

*From the Desk of Chairman*Innovation : **Part 3 - 67**

The key element to achieve technological growth and financial success in the present intense competitive global scenario is converting inventions into innovations and launched products. Such a scenario puts huge pressures on organisations to innovate, and gravitate towards improving ability and capacity to convert ideas into inventions, inventions into products and services and reduce time lag for taking these to the market. The implication, however, is that organisations should focus on technologies in which they have expertise and which harbour better commercial prospects. To give a boost to the Indian innovators for marketing their inventions and ideas, the FICCI Lockheed Martin India Innovation Growth Programme 2008, recently initiated eight business agreements to exploit the tremendous potential their inventions hold for the benefit of Indian and global community.

The 'Special Feature' in the present issue of the **WISTA: Innovation** deals with the importance of progressing judiciously selected ideas into commercially viable inventions, products and services.

Despite the current slowdown and the global economic crisis, Bayer Group of Germany has embarked on a path of maintaining the R&D impetus and ensuring sustained and viable growth. Its R&D thrust encompasses new applications, environmentally compatible production methods, and customised product solutions, particularly in Bayer MaterialScience, Bayer CropScience, Healthcare and Bayer Climate Programme.

The 'Perspective' covers the Bayer's focus on R&D and innovation in the chemical, biological and pharmaceutical sectors to address major socio-economic issues of rising demand for food and healthcare, scarcity of resources, and climate change.

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

We welcome comments and suggestions.

Dr K V Swaminathan

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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

Analytical and R&D Centre for SMEs

The Centre of Excellence, established under the Industrial Infrastructure Development Scheme (IIDS) of the Ministry of Commerce, Govt of India, proves state-of-the-art testing facilities and research services to the numerous small and medium scale chemical manufacturing units at Vapi, Gujarat. The Centre renders its services for constant upgradation of processes and for developing new products. It provides necessary assistance to the member industries to help them raise their product standards to global levels. It is also involved in arranging training to technical staff and providing IT trained human resource to the industry.

With financial help from the Department of Industrial Policy & Promotion, Ministry of Commerce, the Centre has set up facilities like analytical laboratory, pilot plant and R&D centre, convention centre, video conferencing facility, and a digital library. The Centre is in the process of setting up a packaging testing facility and testing facility for textile industries. It is also contemplating imparting postgraduate certification course in packaging science & technology.

Beyond its role as an R&D facility, Centre of Excellence also perceives to function as a world class attesting lab.

(Chemical Weekly, Feb 24, 2009)

Cancer Stimulant Protein

Scientists in Germany have found that survivin, a protein molecule, prevents cancer cells from dying allowing tumour growth. Rajarshi Kar, from the Department of Biochemistry at the All India Institute of Medical Sciences, Delhi, is also working on the protein molecule. He found that survivin reduces the action of Paclitaxel, a prominent anti-cancer drug. Paclitaxel acts by arresting cell development, eventually triggering cell death. Survivin does the opposite, rendering Paclitaxel ineffective. Kar noted that inhibiting surviving in cancerous cells resulted in 30 percent cell death. This increased the efficiency of Paclitaxel. Kar also discovered that curcumin, a

principal component of turmeric, reduces surviving levels. His research includes testing the effect of curcumin, with Paclitaxel and Carboplatin, a drug that inflicts DNA damage on cancer cell death.

Though further assessment is required, a step closer to victory could entail regulating the protection of surviving.

(Down to Earth, Feb 16-28, 2009)

Haploid Breeding Technique

Haploid breeding technology developed by Central Rice Research Institute, has reduced the time gap for breeding new rice varieties. The haploid breeding technique shortens the time required for breeding a new variety from the usual 10 years to 6 years, thus saving on time, labour and financial resource. According to GJN Rao, head plant improvement at Cuttack-based Central Rice Research Institute (CRRRI), in a conventional method two varieties, each having some of the desired characters are crossed and plants derived from the hybrid are followed scientifically for 6-7 generations for identification of the right plant, while in the case of the haploid breeding method, the male gametes collected from the hybrid plants are cultured and plants are generated.

ICAR has been working on technologies on a system mode of operation for direct-seeded rice, mechanical transplantation of rice crops and experimenting on cultivating rice on rice beds under the All-India Coordinated Rice Improvement Project (AICRIP).

The double haploid method launched under the AICRIP has performed well in the multi-location trials conducted across India.

ICAR and Philippines-based International Rice Research Institute (IRRI) have entered into an agreement to support and facilitate the country's rice research over the next three years aimed at boosting to rice production. Meanwhile, IRRI and ICAR have announced the details of the new ICAR work-plan agreement (2009-2012), which would ensure India's continued access to advanced rice research from around the globe and the technologies subsequently developed.

(The Financial Express, Mar 2, 2009)

New Cure for Prostate Cancer

Curing prostate cancer may no longer require surgery. Also it could just take 1-4 hours time, with patients walking out of hospital in two days flat. Urologists in India are trying out the High Intensity Focused Ultrasound (HIFU), a new technology that does not require the removal of the entire prostate gland. Instead, it “cooks the prostate tissue” with ultrasound beams, passed by a robotic arm though the patient’s rectum, destroying and evaporating all the cancerous cells.

HIFU is a one-time procedure performed under regional anesthesia and can completely cure prostate as large as 40 grams. Dr Gupta, who is also head of urology at AIIMS, said HIFU is best suited for small sized prostates. “The normal volume of a prostate is 20 grams. HIFU is highly effective in prostates as big as 40 grams. Even though HIFU seems to be the technique of the future, at present, it’s under clinical trail.

Explaining HIFU, experts said it is non-invasive. A small probe inserted into the rectum emits ultrasound waves directly to the prostatic tissue. Ultrasound energy is focused at a specific location which kills the cancer cells. In the focal zone, the temperature is rapidly elevated to 90 degrees celsius in a matter of seconds which causes tissue destruction. During HIFU, the entire prostate is treated or ablated. The treatment is pain free. People can return to a normal lifestyle within a couple of days. “During the procedure, the probe constantly delivers real-time images of the prostate and the surrounding area, giving the physician immediate and detailed information,” he added. Dr Ramayya, who has till now successfully cured three prostate cancer patients with HIFU, will demonstrate the technique at international symposium on diseases of the prostate gland at All India Institute of Medical Sciences. According to Dr. Gupta, the disease of the prostate gland is a global problem with the increase in aged population. The prostate is part of the male reproductive system. It lies just below the bladder and in front of the rectum. Prostate cancer is usually very slow growing and is most common among men between ages 60 and 80.

