunities to improve operational efficiency.

Owing to fierce competition among themselves and with large domestic companies and imports, most SMEs in India are forced to innovate to survive. Such innovations are continually carried out through small changes in the products, processes and management practices and are attributed to 'incremental model'.

Though not very common, innovation could also mean adoption or adaptation of practices that already exist in other sector firms. However, much of the innovation efforts among SMEs remain confined to incremental steps largely focusing existing products, in an inward looking setting.

Experience from countries, such as South Korea, Taiwan, Japan, Italy, USA etc. demonstrates that SMEs neither are, nor they need to be bystanders, engaged just in the incremental process of innovation. It is interesting to see how these countries have been successful in letting evolve an innovation friendly ecosystem where, in an interactive process, many actors from different levels are involved making it a collective social endeavour, a collaborative process in which the firms, especially the small firms, depend on the expertise of a wider social constituency than is often imagined such as work-force, suppliers, customers, technical institutes, etc.

Quest for Innovation

From the global discourse on the subject, India could draw some important lessons. The public authorities need to work in incentivising collaboration between various economic actors, strengthening the regulatory environment for protection of intellectual property and easing access to venture capital and technology. The SMEs need to reorient their attention on consciously pursuing external knowledge resources and on enhancing their capacity to absorb and exploit new knowledge. The level of skills of the work force and their trainability assume greater importance in a firm's quest for innovation.

Entrepreneurship is all about having a dream, believing in it and nurturing it with passion to see it realised. Today, India is seen as a hub for innovation where there is formal 'Space' for

incubation and mentoring for start-ups both at government and private sector levels. So it is clearly time for people to equip themselves with the most important ingredient of all – the right attitude.

A close examination of Silicon Valley reveals that it is unique not only for its strong supportive entrepreneurial ecosystem, but also because so many of new businesses were built there by individuals who believed in their out-of-box and maverick ideas, and were willing to take risks. Stories of innovation business successes there are now part of modern entrepreneurial folklore. Definitely one of the core components of becoming an entrepreneur is to believe and bet on ones ideas. After all, right from the wheel, everything that makes this modern material world started with a single idea is backed by faith in the power of the idea.

In India today there is huge opportunity in SMB segment both in the rural and semi-urban areas. Keeping that in mind, it's obviously time to catalyse Indian entrepreneurial spirit to tap this vast untapped opportunity.

Innovation A Social Process

We look to consumers for inspiration for innovation. It is a firm belief that innovation must be consumer driven and it must be managed as a social process. At the end of the day, innovation is a human activity. On one hand, innovation benefits human beings and ideally it should be inspired by and focused on their needs and aspirations. At the same time, innovation requires human creativity and human collaboration. It should not be managed as a mechanical process, but rather as a flexible social process that very deliberately enables creativity and connections and collaboration. Innovation inspired by consumer needs can be a powerful transformation experience, making the world a better place. Keeping this in view four core principles of innovation are seen by experts:

(i) Social challenges that are faced today are strongest driver of innovation. These

challenges, daunting as they are, are also highly inspirational.

(ii) Innovation requires a global view of scale as we live in a world where there are as many similarities as there are differences.

(iii) Another important factor is collaborating for open innovation. It requires coming out of silos of company research labs and connect with the world's most inspired minds to develop solutions that improve consumers lives. In India, for example we work with the Indian Institutes of Management as well as the Council of Scientific and Industrial Research.

(iv) Finally, in order to really tap into the power of innovation, it is required to define innovation broadly across multiple dimensions, such as new products, new packaging, new ways of communicating, of doing business, of managing people and even invent new ways of innovating. It is believed that these principles, as integral to companies approach to innovation, will help to have innovation that responds to human need.

Concluding Remarks

As micro, small and medium enterprises are seen to be the engine of India's continued growth and the country's emergence as a leading global supplier and market, those who wish to succeed in a time of rapid transformation must judge wisely which practices to continue and which new practices to adopt. In this connection, Economic Times Empowering Entrepreneurs Innovation Conclave planned recently may be of help to leaders of today's MSME businesses to discover and implement such innovations that will spark and fuel their growth.

