ISSN : 0972-169X
Registered with the Registrar of Newspapers of India: R.N. 70269/98
Postal Registration No. : DL-11360/2005

Monthly Newsletter of Vigyan Prasar

DREAM 2047

July 2005 | Vol. 6 | No. 10 | Price: Rs. 5.00

VP News

WYP 2005: Master Resource Persons' Training Programmes

As part of the countrywide campaign on Science and Technology Communication with activities built around the World Year of Physics 2005, Vigyan Prasar and National Council for Science and Technology Communication have been organizing training programmes-cum-workshops for the Master Resource Persons in different regions of the country. These MRPs, drawn from different states, are expected to train resource persons within their own States after the training.

The first training programme was organised in Shimla for the Northern Zone. The second trainining programme in the series was organised at Guwahati for the North-Eastern Zone during the period 15-17 June 2005, in which 35 participants from the seven North-Eastern States and Sikkim participated. The local hosts were the Assam State Council for Science & Technology and Environment. The programme was inaugurated by Mr. D. N. Saikia, Commissioner and Secretary, S&T Department, Government of Assam. Dr. A. K. Baruwa, Director, ASTEC, welcomed the participants. Smt. Ujjwala Tirkey, Scientist, NCSTC and Dr. V. B. Kamble, Director, VP, also addressed the participants. He also gave a talk on radioactivity. Professor B. K. Sarma delivered a talk on X-rays, while Professor A. K. Borbora spoke on the Discovery of Electron. Professor Naresh Dadhich, Director, IUCAA, delivered a talk on the topic "From Newton to Einstein". He also delivered a popular talk on the topic "Science and Society" at the Handique Girls' College to a packed auditorium. Professor H. L. Duora spoke on the Rise of the Quantum Theory. Shri Biman Basu spoke on Radio Propagation while Prof. A.K Mishra spoke on Raman Effect. Demonstration of Innovative Physics Experiments by Shri Mukesh Roy, Department of Physics, Indian Institute of Technology, Kanpur, were appreciated by all the participants and motivated them to take up similar activities. As part of the training, the participants paid a visit to the research labs of the Physics Department of Guwahati University. Demonstration of the Astronomy kit by Smt. Ujjwala Tirkey, a talk by Smt. Indu Puri on the activities of NCSTC, and a talk on communication by Shri Chander Mohan were well received. Films on Einstein's Miraculous year 1905 and "Anant Yatra – Emergence of Modern Science" were also screened.

Shri Mukesh Roy demonstrating innovative physics experiments at Guwahati

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Inside

... think scientifically, act scientifically... think scientifically, act scientifically... think scientifically, act...

Published and Printed by Dr. Subodh Mahanti on behalf of Vigyan Prasar, C-24, Qutab Institutional Area, New Delhi - 110 016 & Printed at S. Narayan & Sons, B-88, Okhla Indl. Area, Phase - II, New Delhi - 110 020
Editor : Dr. V.B. Kamble

The Call of the Wild

In 1969, a serious concern was voiced about the threat to several species of wildlife and the shrinkage of wilderness in the country at the General Assembly meeting in New Delhi of the International Union for Conservation of Nature and Natural Resources (IUCN). In 1970, a national ban on tiger hunting was imposed and in 1972 the Wildlife Protection Act came into force. In the same year, the first ever tiger census in India was conducted which revealed the existence of only 1827 tigers! The tiger population in India at the time of India's independence was estimated at about 40,000! A task force was set up to formulate a project for tiger conservation with an ecological approach. It was then that Project Tiger was launched in 1973-74 that aimed at tiger conservation in specially constituted 'tiger reserves'. Incidentally, in the initial stages, Project Tiger was a joint effort of the Government of India and World Wide Fund for Nature (WWF). Now it is a Government of India endeavour.

Various tiger reserves were created in the country under the Project Tiger on a 'core-buffer' strategy. The 'core' areas were freed from human activities and the buffer areas were subjected to 'conservation oriented land use'. Initially, 9 tiger reserves were established in different States during the period 1973-74, by pooling the resources available with the Central and State Governments. The project started as a 'Central Sector Scheme' with the full assistance of Central Government till 1979-80: later, it became a 'centrally Sponsored Scheme' from 1980-81,with equal sharing of expenditure between the center and the states. Today, India has 27 Tiger Reserves to protect the dwindling population of tigers in different parts of the country.