(Times of India, Apr 3, 2009)

Solar Power Scale-up

Solar power projects, which have so far been in the fringes of the energy portfolio on account of viability issues, could finally see some scaling up. New solar thermal and grid-interactive solar photovoltaic (PV) projects on the anvil include NTPC Ltd’s plans for a 10-MW solar field at its Anta power project site in Baran, Rajasthan. Another 10-MW demonstration project, proposed by Gurgaon-based, Acme Tele Power, is likely to come up near Nagpur in Maharashtra, while the Clinton Foundation is exploring the possibility of setting up an “integrated Solar City” in Kutch (Gujarat).

The largest solar PV plan in India has a capacity of around 200-kW, a fraction of the size that some of these new projects are targeting, in order to achieve economies of scale. Indicative tariffs from some of these projects are around Rs. 10 a unit, as against tariff of over Rs. 15 a unit in case of current projects. NTPC – the country’s largest power generator – has installed a 10.5 kW silicon PV module at Jaraha Chetwa near its Rihand power station in Uttar-Pradesh, while more PV systems are planned.

(Chemical Weekly, Jan 6, 2009)

Zero Discharge Toilets

Eco-friendly zero discharge toilets are all set to be introduced in trains across the country. The toilets jointly developed by IIT Kanpur, Research Designs and Standards Organization, Lucknow and a private agency in Chennai, ensure that all liquid discharges are converted into “pure water” which can be used as re-cycled water to flush and clean toilets and sanitary fittings. The solid waste is converted into odour free paste by certain bio-chemicals or additives applied at the departing terminal. This can be stored for 15 days in a tank and can easily be emptied at the destination point through pressurised evacuation.

The odourless solid waste could yield revenue since the paste would form an excellent manure after being dried in the sun. After some more trial runs and studies the scheme would be a permanent feature in Indian Railways.

Presently, the system has been installed in trains running between Chennai and Jammu Tawi and Chennai-Lucknow.

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

FRONTIER S&T

AEROSPACE/SPACE

BrahMos Missile

Supersonic BrahMos cruise missile with a range of 290 km was successfully test-fired in the Rajasthan desert. Missile has been developed jointly with Russia. It is reported that the unique technology in the Block II version of missiles made them “unparalleled” and would help the armed forces hit even “insignificant targets” hidden in cluster of buildings which are insignificant in terms of size, in a cluster of large buildings. India is now the only nation in the world with this advanced technology,” an official claimed.

(Financial Express, Mar 30, 2009)

Manned Space Mission

India will reportedly redesign Russian space capsule Soyuz to send its astronauts on the country’s maiden manned space mission. The Soyuz, which has been in use since 1967, has been upgraded several times and has recently brought back American astronauts from the International Space Station. The Soyuz TM is a modernised version of the Soyuz T with a new docking and rendezvous, radio communications, emergency and integrated parachute/landing engine systems. It has a more durable metal body and lighter heat shield material. ISRO plans to undertake the manned space mission in 2015 in which the space craft will be placed in a low earth orbit. Finally it will splash in Indian Ocean.

The human space flight mission holds immense potential in terms of telemedicine, material science and would involve various work packages before it is launched. It includes development of human-rated GSLV, an escape system, an environmental life support system, thermal protection system for re-entry into the earth’s atmosphere, facilities for training astronauts and crew and with mission management system in place with man being in the loop.

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

BIOTECHNOLOGY

Adult Stem Cell Bank

Cryo-Save Group, Europe’s largest adult stem cell storage bank, has announced the launch of its India operations through its 100 percent subsidiary, Cryo-Save India. The Indian subsidiary has been set up with an investment of 1.8 million euros. Cryo-Save Group will scale up its investment to two million Euros within a year of its operation of the Indian subsidiary. The company will offer the collection and storage of adult stem cells derived from cord blood. The services will be available across all metros and other cities.

Stem cells are natural repair kits of the human body. In the last two decades more than 10,000 patients are reported to have been treated with cord blood stem cells transplantations in over 150 countries.

Cryo-Save India offers the dual storage system and does away with manual intervention and thereby contamination by ensuring automatic processing. Cryo-Save India headquartered in Bangalore has a state-of-the-art fully automated adult stem cell storage facility. The facility covers 10,000 square feet with a storage capacity of 150,000 samples, extendable immediately to 300,000 samples.

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

Biocontrolling Congress Grass

Congress grass or parthenium, a native of tropical America, came to India accidentally in 1955. A rapidly growing invasive species, this grass competes well for nutrients and space and reproduces fast. One of the world’s seven most notorious weeds, parthenium has already taken over about five million hectares of this country’s land. Many methods, ranging from manual uprooting, chemical herbicides to biological control agents, have been proposed to limit the spread of this uncontrollable variety of grass. Biocontrol agents are the most preferred as they are inexpensive and cause few side-effects.

Quite a few bioagents, including the leaf beetle, *Zygogramma* sp, and the rust fungus, *Puccinia abrupta*, have been used in the management of parthenium in different parts of the world with some limitation in field trials. Further need based research is continuing in this area.

(Down to Earth, Feb 16-18, 2009)

DRUGS/PHARMACEUTICALS

Experimental Malaria Vaccine

An experimental malaria vaccine was able to reduce the rate of infection and disease in children by 53 to 65 percent in two clinical trials conducted in Africa, according to studies released recently. Researchers have been trying to develop a vaccine for the deadly mosquito-borne illness which kills nearly a million people a year and sickens 250 million others for more than 70 years.

The vaccine was first developed by GlaxoSmithKline in the late 1980's and initially tested in US volunteers. The drug company entered a partnership with the nonprofit group PATH Malaria Vaccine Initiative in 2001 to test the vaccine in African children. They are on track to start the final phase of clinical trials at sites across Africa early this year to confirm and evaluate the vaccine's efficacy, better determine its duration and closely monitor its safety. In the published trials, researchers separately studied two groups of children in Kenya and Tanzania.

(PTI Science Service, Dec 16-31, 2008)

New Diagnostic Tests

Researchers from the Harvard University in US invented a device called the 3D μ PAD that could do away with the requirement of a laboratory analysis as the present method of testing blood for iron, glucose and protein levels is found to be time-consuming and costly. Also the device is portable and can be used to test various constituents of blood simultaneously. Even urine samples can be analyzed this way. The researchers arranged vertical stacks of patterned paper with alternating water impermeable double-sided adhesive tapes. The arrangement was such that between each two layers of paper there was a layer of adhesive tape creating a three-dimensional network of paper-tape-paper and so on.

This technology can make up for detection in places where the doctor can't reach on time. Depending on the number of inlets, one device can test blood or urine samples of the entire family. The more the number of detection spots (which can be increased by increasing the stacks of paper), the more the number of constituents to be tested.