Also it is felt that sustainable growth is possible when innovation integrates with ethical business practices and care for the environment. Organisations and governments need to leverage emerging technologies and collaborate with stakeholder communities across geographies to co-create value to make everyday life a little better now and in the future.

IN FOCUS**INNOVATIONS IN CHEMICAL INDUSTRY****Introduction**

As a measure for boosting innovation in science and technology, recognition of identified new important developments is adhered to by suitable awards to them. This write-up focuses on such awards, specially in the field of chemical industry, and is based on extracts from an article by Ravi Raghavan in a recent issue of *Chemical Weekly*.

Tata Chemicals, soda ash and fertilizer producer, has bagged the 'Best Innovation in Corporate Social Responsibility (CSR)' award, one amongst five given by ICIS, the chemical publishing arm of UK-based Reed Business Information. The awards were announced recently to recognise innovations in products, processes and business in the chemical industry, besides CSR. It has also received recognition for the introduction of an advanced and patented filtration technology to treat the liquid effluents from the soda ash manufacturing process.

Product Innovation Awards

The 'Best Product Innovation' award (which was also judged 'Overall Winner') went to the CECA subsidiary of France's Arkema, for its development of surfactant formulations that help to reduce energy consumption during road construction, improve working conditions and environmental impact (in terms of emissions of carbon dioxide, dust, volatile organic compound and nitrous oxides). Lucite International's Alpha technology for production of methyl methacrylate (MMA) received a 'special mention' in the 'Product Innovation' category. The technology uses readily available feedstock (carbon monoxide, ethylene and methanol), eliminates inventories of toxic and corrosive materials (such as hydrogen cyanide), and minimizes production of effluents and by-products, thus virtually eliminating waste treatment costs.

Lucite says the process lowers manufacturing costs by up to 40-50% compared with traditional MMA technologies based on the acetone cyanohydrin route (which starts with acetone and hydrogen cyanide) or on isobutylene.

Innovation by an SME

The award for the 'Best innovation by an SME' was conferred on Oxford Catalysts (UK) and its US subsidiary, Velocys, for development of a microchannel reactor for the distributed production of third-generation biofuel. Production of liquid biofuel from waste, to give one example, sounds attractive, but the need to transport large volumes to a central facility is not environmentally sound. By greatly reducing the size and cost of chemical processing hardware, microchannel process technology offers the possibility of cost-effective production of synthetic fuel in smaller scale facilities.

Business Innovation

The 'Business Innovation' Award was bestowed on DSM (the Netherlands) for its successful efforts at moving down the value chain with Claryl – a picture glass. Having invented a one-step optical anti-reflective coating for float glass, at its incubator unit, DSM decided that instead of marketing the coating, it would enter the market itself with a branded mid-priced picture-framing glass to capture more of the value from the innovation. Extensive market research indicated a gap in the market and the launch has been so successful that in 2008, within a year after launch, DSM announced a capacity expansion by 50% at its manufacturing facility in the Netherlands.

Claryl is produced in a patented process to provide a particularly high-quality float glass with a coating which requires only one dipping pass. This not only reduces costs, but is also more environment-friendly: it can be produced with about 30% less energy than traditional anti-reflective glass; and moreover, can be recycled in the same way as normal glass.

Recognising Innovations in India

The Indian Chemical Council, earlier known as the Indian Chemical Manufacturers Association (ICMA), has a long history of honoring innovations in the chemical industry. Its annual award for technology innovation, named after its founder Acharya P.C. Ray, is arguably the most coveted. Similar awards across a wide spectrum of industries are bestowed by chambers of commerce and even the Government of India through its Department of Science and Technology. More recently, private foundations have come to recognise the achievements of Indian industry: the Marico Innovation Foundation, for example, is now in its third year, and has recognised a number of innovations, again across industries.