Why should we be concerned so much with tiger and the tiger population? To begin with, tiger is at the apex of the food chain, and hence is the indicator of the stability of the eco-system. For example, for a tiger population to survive, a habitat should possess a good prey base, which in turn depends on undisturbed forest vegetation. This would imply the conservation of the entire eco-system and apart from tigers all other wild animals also would increase in number. The website of the Project Tiger lists the main achievements of this project as being the excellent recovery of the habitat and consequent increase in the tiger population in the reserve areas, from a mere 268 in 9 reserves in 1972 to 1576 in 27 reserves in 2003. In the entire country, however, the tiger population went up from 1827 in 1972 to 3773 in 2001-2002, when the tiger census was last conducted. Apparently, Project Tiger could be described as a huge success story as regards the conservation of the wildlife - tiger in particular. Once again the tiger could roam majestically – at least in the 27 tiger reserves.

Then, a terrible tragedy struck Sariska tiger reserve in Rajasthan, which was home to 22 tigers. By January 2005, there was not a shred of evidence of tigers there! They were all extinct. It was a crisis of magnitude never encountered before. Those who have roamed around in the jungles and seen wildlife in its natural glory only can feel the magnitude of the crisis. It is like a house whose all members have perished in a violent manner!

How did this tragedy of such a great magnitude take place? The indications are that the wipe out of tigers in Sariska was a result of poaching. And, how were they killed? According to Valmik Thapar, a member of the Prime Minister's Tiger Task Force, and who has spent 30 years serving the tiger, the tigers were killed amid agonizing roars mainly by metal traps on the paths to waterholes or around kills, livestock and deer kills. Apparently, an organized gang of poachers had killed the tigers. There are signs of decline in the number of tigers in Ranthambore (Rajasthan) and Panna (Madhya Pradesh) reserves too. Indeed 12 out of 27 tiger reserves need immediate attention, as Thapar says.

Why are the tigers killed? Tiger parts are considered an aphrodisiac by believers in traditional medicine in many parts of East Asia, including China. With a tiger body and all its parts estimated to be worth about US $ 65,000 on the Chinese medicine market, it is poachers who are destroying India's tiger population. International trade in tiger parts is banned under the United Nations' Convention on Trade in Endangered Species, but illegal trade continues to flourish in areas ranging from the Russian Far East to Indochina. Surely, more must be done to stem the tiger trade by curbing the market demand for tiger parts at the source itself.

The disappearance of the tiger from the Sariska reserve means that an important local Indian gene pool of tiger has been lost forever. Surely, we need to review our wildlife conservation policy and its implementation in the field. If the immediate corrective steps are not taken, the story is likely to be repeated in many other tiger reserves. The average age of forest guards in Sariska is reported to be 53 years. Surely, we cannot expect them to patrol a rugged hilly terrain. We need to recruit local persons who can make tough forest guards and who are familiar with the

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Max Born

Founder of Lattice Dynamics

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"I am now convinced that theoretical physics is actual philosophy."

Max Born

"The problem of physics is how the actual phenomena, as observed with the help of our sense organs aided by instruments, can be reduced to simple notions which are suited for precise measurement and used for the formulation of quantitative laws."

Max Born in his Experiments and Theory in Physics

Max Born was a pioneer in developing quantum mechanics. The term "quantum mechanics" was introduced by Born. Born's initial research interests were lattice dynamics and how atoms in solids one held together and vibrate. The Born-Haber cycle, a cycle of theoretical reactions and changes, allows calculation of the lattice energy of ionic crystals. In 1926, immediately after his student Warner Heisenberg had formulated his first laws of a new quantum theory of atoms. Born collaborated with him to develop the mathematical formulation that would adequately describe it. It was Born who first showed that the solution of Schroendinger's quantum mechanical wave equation has a statistical meaning of physical significance. Born's interpretation of the wave equation has proved to be of great importance in the new quantum theory. Born reformulated the first law of thermodynamics. Born produced a very precise definition of quantity of heat and thus provide the most satisfactory mathematical interpretation of the first law of thermodynamics.

Max Born

Commenting on Born's scientific contributions, the winner of 1977 Nobel Prize for Physics, Sir Neville Francis Mott (1905-1996) wrote: "As the founder of lattice dynamics, that is, the theory of how atoms in solids stick together and vibrate, Max Born is one of the pre-eminent physicists of this century. His celebrated work on cohesion in ionic crystals formed the bridge between the physicist's and chemist's ways of studying crystals. For the physicists, lattice energies of the crystals were of central interest and for the chemists, heats of reaction. Born showed that the ionization potentials of the atoms could be used to compare the chemical and physical concepts. This was a landmark."

Max Born was born on December 11, 1882 at Breslau, Germany (now Worclaw, Poland). His father Gustav Born was a professor of embryology at the University of Breslau and his mother Margarete Born (nee Kaufmann) came from a Silesian family of industrialists. It was from his mother that Born inherited his love for music. Born's mother died when he was four years old. In his childhood, Born badly suffered from bad colds and asthma and which continued to afflict him throughout his life. Because of his bad health, he was taught by private tutor for a year in home and then after spending two years in a preparatory school, he joined the Wilhelm's Gymnasium in Breslau. At the Gymnasium, Born studied a wide range of subjects including mathematics, physics, history, modern languages, Latin, Greek, and German. At the School, Born did not display any sign of a gifted child. He was more interested in humanities than in science subjects.