(Down to Earth, Feb 1-15, 2009)

ELECTRONICS/COMMUNICATIONS

Energy Efficient Communications

The communicating devices are generally portable, powered by small batteries that need to be recharged regularly. This can be expensive and time consuming, reducing the device's efficiency. Bangalore-based American multinational called Honeywell Technology Solutions Lab (HTSL), has devised an energy efficient communication technology that uses silence to transmit data. In the world of wireless communication, data sent by a transmitter is converted into a binary language consisting of 0 and 1. The silent symbol technology allows the transmitter to stop transmitting when it reads 0. The receiver is programmed to understand that the absence of a signal denotes 0. Hence energy is conserved while transmitting parts of the message. At the same time the complete message is sent. In other words, information is communicated even when a signal is not transmitted. Research claims that technology halves the time needed for transmission and also saves 33-50% energy both at the transmitter and at the receiver.

Research would be beneficial in setting up wireless-based development projects in rural areas where availability of electricity is unpredictable, making it difficult to recharge batteries.

(Down to Earth, Feb 1-15, 2009)

Sensor for Health Monitoring

GE Global Research has announced that its scientists have developed a low-cost wireless medical sensing platform, a potential product application that includes neonatal and home health monitoring. The technology development arm of General Electric Company said the scientists have transformed a common and commercially available GE sensor for home security into an innovative, intelligent wireless medical sensing platform.

One of the most promising applications of this new technology could be in neonatal infant health monitoring. Further GE's sensing technology could enable new applications in elder and outpatient care as well by enabling remote monitoring of the health and well-being of a patient and loved one.

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

S&T FOR BASIC NEEDS

BUILDING/SHELTER

Concrete Admixtures

Worldwide there is increasing focus on use of chemicals in construction industry. These are defined as chemical compounds that are added as such or in formulations to or on construction materials at the construction site in order to improve workability, enhance performance, add functionality or protect the construction material or the finished structure made out of it. They undergo chemical reactions (e.g., solidification from melt) during their application. The important groups of construction chemicals are: concrete admixtures; asphalt additives; adhesives and sealants; and protective coatings.

It is found that strength of concrete rises dramatically due to the use of construction chemicals. For example, the diameter of a pillar needed to carry 100-tons has been reduced from 100-cm to 10-cm between 1920 and 2004. The cross-section of such a pillar is one-hundredth of what was needed in 1920.

(Chemical Weekly, Feb 17, 2009)

Green Rating for Buildings

Bureau of Energy Efficiency is reportedly extending the star rating scheme to buildings as well. The ratings, meant only for offices at present, will award certificates to buildings based on their energy consumption over a period of at least one year. Organizations that apply to BEE will be assessed on their power consumption and awarded star ratings from one to five, with five signifying a highly efficient building. It takes off from the energy conservation building code that had been enforced in May 2007. So far around 500 buildings have been designed according to it.

Benefits are likely to motivate builders to adopt better construction practices. However, only existing buildings will benefit from the programme since a building has to be in existence for at least one year to qualify for the audit. New buildings can probably take tips from LEED or GRIHA codes developed by separate organizations for energy efficient buildings so that when they are finally assessed, they can get a good rating.

(Indian Building Congress, Mar, 2009)

CLOTHING/TEXTILES

Developments in Textiles

Techtextil North America represents all vertical aspects of the technical textile industry from research and development, through raw materials and production processes, to conversion, further treatment and recycling, and showcases the latest products and advanced technologies in textiles and materials.

Some of the latest developments in this area are: (i) application driven fabric solutions; (ii) high quality economical machinery for the recycling of nonwovens, waste yarn and materials; (iii) highly functional fabrics for waterproof breathable applications; (iv) x-odor fabric having anti-odor, antibacterial, antifungal, UV protection and static-less functions; (v) high quality woven 4-way stretch fabrics; and (vi) fire-resistant brattice cloth used for underground applications.

(www.innovationintextiles.com, Apr 06, 2009)

Technical Textiles

The Institute of Environmental and Human Health (TIEHH) at Texas Tech University is joining hands with Enercon Industries Corp to develop technology to advance the functionality of nonwovens and technical textile.

The partnership seeks to explore the opportunities of commercializing atmospheric plasma technology in the nonwovens and specialty fabrics industry to make apparel-grade nonwovens and other value-added fabrics, such as liquid-repellant fabrics and breathable protective fabrics.

Plasma technology is a surface modification treatment technique using gases for the nonwoven and technical textile industry to modify the surface of the materials. This makes it suitable for various desired applications, such as making a fabric more or less absorbent. Use of atmospheric plasma also enhances the wettability and dyeability of textiles.

(Chemical Weekly, Feb 24, 2009)

ENERGY

Clean Coal

Envisaging a significant role for French companies in India's energy strategy, both countries are all set to join hands in the area of clean coal technologies. World renowned French companies like Areva and Alstom are set to play an increasing and a significant role in this direction. Such collaborations are vital, as India has to wake up to the challenge of climate change and embrace technologies that reduce greenhouse gas (GHG) emissions.

There seems to be a real need to make the transition to efficient coal technologies as coal based plants are expected to meet over 50% of India's electricity needs up 2015.

(The Financial Express, Feb 5, 2009)

Microbes to Solve Energy Crisis

Microbes may well be the answer to our global energy crisis. By fermenting biomass to produce biofuels, they offer a possible climate-friendly solution to the anticipated shortfall in fossil fuel supply. Global oil reserves and new petroleum discoveries will not be enough to meet the annual demand worldwide. It is, therefore, essential to anticipate and avoid any shortfall in future supply and to provide access to new bioenergy alternatives for the marketplace. In the context of a strong global political and economical debate on the gradual substitution of petroleum by renewable alternatives, such as biofuels, microbes can help solve the energy problem, and focuses on the organisms that ferment lignocellulosic biomass to produce bioethanol, biobutanol, biodiesel and biohydrocarbons in particular.

Use of these biofuels would help reduce greenhouse gas emissions. Also there have been a number of US government initiatives pushing for and backing the development of biofuels. Finally, what remains is a major effort and challenge to biochemical engineering at the many new plants being built for biofuel production. Processes have to be scaled up and carried out in cost-effective way.

(Chemical Weekly, Feb 17, 2009)

FOOD

Beverage from Kithul Sap

Kithul or *Caryota urens* sap is widely known among the Asians from historic times for its products such as treacle, jaggery and toddy which are made from it. Kithul sap contains 5-18% natural sugar or sucrose, glucose, fructose etc. and is highly perishable. It starts deteriorating from the moment it flows out from the flower due to fermentation by the yeast in the environment.

Ms Damitha Rajapakse and Ms Agnes Fernando of the Food Technology Section of the ITI, Colombo, have formulated a method to process kithul sap into a refreshing, natural, non-fermented drink and obtained the patent rights for the process. This novel drink could be stored in sealed bottles at room temperature for more than six months. In this process they have been able to arrest the fermentation soon after tapping, and this helps the processing of the sap to make the non-alcoholic beverage.