TECHNOLOGY DEVELOPMENT

R&D COMMERCIALIZATION

Technology Commercialization Specialists

Consultancy Development Centre (CDC), an autonomous institution of the Department of Scientific and Industrial Research (DSIR), Ministry of Science and Technology, set up as a nodal organization for promotion, development and strengthening of consultancy skills and capabilities, has recently launched a project for training and certification of Technology Commercialization Specialists in the country. As part of this project, around 200 experts will be trained on various aspects of technology commercialization, beginning with technology assessment to technology transfer, leading to mass manufacturing.

The proposed training process will expose the pool of experts and scientists/engineers from R&D institutions to commercialization process for a few model technologies having potential for a commercialization. The training process will also deal with various aspects of technology such as: commercial viability; organizational set up; transfer process; technology transfer package; legal issues for commercialization; field support and marketing technology/ products/solutions. The project would train and certify 'Technology Commercialization Specialists' across technologies-biological, chemical, mechanical and electronics. These specialists will subsequently work with R&D engineers in the lab to facilitate transfer of technologies from the lab to the manufacturers for bulk production, thus reaching out the benefits of public funded R&D institutions to the masses.

This initiative launched by the CDC will fill a long standing gap of technology commercialization knowhow faced by public funded labs in science and technology, defence, telecom, space, agriculture, medicine and other fields.

(Chemical Weekly, Aug 18, 2009)

Technologies on Offer

The National Chemical Laboratory (NCL), Pune, along with other laboratories under the Council

of Scientific and Industrial Research (CSIR) are attempting to chart a new course in technology development, and commercialization of scientific research. With past models of engagement with industry on transfer of technology having outlived their usefulness, and a sea-change in the environment in which the institutes operate, the pressure has been on the industrial research laboratories to better serve industry. In response, the laboratories are attempting to evolve participatory, risk-sharing models of technology transfer and development, to better serve Indian industry. Indian industry today has a much wider access to technology – although, perhaps, not state-of-the-art.

At the same time, businesses themselves have ramped up their in-house R&D spends considerably – at least in select sectors – in recognition of the fact that innovation can be a powerful driver for sustainable growth. Similarly, several Indian pharmaceutical companies now each spend a few hundred million dollars in R&D efforts ranging from process development and scale-up to development of alternate, more efficient routes to synthesis; and on development of new chemical entities and formulations.

As a pioneering experiment, NCL has created the 'NCL Innovation Park' and a 'Venture Center' therein, that aims to create the ecosystem necessary to nurture an idea from the laboratory and take it through the stages that will eventually see it emerge as a successful technology serving a market need. Designated as a technology business incubator, its focus is currently on the chemical, biochemical and material sciences – all areas in which NCL has significant research programs.

NCL is now open to multiple modes of engagement with industry, including sponsored research projects, consulting and technology transfer. While exclusive or non-exclusive technology transfer through licensing was the preferred route in the past, the laboratory is now in a position to part with its knowhow and intellectual property even for equity in existing or start-up companies. The choice of the model depends on the nature of knowhow, intended markets and industry scenario; the stage of technology readiness; stage at which the commercialization partner enters; IPR and knowhow strength and ownership position; and the type of relationship desired (transactional or partnership).

(NCL, Nov 24, 2009)

INTELLECTUAL PROPERTY

Heart Failure Drug

Palatin Technologies, Inc. announced recently that it has received a Notice of Allowance from the US Patent and Trademark Office for its US patent application Number 11/694,260, titled "Cyclic Natriuretic Peptide Constructs." Allowed claims cover a family of cyclic compounds that bind to natriuretic peptide receptor A (NPRA), including PL-3994, Palatin's lead heart failure drug candidate. Palatin expected patent issue in the second half of 2009; the patent's 20-year term would expire in 2027. PL-3994 and related compounds are first-in-class peptide mimetics with extended half-lives and favorable pharmacokinetic properties. These are the only drugs that bind to NPRA and are suitable for subcutaneous administration, with the possibility of once-daily administration. PL-3994 and the related family of cyclic compounds were discovered entirely in-house and are owned by Palatin.