In 1901, Born joined the University of Breslau. Following his father's advice, Born did not specialize in any particular subject. He took a wide range of subjects including mathematics, astronomy, physics, chemistry, logic, philosophy, and zoology. At the Breslau University, Born became interested in mathematics and the credit for this goes to his teachers Rosanes and London. Rosanes, a student of Leopold Kronecker (1823-91), who developed algebraic number theory and invented the Kronecker delta, gave brilliant lectures on analytical geometry. It was Rosanes, who introduced Born the ideas of group theory and matrix calculus, which were later used successfully by Born to solve physical problems. London's lectures on definite integrals and on analytical mechanics were clear and lucid. The resultant effect of the teachings of Rosanes and London was that Born was drawn towards mathematics. He was helped by some of his classmates to develop interest in science. One of his classmates named Lachmann awakened his interest in astronomy. His other classmate Otto Toeplitz introduced the lives and works of some of the greatest mathematicians like Euler, Lagrange, Cauchy and Riemann to Born. Toeplitz

had learnt these from his father, who was a schoolmaster and mathematician. In his later life Born acknowledged his debt to Otto Toeplitz 'for the first introduction to these pathfinders in mathematical science'.

In those days it was a common practice for a German student to move from university to university. And Born was no exception. In 1902 Born went to the University of Heidelberg and then in 1903 he went to the University of Zurich. It was at Zurich that Born attended his first course on advanced mathematics given by Adolf Hurwitz (1859-1919). After coming back to Breslau University, he was told by his classmates Toeplitz and Hellinger of the great teachers of mathematics, Christian Felix Klein (1849-1925), the founder of modern geometry unifying Euclidean and non-Euclidean geometry; David Hilbert (1862-1943), who originated the concept of Hilbert Space; and Hermann Minkowski (1864-1909), who developed the mathematics that played a crucial role in Einstein's formulation of theory of relativity at the University of Gottingen. So Born went to the University of Gottingen to attend lectures by these great scientists. At the Gottingen University, Born served as an Assistant to David Hilbert. He attended lectures by Klein and Carl Runge (1856-1927) on elasticity and a seminar on electrodynamics by Hilbert and Minkowski. Klein was annoyed with Born because of Born's irregular attendance at his lectures. Born then attended Schwarzschild's astronomy lectures. During his student days at the Gottingen University, he had the opportunity to go for walks in the woods with Hilbert and Minkowski. During these walks, all matters of fascinating subjects were discussed in addition to mathematics including problems pertaining to philosophy, politics and social. Born was also interacting with non-mathematicians like Courant, Schmidt and Caratheodory.

David Hilbert

Christian Felix Klein

Born earned his PhD in physics from the University of Gottingen in 1907. He then undertook compulsory military service. However, he did not have to complete the standard one year period because he suffered from asthma. Even his brief stint with the military made him loath all things military. After serving in the military Born visited Caius College, Cambridge for six months to study under Larmor and J. J. Thomson (1908-1909). He came back to Breslau and worked there with the physicists Lummer and Pringsheim. Around this time he was fascinated by Einstein's work on relativity. Born's work on combining ideas of Einstein and Minkowski led to an invitation to Gottingen in 1909, by Minkowski as his assistant. However, Minkowski died within weeks after Born's coming to Gottingen. In 1912, Born joined the faculty of the Gottingen University and he started with working with Theodore von Karman (1881-1963), who discovered Karman vortices.

In 1915 Born was appointed as Professor *(extraordinarius)* at the Berlin University to assist Max Plunck. At the time Albert Einstein was also at the Berlin University. However, soon he had to join the Army. He was attached to a scientific office of the Army, where he worked on the theory of sound ranging. He could also manage to find time to work on the theory of crystals, which led to publication his first book entitled "Dynamics of Crystal Lattices" summarizing a series of investigations that Born had initiated at Gottingen.

In 1919, after the conclusion of the First World War, Born was appointed Professor at the University of Frankfurt-on-Main, where a laboratory was put at his disposal.. Here Born's assistant was Otto Stern, the first of Stern's well-known experiments, which were awrded with a Nobel Prize originated there.