(Information Science Centre, ITI, Colombo, Dec 2008)

Nanotechnology for Food Safety

A microscopic biological sensor that detects Salmonella bacteria in lab tests has been developed by an Agricultural Research Service (ARS) scientist in Athens, Ga., and cooperators at the University of Georgia. The sensor could be adapted to detect other foodborne pathogens as well. There are examples of biosensors in nature. Insects detect tiny amounts of sex pheromones in the environment and use them as a beacon to find mates. And fish use natural biosensors to detect barely perceptible vibrations in the surrounding water.

ARS research units and his collaborators used nanotechnology to develop the biosensor. The detection method may have great potential for food safety and security. The biosensors that ARS and university scientists developed include fluorescent organic dye particles attached to Salmonella antibodies. The antibodies hook onto Salmonella bacteria and the dye lights up like a beacon, making the bacteria easier to see.

(Chemical Weekly, Jan 13, 2009)

HEALTH**Cervical Cancer**

Doctors from Tata Memorial Hospital, Mumbai, along with international experts, have hit upon the best way to reduce the killer impact of cervical cancer, the giant slayer of Indian women. They have concluded a 10-year-long research, supported by the Bill & Melinda Gates Foundation and involving 1.3 lakh women in Osmanabad district to zero down on an one-time mass screening test that could cut down the high toll of cervical cancer in the country, said the *New England Journal of Medicine* (NEJM). It hailed the research as “from India to the world – a better way to prevent cancer.”

It concluded that genetic testing for HPV (by taking DNA cell from the cervix) was better than the world’s popular method called pap smear (cells collected from the surface of the cervix). Even the made-in-India method – visual inspection in which health workers put a drop of acetic acid (vinegar) on the cervix – was found to be less effective. If the research reaches its logical conclusion, millions of Indian women could in the next couple of year undergo a mass HPV screening test at \$2 (as against \$10-20 at present). India contributes 20% of the global burden of cervical cancer. Moreover, 70% of patients come in the last stage,” said Dr Surendra Shastri of Tata Memorial Hospital.

(The Times of India, Apr 3, 2009)

Hot Tea and Cancer

According to Iranian researchers who published their study in the *British Medical Journal*, there appears to be a significant link between hot tea, consumers of hot tea, and throat cancer. Piping hot a cup of tea can do just the opposite for one’s vocal pipes. The intensity of its hotness increases the risk of throat cancer. For instance, among the nearly 900 men and women they followed – a third of whom had some form of esophageal cancer already – there was an eight-fold increase in cancer among those who drank their tea when the temperature of their tea was 158 degrees Fahrenheit, as opposed to others who drank their tea when it was much cooler, around 149 degrees Fahrenheit.

The research was performed by doctors from Tehran University of Medical Sciences. Researchers, however, are not sure about the link between excessive heat and cancer.

(Discovery Health, Apr 6, 2009)

TRANSPORTATION**New Shock Absorber**

A new shock absorber developed by a team of researchers from the Massachusetts University of Technology, USA, can generate electricity to fuel your vehicle when it hits a bump. The group used different car models, fitted the suspension with sensors and drove around. The tests showed a significant amount of energy wasted, specially in heavy vehicles.

To find methods to harness wasted energy, scientists replaced the suspension system with a contraption consisting of a hydraulic system that forced the fluid through a turbine when the vehicle hit a bump. The turbine was connected to a generator that converted mechanical energy to electrical energy. The electrical energy was used by the vehicle, thus saving energy. The system can operate in vehicles which are completely battery-driven or run on a combination of fuel and battery (hybrids).

Calculations indicate that heavy vehicles could increase their fuel efficiency by 10 percent with this new shock absorber. The group filed for a patent last year and formed a company called the Levant Power Corporation to develop and commercialize the product.

(Down to Earth, Mar 16-31, 2009)

Oscillation Monitoring of Railway Vehicles

Oscillation Monitoring System (OMS) is an advanced portable instrument to monitor, detect and record the horizontal and nautical accelerations of railway coaches, wagons and locomotives etc and also railway tracks. Project was funded by Research Design and Standards Organization (RDSO), Lucknow. Field testing of the engineering model of OMS has been done in association with RDSO, Lucknow by installing it in Track Recording Coach (TRC) on few routes. Potential users of the system are RDSO, Lucknow, Indian Railways, different universities and educational institutions.

(CSIR News, Sep 15-30, 2008)

IN FOCUS

Life Sciences: Ten Top Developments

The top 10 innovations of 2008 as reported in *'Science'* are likely to make life sciences research easier and cheaper. Either totally new or an advancement on existing technology, these innovations are indications that the life sciences field is still growing. Ranked by some noted experts and biologists, these are:

1. *Low-Cost Sequencing* – Released in May 2008, this machine can sequence the human genome for \$60,000. This system can generate six gigabases of mappable sequence data per run. The whole genome sequencing, which would take weeks in the earlier days, now seems to be less time consuming and affordable.

2. *Continuous Focus Microscopy* – When viewing an object through a microscope, the eyes often move off the target. In scientific parlance, this is focus drift, one of the biggest challenges in high resolution and live cell imaging. In January 2008, Nikon unveiled a solution to this problem by designing Perfect Focus System (PFS). It is a hardware component that uses a half-moon shaped beam of infrared light to track optical offset and correct for it by sampling every 5 milliseconds.

3. *Custom Zinc-Finger Platform* – Manipulation of genomes of living organism becomes easier with a new custom zinc-finger protein creation service called CompoZr. With this, scientists can knock-out (suppress) or knock-in (activate) genes to the level of a single nucleotide (the component making up the DNA.)

4. *Open Source Sequencing* – The first “open source” gene sequencing instrument with its software and specifications is freely available to the public. Developed as a part of the personal genome project, it is meant to encourage a more diverse group of researchers to do their own sequencing at an affordable cost.

5. *Cell Cycle Imaging in Vivo* – Fluorescent ubiquitination-based cell cycle indicator, or Fucci, helps biologists understand the finer details by tracking how dividing cells alternate between green and red flashes (indicators of tagged fluorescent proteins).

Scientists have already started applying Fucci technique as a means for examining candidate anticancer drugs and their impact on tumor cell division and migration.

6. *Pet/MRI Combined Imaging* – Combining the two technologies-MRI (Magnetic Resonance Imaging) and PET (Positron Emission Tomography), this technology designed for imaging studies in small animals will help trace radiolabelled tracers. Further work is in progress on the next generation design, a PET add on, in locating low abundance molecules.

7. *White Laser Confocal Instrument* – With this, researchers can make the most of every sample put on the instrument as against the restriction posed by conventional confocal instruments which limit the researcher's choice of both fluorescent dyes and the experiments.