Palatin has completed two clinical trials with PL-3994, a Phase 1 trial in healthy volunteers and a Phase 2a trial in patients with controlled hypertension. PL-3994 produced dose-related decreases in blood pressure, increases in plasma cGMP (cyclic guanosine monophosphate), a natural messenger nucleotide, and increases in urine volume and sodium excretion. There were no serious or severe adverse events. PL-3994 incorporates a novel and proprietary amino acid mimetic developed by scientists at Palatin. PL-3994 has an extended half-life, with reduced affinity for natriuretic peptide clearance receptors and increased resistance to neutral endopeptidase, an endogenous enzyme that degrades natriuretic peptides. The result is a drug candidate with improved pharmacokinetic and pharmacodynamic properties.

Heart failure affects over 5.7 million people in the United States, with 670,000 new cases diagnosed each year. Despite the treatment of heart failure with multiple drugs, the prognosis remains poor. There were over 1.1 million hospitalizations for heart failure in 2006 in the United States, with estimated direct and indirect costs of heart failure in the United States for 2009 of \$37.2 billion.

Palatin Technologies, Inc. is a biopharmaceutical company focused on discovering and developing targeted, receptor-specific small molecule and peptide therapeutics. Palatin's strategy is to develop products and then form marketing collaborations with industry leaders in order to maximize their commercial potential.

(Palatin Technologies Inc, Aug 4, 2009)

Metabolomics Software

Metabolon, Inc., the leader in metabolomics-driven biomarker discovery and analysis, has been awarded a patent for its metabolomics software, Ion Tracker™, which provides a mechanism for creating new chemical library entries. The software is designed to greatly accelerate and automate the organization of ion features for mass spectrometry into chemically related sets and expedites the creation of a metabolite library. It is a key component of the company's global biochemical profiling technology. This tool gives a unique advantage because it is able to dig very deeply into datasets and find those underlying chemicals that are not already a part of library, then add them to the library with very little time or effort. It is in this way that Metabolon has been able to build the world's largest metabolomic reference library and continue to add to this database daily.

The awarded patent (US Patent 7561975), titled "System, Method, and Computer Program Product for Analyzing Spectrometry Data to Identify and Quantify Individual Component in a Sample," is the latest addition to Metabolon's extensive IP portfolio consisting of over 100 US and worldwide patents and patent applications, including broad metabolomics methods, data analysis and biomarker patents, as well as focused product patents. Metabolon is a diagnostics and services company offering the industry's leading biochemical profiling platform. Metabolon's patented platform provides a global analysis of complex biological samples for the discovery of markers and pathways associated with drug action and disease. This metabolomics-driven approach enables the identification of biomarkers useful for the development of a wide range of diagnostics and provides insight into complex biochemical processes such as drug action, toxicology and bioprocess optimization.

(Metabolon, Aug 11, 2009)

TECHNOLOGY FUNDING

AcceleGlove

The device known as AcceleGlove, developed by the Institute for Disabilities Research and Training (IDRT) at Wheaton, Md, has a low-cost, sensor-equipped system for translating hand and finger motion into information. The device has been developed with the support of funding from NSF's Small Business Innovation Research (SBIR) program. The AcceleGlove has a range of applications, including translation of sign language. This could help first responders and health providers communicate with individuals who are deaf or hard of hearing. Military applications are also possible, as the device would allow soldiers to silently communicate through hand signals. IDRT has received its first patent on the technology. New applications include augmented and virtual reality, and gaming.