8. *Multispectral Signaling X-Ray* – Enabling researchers to view the movement of molecules within small animals in nearly real-time, this tool lets scientists study the progression of disease states at the molecular level in living animals.

9. *Optical Lock in Detection* – The current FRET (fluorescence resonance energy transfer) technology advancement at the Madison University has made possible spotting of protein-protein interactions easier in tissues and mammalian cells. In the standard FRET technology, with more than 10,000 variations of the fluorescent proteins used for spotting, the interactions between target proteins in live cells was found to be difficult due to problem in the background. The recent FRET technology is based on a single protein GFP (green fluorescent protein) and this can reduce background in live tissue staining, making observations easier for biologists.

10. *Microfluidics* - Manipulating the behaviour of fluids constrained in small volume is called microfluidics and its practical applications are seen in inkjet printheads, DNA chips, lab-on-a-chip technology, micro-propulsion, and micro-thermal technologies. Microfluidics has already made a huge impact on biopharma work and is likely to enable researchers create their own lab-on-chips which are miniature devices for performing laboratory experiments on a small scale. Fluids being one of the main component for lab experiments can be managed well with the “lab-on-chips” concept.

(Gene News, Jan-Feb, 2009)

PERSPECTIVE

THE INDIAN BAYH-DOLE ACT: A REVIEW

Introduction

The Protection and Utilisation of Public Funded Intellectual Property Bill 2008, was introduced in the Rajya Sabha by the Minister of Science & Technology December last. Introduced as a mechanism to encourage the commercialization of publicly funded research, critics feel, the Bill also has the potential to reduce access to the outputs of publicly funded research, while harming future innovation.

The bill has been developed on the lines of the Bayh-Dole Act of the USA. The Bayh-Dole Act of the United States can be briefly put as under:

- (i) The Patent and Trademark Act Amendments of 1980 (more popularly known as the Bayh-Dole Act) was enacted on December 12, 1980.
- (ii) It created a uniform patent policy among the many federal agencies that fund research, enabling universities and businesses, operating with federal contracts, to patent materials and products they invent under federal funding.
- (iii) It encouraged universities to set up Technological Transfer Offices (TTO) to manage and promote their patents.
- (iv) The contracting universities and businesses are permitted to exclusively license the inventions to other parties.
- (v) The federal government, however, retains "March-in" rights to license the invention to a third party, without the consent of the patent holder or original licensee, where it determines the invention is not being made available to the public on a reasonable basis.

The Indian Bill, developed on similar lines, seeks as follows:

- (i) It gives government-funded universities and research institutions the right to patent innovations arising out of public funded research and development.
- (ii) The Bill seeks to provide the necessary boost to the commercialization of inventions made through government-funded research by passing on the IP rights on the same to the institution responsible for that invention.
- (iii) In addition to seeking to bar public disclosure, publication and exhibition of the public funded intellectual property, the Bill lists duties of the recipient who retains the titles. Observing that in order to compete in a global environment, it was necessary for India to innovate and promote creativity, the statement of objects and reasons says that the country also needed to protect and utilize the intellectual property created out of public funded research and development.
- (iv) Further, it states that the institutions will have to report to the government within a stipulated period of time (90 days) about its intention to retain the title of the publicly funded intellectual property. To manage the inventions created and formulate mechanisms for commercial utilization of the inventions, the institution will set up an IP Management Committee (like the Technological Transfer Offices under the Bayh-Dole Act). The Bill determines how the royalty received by the institution will be shared by the inventor, IP cell and the institution.

Some Concerns

There have been some differences of opinion on the Bill by experts from the time of its introduction. There have been different perspectives on some of its contents in comparison with US Bayh-Dole Act.

Introduced as a mechanism to encourage the commercialization of publicly funded research, critics feel that the Bill also has the potential to reduce access to the outputs of publicly funded research, while harming future innovation. The Bayh-Dole, on

which it has been modeled, has been under fire for doing very little in increasing public access to the innovation.

The Universities Allied for Essential Medicines point out that the Indian Bayh-Dole Bill replicates and magnifies the mistakes of the US Bayh-Dole Act.

It is apprehended that this Bill, in its present form, will only lead to monopoly over access to technology. This, in turn, can hamper academic knowledge generation. It is felt by many experts in the field that universities must be allowed to maintain their mission of diffusing knowledge, independent of state and market and without subordinating them to corporate interests. The Universities Allied for Essential Medicines point out that much of the research done at universities is upstream research, often related to research tools that are critical for developing further innovations. Patenting is not only unnecessary for these basic tools; it can inhibit further downstream research and development by placing a costly “tax” on tools for innovation.

Along with increases in patenting, it is feared that the same is likely to reduce free access to the knowledge created out of research, funded by the tax-payer, who will end up paying double: both for the research as well as for the products of the research. One serious concern expressed in certain circles is that rights conferred under the legislation allowing institutions and their licensees to charge monopoly prices, may for instance, place life-saving medicines out of the reach of the poor. Thus, public funded research will be seriously hampered in serving the public good.

Another flaw, as seen by experts, is that Indian legislation contains very few provisions to safeguard public access. The US Bayh-Dole Act, recognising the need to ensure public access to publicly-funded inventions, states that it is necessary to “ensure the government obtains sufficient rights in federally supported inventions to meet the need of the government and protect the public against non-use or unreasonable use of inventions.” Critics point out that though these rights have never been successfully used, nevertheless, the fact that such

provisions have been incorporated testifies to the importance of access in setting public policy.

The Indian legislation, however, does not confer such rights. The only concession to public access is the provision that gives the Indian government the right to refuse title to a research institution receiving the grant within ninety days of learning of the research institution’s intention to retain a patent. Thus, in a marked contrast to the licensing and march-in rights of the Bayh-Dole, which are perpetual and automatic, this provision is available only for a brief, 90-day window occurring immediately after the research institution announces its intent to retain title to a patent.

Also it is argued that the Bill has been drafted with the assumption that IPR is the best way to promote innovation, which is not always true. There is an increasing realization world-wide that collaboration, networking and sharing of knowledge can be a better business strategy than operating in isolation and appropriating or patenting information.

Concluding Remarks

In view of above and also fear that the bill, though introduced as a mechanism to encourage the commercialisation of publicly funded research, critics feel that the Bill also has the potential to reduce access to the outputs of publicly funded research, while harming innovation.

Many experts and institutes around the globe have suggested that alternative models like open source model will be more effective than Bayh-Dole like models in stimulating innovation.

Other channels to incentivise innovation include publications, conferences, sponsored research, university-industry patents to promote creativity and innovation. Incentives could include open source, prizes, tax exemption, and network research.

(‘Perspective’ has been extracted and reproduced from a report on ‘Intellectual Property Rights’ (IPR) published in the Gene News of January-February 2009.)

TECHNOLOGY DEVELOPMENT

R&D COMMERCIALISATION

Harnessing Wind Power

Wind power is being touted as a clean and inexhaustible energy source. As wind is intermittent, the power output of wind farms can be variable. Proposed measures to overcome these fluctuations usually involve the installation of units of batteries or capacitors to store electricity on good days and release the energy on still days or at times when wind speeds are too high for system stability. Technology to smooth the power supply and prevent blackouts due to the tripping of safety switches when electricity frequency deviates wildly is also essential.

Recently, scientists at the US Department of Electrical Engineering and Computer Science, Power Electronics and Motor Drives Laboratory, University of Wisconsin-Milwaukee, have devised a solution to the electricity grid susceptibility to changes in wind speed. They have figured a way to make wind power smoother and more efficient by exploiting the inertia of a wind turbine rotor, according to research published in the *International Journal of Power Electronics*.

The new technology creates a braking control algorithm. When incoming wind power is greater than the average power, the rotor is allowed to speed up so that it can store the excess energy as kinetic energy rather than generating electricity. This energy is then released when the wind power falls below average. This approach, the team explains, precludes the need for external energy storage facilities, such as capacitors, and the additional infrastructure and engineering they entail. Method also captures wind energy more effectively and improves the overall efficiency of wind farming, potentially reducing the number of turbines required at any given site.

(*Chemical Weekly*, Jan 27, 2009)

Reducing Solar Power Cost

University of Utah engineers have devised a new way to slice thin wafers of the chemical element germanium for use in the most efficient type of solar power cells. They say the new method should lower the cost of such cells by reducing the waste and breakage of the brittle semiconductor.

The expensive solar cells now are used mainly on spacecraft, but with the improved wafer-slicing method, the idea is to make it possible to use germanium-based, high-efficiency solar cells where cost now is a factor, particularly for solar power on earth, according to Eberhard 'Ebbe' Bamberg, an assistant professor of mechanical engineering.

Brass-coated, steel-wire saws now are used to slice round wafers of germanium from cylindrical single-crystal ingots. But the brittle chemical element cracks easily, requiring broken piece to be recycled, and the width of the saws means a significant amount of germanium is lost during the cutting process.

The new method for slicing solar cell wafers, known as WEDM (wire electrical discharge machining), wastes less germanium and produces more wafers by cutting even thinner wafers with less waste and cracking. The method uses an extremely thin molybdenum wire, an electrical current running through it.

Germanium serves as the bottom layer of the most efficient existing types of solar cells, but is used primarily on NASA, military, and commercial satellites because of the high expense as raw germanium costs about \$680 per pound. Anything that can be done to lower this cost ultimately will lower the cost of solar power per kilowatt-hour, which is beneficial, and will encourage wider use of solar power.

It is claimed that Bamberg's method would reduce the amount to be recycled thereby increasing the yield. It has the potential to give good savings, which helps enable this technology here on earth. A patent is pending on a way of using the new method so that multiple, parallel electrically charged wires are used to cut germanium wafers – a mass-production method that Bamberg compares with an egg slicer.

(*Akshay Urja*, Sep-Oct, 2008)

INTELLECTUAL PROPERTY

Boosting Indigenous Innovation

Global software piracy study reveals that Indian software industry lost around \$2 billion due to software piracy last year. In a scenario like this, Intellectual Property (IP) protection is one step to encourage indigenous innovation and local software product development. "Innovation can only be facilitated if inventors and developers know that their intellectual property will be protected and the eco-system provides adequate checks and balances for innovators," said Lizum Mishra, India Director, Business Software Alliance (BSA), an international association representing the global software industry.

BSA and Economist Intelligence Unit (EIU) jointly publish a study annually which statistically proves the correlation of a nation's IT competitiveness to levels of software piracy, legal protection offered and patent development. Innovation naturally facilitates competitiveness.

The need is to create an environment at a national level that facilitates and protects the process of creative thinking. Areas of improvement include IT infrastructure, R&D and legal environment in the country which are relatively low for India as stated in the BSA-EIU IT competitiveness index.

According to experts, the government's role would help add to economic development through establishment of a robust local software ecosystem for the domestic market, generate employment and significant tax revenue for the domestic economy. "Strong IP adherence increases inflow of international capital and technical knowhow for the nation.

It is also felt that Indian companies and leading bodies like Nasscom, FICCI, CII and the government need to work together to address the growing menace of software piracy. The enforcement system too needs to be more stringent and effective. Greater awareness needs to be generated and training imparted among law enforcement officials and the judiciary on what

constitutes copyright infringement and overall intellectual property violation.

(The Financial Express, Apr 3, 2009)

Protecting Generics

At a recent World Health Organization (WHO) meeting in Germany, the Indian government reportedly succeeded in convincing the international community that as the new definition for fake drugs proposed by WTO could pose a threat to sale and export of legitimate generic drugs, it should be modified. The WHO-funded International Medical Products Anti-Counterfeiting Taskforce (IMPACT) had earlier proposed a new definition of counterfeit drugs as medical products with a "false representation about their identify, history or source."

Generics are usually the cheaper versions of drugs on which patents have expired. In India's case, the earlier patent process allowed domestic companies to launch generics of drugs manufactured by multinational pharmaceutical companies even when the patent was still in place. India moved to the product patent regime in 2005 and generics of drugs still under patent protection were banned.

It is reported that WHO had agreed to reframe the definition. The word history, would be dropped in the final draft of the IMPACT definition. India has also voiced its concern regarding the commercial issues taken up in the definition and told WHO that intellectual property right (IPR) issues and trademark violations should not be part of it as it could be used as a market barrier by some countries.

WHO meeting held in Bonn, Germany, was attended by 24 countries, including the USA, the UK, Canada, Brazil and WHO representatives. According to Drug Controller General of India (DCGI), counterfeit drug will be redefined without use of the word 'history' and with clarity on the other words. The draft of the reframed definition will be presented in WHO's next meeting in Tunisia. A final decision on the definition of counter offer was expected by May 2009 at a world health assembly meeting.

(Chemical Weekly, Dec 23, 2008)

TECHNOLOGY FUNDING

BASF Venture Capital

BASF Venture Capital GmbH has invested in the US startup company NanoMas Technologies Inc. NanoMas develops inks containing silver nanoparticles that are easily processed to electrical circuits in printed electronics, solar cells and special adhesives.

NanoMas raised US\$3.2mn (about euro 2.35mn), with BASF Venture Capital contributing US\$1.5 mn, (about euro 1.1 mn). Other investors include Earthrise Capital Partners, LLC and Nano Materials Investors, LLC. NanoMas will use the funds to expand its nanoparticle production capacity, invest further in research and development, and to support the marketing of its silver inks.