SBIR funding has also been used for two other innovative projects, namely industrial refrigerators that will run 30-40 percent more efficiently than the current system, and also advanced infrared imaging technology using new materials that integrate germanium pixels with standard silicon components. The result is a low-cost, high-resolution shortwave infrared (SWIR) imaging technology that can be integrated into a range of devices to assist with security, research and other applications.

(NSF News, Nov 11, 2009)

Infra Projects Financing

In a bid to accelerate the infrastructure projects through public-private partnership (PPP) initiatives in India, the Asian Development Bank (ADB) has decided to provide close to \$700 million in loans. ADB's board of directors approved the multi-tranche loan for the second India infrastructure project financing facility. The loan will be released over a five-year period to the state-owned India Infrastructure Finance Company Ltd (IIFCL), and is follow-on of the first-stage facility of \$500 million, approved in 2007. IIFCL, established in 1996 to promote PPPs, will use the facility to support investments in a broad range of PPP infrastructure projects. The first-stage facility has proven to be effective in facilitating PPP infrastructure.

Although government has carried out broad financial sector reforms to create a market environment for long-term and innovative financing required for projects, products and market, the appetite from private sector investors for long-term finance for infrastructure is still limited. The multi-tranche loan will provide funds on commercial terms with more than 20 year maturities, which are not currently available in the domestic market. The facility is expected to enhance the availability of long-term funds for infrastructure and boost investor confidence.

The new loan will help India meet its infrastructure investment target of \$514 billion under its current 11th Five Year Plan, and continue support for the government's effort to move forward the infrastructure agenda. Loan amount under the latest facility will be released in three tranches, with \$210 million in the first, \$250 million in the second; and \$240 million in the third.

(The Financial Express, Nov 18, 2009)

Reprocessing Plastic Waste

The Department of Chemicals and Petrochemicals (DCP) decided to constitute plastic waste reprocessing fund for promoting plastic waste processing through chemical process in the country. The proposed fund will be mainly utilised in reprocessing post-consumer plastic waste in a systematic manner. The rationale behind the scheme is the perceived need to create awareness about the recyclable properties of plastics and eliminate littering of plastics, while promoting used plastics. In line with this thinking, a charge is proposed to be levied on the manufacture and import of polymers in the country. The rate is envisaged at 0.5% of the ex-factory price of the Cost Insurance Freight (CIF) value of the imported polymers. The proceeds of this cess will go to the proposed fund. The DCP expects the cess amount to be in the range of Rs 150-200 crore per annum. The scheme will initially be operational for a period of three years, and, will be tentatively reviewed in 2011-12. The DCP is of the view that the proposed scheme, apart from its core function, would also promote collection of plastic wastes, along with storage and segregation in an integrated manner.

(DCP, Nov 3, 2009)

EXPERTS CONVERGE

Clean Operations

Experts in the area of environment and pollution control urge the industry to use latest technologies to achieve zero discharge. These observations were made by them at a seminar on environmental concerns and challenges in the pharmaceutical sector, organised by the Andhra Pradesh Pollution Control Board, in view of the pharma city project in Visakhapatnam district and several bulk drug units coming up in the north-coastal districts of Andhra Pradesh. It was mentioned that the amount of waste being generated in the pharma and chemical sectors was a matter of great concern. For every ton of production, as much as 8-10 tons of waste is being generated, and too many toxins were is being used, even when there was no need. Solvent recovery out of the hazardous waste generated was another crucial area and the industry should focus more on it.

Energy Efficiency

Awareness of energy efficiency is the key to sustainable development and national energy security. This fact led APO to organize an observational study mission to Germany on Energy Efficiency, from 27 September-1 October 2009, in collaboration with Adelphi Consult GmbH. Twenty-five energy professionals from 13 member countries attended along with APO expert Arvind K. Asthana. Twelve presentations and nine site visits were packed into the five-day mission. Each demonstrated energy efficiency initiatives in Germany and dealt with the introduction of governmental policy and support, best practices of energy efficiency in industries and buildings, and renewable energy application by public and industrial facilities and institutions. Participants were advised to establish future strategies and action plans for applying these best practices in the Asia-Pacific context.

Showcasing Technologies

National Chemical Laboratory (NCL) based in Pune, and Venture Centre, an incubation centre of CSIR, launched its first event in November, 2009 at NCL Innovation Park to showcase selected competencies and related technologies from the area

of polymer science and engineering, specifically super-absorbing polymers, membranes, microspheres and microcapsules and silicones. These technologies are applicable to a wide variety of large and growing markets both in India and abroad, in the fields of healthcare, consumer goods, industrial equipment, construction materials, military applications etc. The event targeted entrepreneurs, MSMEs, corporations and technology commercialization professionals who wish to leverage NCL's competencies and know-how, and identify specific opportunities for taking these technologies to market. Participants got an opportunity for interaction with some of the scientists behind these technologies who also focused on explaining the technology commercialisation process, how technology transfer /licensing works at NCL, and insights into various sources of funding for entrepreneurs who wish to commercialize these technologies.

Workshops for GLP Upgradation

The Department of Chemicals and Petrochemicals (DCP), under the Ministry of Chemicals and Fertilizers, has requested the Department of Commerce (DoC), under the Ministry of Commerce and Industry, to consider the possibility of funding the awareness workshops to be conducted by Chemexcil workshops to be conducted by Chemexcil and the National Good Laboratory Practice Compliance Monitoring Authority (NGLPCMA), as a part of the India European Union Capacity Building Initiative for Trade Development (IEUCBITD). Chemexcil has proposed to organize a series of awareness workshops on REACH (Registration, Evaluation, Authorization and Restriction of Chemicals) regulations, in order to, mainly, generate awareness about the timeframe for registration of chemicals with the European Chemicals Agency (ECHA).

The NGLPCMA has proposed to conduct a five-day training course for Good Laboratory Practice (GLP) inspectors. The training will be provided by a faculty team who are members of the Organization for Economic Cooperation and Development (OECD) Working Group on GLP. About 30-35 inspectors are expected to be trained in the proposed workshop. The training is expected to mould them as resource persons for the implementation of GLP in their respective institutions.

SCAN AROUND THE GLOBE

Fire-Resistant Polymer

Researchers in Melbourne, Australia, have developed a new class of fire-resistant polymer coatings that they claim are not only cheap and versatile but are also able to survive much higher heat. A team at CSIRO in Australia has developed the fire-resistant coating materials, called HIPS (hybrid inorganic polymer system), which can withstand temperatures of up to 1000°C and could be applied to building materials.

HIPS coatings contain an inorganic geopolymer resin and a small component of polymer additives, can form thin fireproof coatings on timbers, such as weather boards and on metals like galvanised steel. It can also protect brickwork, either a thin coating or as a render. HIPS can be applied by spray equipment, roller or brush, and cures from ambient temperature to below 90°C.

It is claimed that coatings are not only fire, blast and acid-resistant, they are also strong, castable, sprayable and extricable, making their potential uses almost limitless. As water-based products, HIPS coatings are free of volatile organic compounds, do not burn or produce heat, and do not release smoke or toxic chemicals at temperatures up to 1200°C.

Geopolymers are cost-competitive, since they are made from readily available raw materials. They can also be derived from industrial byproducts, such as flyash and blast furnace slag. They can be cheaper than organic resins and coloured with pigments or dyes. CSIRO also sees potential for the manufacture of fireproof wood composites and fire seals from HIPS technology.

(Australia-PTI Science Service, Jul 16-31, 2009)

Antimicrobial Surfaces

European scientists have created light-activated antimicrobial surfaces by modifying a material used in medical devices with tiny amounts of commonly used dyes. Silicone is used in medical equipment, such

as catheters. But bacteria can colonise its surface so the infections associated with catheter-use are very common. Ivan Parkin, Mike Wilson, at University College London, and their colleagues in the UK and Spain have modified the polymer so that it kills bacteria when it is irradiated with a laser or visible light.