The US startup's silver nanoparticles are suitable for use in transistors, conductors and semiconductors. Silver is highly conductive and functions better than other metals under oxidative conditions. The NanoMas chemical process enables the silver nanoparticles to be processed at low temperatures, thereby increasing efficiency and lowering cost. The process is also ideal for printing electronics on temperature-sensitive materials such as paper and plastics. Printed electronics is the basis for developing enhanced performance of printed labels which can be used for low cost labeling of consumer goods. The technology will enable RFID labels in the long term to replace the barcodes used by retailers today.

This investment strengthens company's development work in nanotechnology. Besides, the NanoMas technology complements BASF's activities in printed electronics.

(Chemical Weekly, Nov 25, 2008)

Reaching Health Benefits to Commons

Scientists working on Human Genome Project said that though they were working on development of medicines which would be more decisive and

less toxic in treating disorders and various diseases, sound health financing from various governments was needed to take the benefits to the common man.

Greatest challenge faced is health financing in translating the huge amount of information and database findings of research into a product, mainly drug and diagnostic tools. Though it is well known that products are going to be effective and safer than the existing drugs and can be made available at affordable prices, yet important requirement is sound health financing in the world that would take care of all these steps. The human genome sequencing, detailed studies, interpretation and analysis of data is a multimillion dollar effort and is done mostly through multi-country collaboration.

India has launched its ambitious project on Open Source Drug Discovery (OSDD) but it is important to sustain it through a continuous health financing with appropriate science managers. The recent anti-malarial drug developed by researchers at the University of California, Berkeley, which was given free to a pharmaceutical company on the condition that it was made available to people at a reasonable cost, was a unique approach in the pharmaceutical research history. Important thing is the will of the governments for health financing. Scientists hope to bring down the cost of human genome sequencing considerably over a period, especially for the poor in Asia.

Many researchers feel, it was important that individuals should be routinely sequenced either prenatal or neo-natal, to get a long term picture of their susceptibility to genetic and other diseases. Speaking at a seminar "Genomics, 20 years from now", renowned scientist Charles Cantor, Founder, Chief Scientific Officer of Sequenom Inc, US, said that genetically engineered humans would be a reality of the future. He was confident that in 2028, DNA (Deoxyribonucleic Acid) sequence information will play an important role in the management of individual healthcare.

(PTI Science Service, Oct 16-31, 2008)

KNOWLEDGE SPREADS

Science and Technology Initiatives in India

The above publication brought out by the Waterfalls Institute of Technology Transfer (WITT) (May 2009) attempts to present the current status of Science and Technology activities in India.

The growth of science and technology in the country is no longer confined to a few Institutions or Departments of the Central Government. With the emphasis on trying to deliver the benefits arising from advances in science and technology to the entire cross section of population in the country - with its diverse geographical regions, different climatic zones, patterns of food production and consumption, developmental measures reaching them and impacting their lifestyle in very many different ways - it is now well recognized that the support to science and technology measures have also to be calibrated suitably. Thus, the roles of many ministries and departments of the Central Government, organizations of the State Governments and the contributions made by Industry are available only in a scattered form and often not easily understood even by those who are actively engaged in some aspect of science and technology development.

Keeping this in view, WITT has prepared a compendium reflecting the different areas that have shown significant improvement in reaching the benefits of science & technology to the society.

This compilation is broadly arranged in fifteen chapters, the first Chapter is a brief statement of basic facts about our country, leading to the administrative set-up and indicating the allocation of different subjects assigned to ministries and departments; Chapter 2 deals with Science and Technology Set-up; Chapter 3 with Department of Science

and Technology; Chapters 4 and 5 with Department of Scientific and Industrial Research, and Departments of Biotechnology; Chapters 6 and 7 cover the Department of Atomic Energy, and Department of Space; Chapters 8, 9 and 10 deal with Earth Sciences, New and Renewable Energy and Information Technology, respectively; Chapters 11, 12, 13 and 14 relate to Indian Council of Agricultural Research, Defence Research Development Organization, Indian Council of Medical Research and University Grants Commission; and finally, Chapter 15 covers R&D in other ministries.

Several annexures give background information or sources from which more information can be obtained.

Thus this compilation gives an overview of the science and technology developments, plans, programmes and policies as were discernable in published material in 2008.

It is expected that this compilation will provide an initial lead which a reader can get and would possibly help him to track down the source for more information on a topic of his interest. It is also expected to be useful for reference to interested persons in other parts of the world who have links with India through many different channels. Further, it is believed that many concerned agencies and organizations in India and abroad would find this a valuable reference compendium.

The book is hardbound, comprises 320 pages, and is priced at Rupees four hundred ninety five only plus postage. For any further information, please contact:

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SCAN AROUND THE GLOBE

Cosmic Observatory

Scientists in western Argentina were set to inaugurate the world's largest astronomical observatory, hoping to unlock the mysteries of high energy cosmic rays that bombard the Earth. The vast Pierre Auger Observatory will begin realizing "its potential for the next 20 years," as per astronomer team member Beatriz Garcia.

Construction for the international efforts, involving a team of more than 370 scientists and engineers from 17 countries, began in 1999 in an elaborate joint project to better understand the particles discovered by the facility's namesake, French physicist Pierre Auger, in 1938. With the launch of the observatory's detection systems, science has "taken a big step forward in solving the mystery of the nature and origin of the highest-energy cosmic rays."

It paves the way for a second phase of construction that will include building a similar instrument in the US state of Colorado. To observe the cosmic ray showers, high-energy particles present in universe that bombard the Earth, the Pierre Auger uses a collection of 1,600 particle detectors placed 1.5 kilometres apart, in a grid spread across 3,000 square kilometres. On top of this detection system, scientists will turn the observatory into the most powerful galaxial observation instrument ever built with an additional 24 telescopes, to record emissions of light from the particle shower.

(Argentina – *PTI Science Service, Dec 1-15, 2008*)

Green Chemistry Centre

Parteq Innovations, the technology commercialization office of Canada's Queen's University, has been awarded US\$9.1 mn by the Canadian government for establishing a 'National Centre of Excellence' for the development and commercialization of 'green' chemistry technologies.

The first entity of its kind in North America, GreenCentre Canada will bring together Canada's leading green chemistry researchers, industry partners, and commercialisation professionals with a common goal to develop cleaner, less energy-intensive solutions for traditional chemical and manufacturing processes.

The centre, to be located at Innovation Park at Queen's University in Kingston, Ontario, will provide expertise in technology development, intellectual property protection, business development, marketing and financial management, complemented with facilities and expertise for product development, scale-up manufacturing and testing of early stage discoveries.

(Canada – *Chemical Weekly, Mar 17, 2009*)

First Solar Powered Building

In China, a new building that operates electricity generated from the solar energy collected by the building itself was put into operation recently in the Baoding High Tech Development Zone.