The researchers covalently bound organic dye molecules, methylene blue or toluidine blue O, to silicone surfaces. The process involves dipping a modified silicone in a solution of the dye for 24 hours, washing and drying it. It uses only small amounts of the dyes (picograms per mm²) but is very effective. After a few minutes' exposure to a low power laser, levels of viable *Escherichia coli* and *Staphylococcus epidermidis* on the polymeric surfaces dramatically drop: up to 99.999 percent in the case of *S. epidermidis*.

The dyes work by generating reactive oxygen species under light irradiation and it is these that are toxic to the bacteria. The work is an interesting and novel strategy in developing effective antimicrobial coatings for medical surfaces. Research is attributed as significant advancement in functional coatings.

*(Europe-Chemical Technology,
Jul 15, 2009)*

Nano-fishing Cancer Treatment

Researchers at the University Medical Centre Hamburg-Eppendorf (UKE) won a national contest in October, 2009 to further develop their so-called "nano-fishing" cancer treatment, a method which aims to pluck cancer cells from a patient's bloodstream. The •1.5-million Federal Ministry of Education and Research (BMBF) award for innovation in medical techniques will go to further testing of the cancer treatment.

Single cancer cells are released from tumours into the bloodstream where they spread into the body and build more tumours – a deadly cycle that could be hindered if these cells can be detected and used to create a targeted treatment, the spokesperson explained.

Similar techniques have been costly and time-intensive, but the new system is simple, accurate and affordable, according to the UKE. The technique involves using tiny “tentacles” about 50 times thinner than a human hair that act as angling devices to “fish out” specific cells. Experts believe the new technology will help improve tumour diagnosis in addition to enhanced monitoring of infection stages.

The UKE is working closely with nanobiotechnicians in Dusseldorf, and industrial partners in Elmshorn and Wiesbaum.

(Germany-*Science and Technology*, Oct 29, 2009)

Rocket Launch

South Korea has launched its first space rocket in August 2009. The two-stage rocket lifted off from an island off the south coast. The first stage separated successfully less than five minutes after lift-off and the South Korean-built 100-kilogram scientific research satellite was placed into Earth orbit.

South Korea’s half-a-billion dollar bid to join the exclusive club of spacefaring nations is an attempt to place a scientific observation satellite into orbit. All aspects of the launch are reportedly normal, but the satellite exceeded its planned orbit and reached an altitude of 360 kilometres. A joint probe is under way by South Korean and Russian engineers to find the exact cause. However, despite the satellite’s failure to reach its proper orbit, the launch should be seen as a “half success” since the rocket functioned without any problem.

(South Korea-*BBC News*, Aug 25, 2009)

Solar Cleaning of Wastewater

Engineers have come up with a novel way to decontaminate hazardous industrial wastewater by harnessing the power of the sun.

Ecosystem Environmental Services SA, a small Spanish firm participating in CADOX, contributed to the creation of SolarCadox. The new technology combines the Fenton process, discovered more than a century ago, with modern photochemistry.

Specifically, ultraviolet and visible light are used to reduce Fe(III) to Fe(II), iron’s initial state in the Fenton process. The reaction also produces hydroxyl radicals, which help break down organic pollutants in the wastewater.

A major advantage of SolarCadox is that the light is derived from solar radiation. This ensures that no additional energy is required, and consequently no further pollution is generated. A turn-key solution was produced in collaboration with the CADOX project coordinator, the Plataforma Solar de AlmerAa of the Research Centre for Energy, Environment and Technology in Spain. Ecosystem Environmental Services SA can provide consulting services to tailor SolarCadox to specific sites, climates and types of wastewater.

(Spain-*CORDIS*-Jun 5, 2009)

Heart Valves that Grow in Patient

Swiss reserchers are working on a project to develop heart valves made of stem cells that are capable of growing within young patients. Tests being conducted on sheep have proven successful up to now. Researchers at the University Hospital in Zurich have already succeeded in cultivating the heart valve of a sheep using the creature’s cells. This means that many heart patients, particularly young people, may one day not have to undergo rounds of painful transplant surgery to replace artificial valves that they have outgrown.

To-date, surgeons have used artificial valves made out of synthetic materials or dead animal tissues in order to avoid any chance of the body rejecting the replacement part. One big problem however, particularly in the case of children, is that these substitute valves do not grow within the body. This means young patients must endure new transplant surgery every few years.

To create a heart valve, heart surgeon extracts cells from an artery in the sheep’s neck. The cells are then propagated in the laboratory and are deposited on a scaffold. This template corresponds almost exactly to the shape of a heart valve. This is then put in a bioreactor where the cells continue to grow and

attach themselves to the scaffold, which gradually dissolves.

Meanwhile, the nutrient solution is kept constantly in movement while the valve is growing. It simulates the motion of the heart and is intended to train the new component for its future duty in the body. The whole process takes a mere eight weeks. The valve is then transplanted back into the sheep, whose stem cells were used to grow the bodily component. This process allows researchers to avoid any chance of rejection.

Although heart surgeon Simon Hoerstrup and his team are already looking forward to the day when they will be able to transplant a living heart valve into a human patient, it is still likely to be a few years from now.

(Switzerland-Zurich University Hospital, Nov 13, 2009)

Revolutionary Fingerprinting

'Bullet fingerprinting' technology developed at the University of Leicester in collaboration with Northamptonshire Police is now being advanced in new ways.

Method claims to visualise fingerprints even after the print itself has been removed. Continuing work exploring this forensic technique in the Department of Chemistry at the University of Leicester is uncovering new ways of recovering fingerprints from metal surfaces.

Researcher Alex Goddard has uncovered a natural technique that he believes is so simple, which can explain why it has been overlooked until now.

The technique involves studying the chemical and physical interactions occurring between the metal and the fingerprint sweat deposit. Using advanced surface imaging techniques, such as an Atomic Force Microscope, nanoscale observations of fingerprinted brass samples can identify optimum conditions to promote the natural enhancement of the fingerprint, vastly improving their recovery rate. It has also proven that components of the sweat deposit survive washing and wiping of the surface. Once a finger has touched the metal surface, a residue

remains behind, this starts to react with the metal and an image of the fingerprint can be developed by the use of elevated temperature and humidity, with the resultant image becoming a permanent feature on the surface of the metal.

This new technique promotes a naturally occurring process which does not involve adding anything to, or damaging, the evidence. Instead, it employs heat and humidity to promote the enhancement of the fingerprint image, there are also indications that it could be used after other techniques have failed, perhaps as a last resort. This is seen as an important area of forensic research.

(UK- University of Leicester, Jul 13, 2009)

Cure for Obesity

US researchers have cured obesity in mice by injecting them with a synthetic peptide that simultaneously mimics two naturally occurring hormones. The weight loss in the mice has been described as 'staggering', and opens the prospect for the development of a drug treatment for obesity in humans - something that has so far proved elusive.

The synthetic molecule possesses key features of two natural peptide hormones, glucagon and glucagon-like peptide-1 (GLP-1), which are involved in regulating glucose metabolism and appetite control. When injected into obese mice, after one week the animals' body weights had decreased by 25 percent and their body fat by 42 percent. Repeated treatment resulted in greater effect. While both peptides are known to suppress appetite, glucagon has the effect of raising blood glucose while GLP-1 lowers glucose in the blood. The researchers, led by Richard DiMarchi of Indiana University, postulated that if both hormones were administered at the same time, the risk of glucagon dangerously elevating blood glucose levels could be negated by the effect of GLP-1.

Further investigation showed that the GLP component of the drug was mainly suppressing appetite, while the glucagon was working to stimulate the burning of calories.

(USA-Chemistry World News-Jul 15, 2009)