The 26-floor, five-star hotel looks like a circuit, with some 30,000 square metres of space, including exterior walls, ceilings, and platforms, and installed with the proprietary solar energy absorbing glass panels developed by Yingli Solar. The new building has applied a range of innovative technologies that have earlier not been used either domestically or internationally. The 'breathing solar panel' in particular is able to turn solar energy into electric power. The electric power produced by the building, as by a small hydro-power station, will be connected to the local grid, in addition to its own use.

It is estimated that the building will generate 260,000 kilowatt hours of electricity in a year, saving 104 tons of coal equivalent, or cutting down 75.5 tons of CO₂ emission. Additionally, the contaminated water handling system installed in the building enjoys an improved cyclic use of water for heating, cooling and washing.

(China – *NAM S&T Centre, Oct-Dec, 2008*)

Merck Research Facility

Germany-based Merck-kgaA is expanding its facilities at the Chilworth Technical Centre in Southampton, England. Merck is investing approximately Euro 3 mn to construct an extension that will house state-of-the-art research facilities for further development of two highly innovative segments within its Liquid Crystals Division.

The new laboratories will be equipped with the latest technology for research and development of organic photovoltaic products and materials for flexible displays as well as modern offices and meeting rooms.

The new facilities are to be completed by June 2009. This extension confirms the status of Chilworth Technical Centre as a major R&D site within the Merck Group's chemicals business sector to develop new technologies as a foundation for future business within the Liquid Crystals Division.

(Germany – *Chemical Weekly*, Nov 25, 2008)

Ireland Seeks Help in R&D

Invest Northern Ireland, the public body aiming at economic development of Northern Ireland, is looking at attracting small and mid-size Indian IT services companies, BPOs and niche software development firms for research and development (R&D) in their country. The body helps international companies (large and mid-size) set up their base in Northern Ireland by bringing them financial incentives of up to 15-25%.

These firms could be looking at niche areas like transaction related software development for the banking, financial services and insurance sector, radio frequency in IT, mobile telephony software and life sciences.

Besides the strategic location that Northern Ireland has, its value proposition is the operational cost as there is a lot of availability of quality labour at about 20-35% cheaper than in the UK. Also, the cost of living there is about 15-20% lower than in

UK. So the incentive package, which is about 15-25%, accelerates the investments to set up their base in Ireland. Therefore, many companies are exploring this option seriously. Companies like HCL Technologies, Polaris Software Labs, First Source Solutions and Tech Mahindra are already present in that country.

Invest Northern Ireland has already invested about pounds 150 million for setting up various Indian IT companies. Within Invest Northern Ireland, the Inward Investment Division is responsible for attracting new foreign direct investment (FDI) from outside of Northern Ireland.

(Ireland – *The Financial Express*, Mar 2, 2009)

Insect-Proof Greenhouse

Kenya, a severely food-deficit country, needs to expedite the process of biotech crop adoption to boost agricultural productivity. With this objective, the Kenya Agricultural Research Institute Biotechnology Center (KARI-Biotech) unveiled a state-of-the-art insect-proof biosafety greenhouse for research into the impact of transgenic crops on insects.

KARI-Biotech is currently conducting trials on various biotechnology crops, such as Bt cotton, Bt maize, cassava, sorghum and sweet potatoes. Construction of the greenhouse was funded by the Danish government through the BiosafeTrain Project at a cost of ~US\$40,000. The facility is an addition to the Center's existing level-II biosafety greenhouse. BiosafeTrain Project aims to build capacity in East Africa for biosafety and ecological impact assessment of genetically modified organisms.

(Kenya – *Crop Biotech Update*, Dec 5, 2008)

Origin of Maize Virus

African scientists from the University of Cape Town (UCT) in South Africa have uncovered how one of the world's most economically devastating crop diseases emerged, and hope to genetically

engineer disease resistant crops using the information. They compared the genetic sequence of the virulent maize streak virus (MSV) with ten less harmful strains of the virus from across the continent, which infect other grass food crops, such as wheat and oats. It was found that two relatively mild grass viruses had merged through genetic recombination, which resulted in an ancestral MSV far more potent than its parents, thereafter moving into maize before spreading rapidly across the continent.

The researchers think that this occurred about a century ago, just when commercial agriculture was replacing subsistence farming and maize started to overshadow indigenous crops in Africa. These results mean that DNA viruses are evolving faster than was thought. This rapid mutation increases the possibility of new plant viruses emerging. While plant diseases do not feature very highly in the public's consciousness, their impact on food production causes more suffering in the developing world than many high profile human diseases. Studying plant diseases can provide information about pathogens that can be used to develop resistant crops. At least two hundred samples of infected maize are analyzed each year by UCT team.

An analysis of virus-infected maize from Burkina Faso, the Central African Republic, Ivory Coast, Namibia and Zambia, is being placed in a database. Maize resistant to the streak virus has been developed but it has to be proved that it will hold up under different conditions throughout sub-Saharan Africa.

(South Africa – *NAM S&T Centre, Oct-Dec, 2008*)

Robotic Cyberknife

Doctors in Britain were reported to be using robotic radiotherapy machine for the first time. The machine called Cyberknife, is said to be worth 2.5 million pounds. It maps the movement of a patient's breathing so that tumours can be targeted with greater accuracy than is currently possible. The novel device uses a robotic arm to

deliver multiple beams of high-dose radiation from a wide variety of angles. The patient's breathing is monitored with the aid of x-ray cameras, and the radiotherapy beam is repositioned accordingly to minimize damage to surrounding tissues. This, in turn, makes the therapy so accurate that even tumours in difficult positions and dangerous to operate on, such as near the spinal chord, can be treated safely.

Cyberknife technology is best suited for discreet little tumour in an awkward place, under the liver or next to the kidney.

(UK – *ANI, Feb 8, 2009*)

New Light on Life

University of Utah physicists and chemists have developed a new method that uses a mirror of tiny silver "nanoparticles" so that microscopes can reveal the internal structure of nearly opaque biological materials like bone, tumor cells and the iridescent green scales of the so-called "photonic beetle." The method also might be used for detecting fatigue in materials, such as carbon-fiber plastics used to build the latest generation of aircraft fuselages, tails and wings, says John Lupton, an associate professor of physics and leader of the new study.

The new method developed by Lupton and colleagues is a variation of fluorescence microscopy, but involves using an infrared laser to excite clusters of silver nanoparticles placed below the sample being studied.

The particles form "plasmonic hotspots," which act as beacons, shooting intensely focused white light upward through the overlying sample. The spectrum or colours of transmitted light reveal information about the composition and structure of the substance examined.

While Lupton believes the new method will be of interest mainly to biologists, he also says it could be useful for material science.

(USA – *University of Utah, Feb 4, 2009*)