In 1921, Born came back to the University of Gottingen as Professor of Physics, where he stayed for 12 years, interrupted only by a visit to USA in 1925. Among his collaborators at Gottingen were Pauli, Heisenberg, Jordan, Fermi, Dirac, Hund, Weisskopf, Oppenheimer, Joseph Mayer and Maria Goeppert- Mayer. During his stay Born's most important contributions to physics were made. He published a modernized version of his book on crystals. Assisted by his students he undertook numerous investigations on crystal lattices, followed by a series of studies on quantum theory. He collaborated with Heisenberg and Jordan to develop further the principles of quantum mechanics discovered by Heisenberg. He also undertook his own studies on the statistical interpretation of quantum mechanics. Born proposed that what Schrodinger had described with his wave equation, not the electron itself, but the probability of finding the electron in any given location. Consider you are bombarding a barrier with electrons, when some will go through and some will bounce off. Born figured out that a single electron has, say 55 percent chance of going through the barrier, and a 45 percent chance of bouncing back. Because electrons cannot readily divide, Schrodinger's quantum mechanical wave equation could not have describing the electron itself, what it was describing was its probable location. Born's interpretation was hailed by Leon Lederman, as "the single most dramatic and major change in our world view since Newton". However, at the beginning Born's interpretation was not liked either by Schrodinger, the propounder of the wave equation or many other physicists including Einstein. Born corresponded with Einstein on the subject and the Born-Einstein letters were published in 1971. Born's

proposition of probability meant that the determinism of Newton's classical physics was no more valid. There is no predetermined way in which absolute prediction can be made, as in classical physics. Everything depends on probability. A similar idea is embodied in the uncertainty principle of Werner Heisenberg. But Bohr, Sommerfeld, Heisenberg and many others took Born's ideas seriously and they continued the exciting work of trying to get all pieces to fit.

Hermann Minkowski

Theodore von Kármán

Born introduced a useful technique, known as the Born Approximation, for solving problems concerning the scattering of atomic particles. Born and J. Robert Oppenheimer introduced a widely used simplification of the calculations dealing with electronic structures of molecules. This work known as "Born-Oppenheimer theory of molecules deals with interatomic forces."

In 1933, like many other scientists of Jewish origin, Born was forced to leave Germany. He went to England and became Stokes lecturer at the University of Cambridge. He worked there for three years. During these years he mostly worked in the field of nonliniear electrodynamics, which he developed with Infeld.

During the winter of 1935-1936, Born spent six months at Bangalore at the invitation of C. V. Raman. Commenting on his coming to Bangalore and subsequent events, Born said: " As I had no other job, I was willing to accept Raman's offer namely, a permanent position at his institute, if he could obtain the consent of the Council. Then he insisted on my attending the next faculty meeting which had to decide on bringing my appointment before the Council.

The English professor Aston (who had joined around the same time) went up and spoke in a most unpleasant way against Raman's motion declaring that a second rank foreigner driven out from his own his country was not good enough for them. I was so shaken that, when I returned home, I simply cried."

Born was elected to the Tait Chair of natural philosophy at the University of Edinburgh in 1936. He became a British subject in 1936. One of Born's research students described Born's days at Edinburgh: "When Born arrived in the morning he first used to make the round of his research students, asking them whether they had any progress to report, and giving them advice, sometimes presenting them with sheets of elaborate calculations concerning their problems which he had himself done the day before…The rest of the morning was spent by Born in delivering his lectures to undergraduate honours students, attending to departmental business, and doing research work of his own. Most of the latter, however he used to carry out at home in the afternoons and evenings."

After his retirement in 1953 Born went back to his native country and settled in Gottingen. In 1954 he was awarded the Nobel Prize in Physics "for his fundamental research in quantum mechanics, especially for his statistical interpretation of the wavefunction." He shared the Prize with Walther Wilhelm Georg Franz Bothe (1891-1957).

Born was awarded Fellowships of many scientific academies—Gottingen, Moscow, Berlin, Bangalore, Bucharest, Edinburgh, London, Lima, Dublin, Copenhagen, Stockholm, Washington, and Boston. He was awarded honorary doctorates from a number of universities including Bristol, Bordeaux, Oxford, Freidburg/Breisgau, Edinburgh, Oslo, and Brussels. He received the Stokes Medal of Cambridge, the Max Planck Medal of the German Physical Society, the Hughes Medal of the Royal Society of London. He was also awarded the MacDougall-Brisbane Prize, the Gunning-Victoria Jubilee Prize of the Royal Society, Edinburgh and the Grand Cross of Merit with Star of the order of Merit of the German Federal Republic.

During his post-retirement life in Bad Pyrmomt, a town neer Gottingen, Born wrote many articles and books on philosophy of science and the impact of science on human affairs particularly the responsibility of scientists for the use of nuclear energy in war and peace. He was totally against the use contemporary scientific knowledge of nuclear energy for warfare. He took the initiative in 1955 to get a statement on this subject signed by a gathering of Nobel Laureates. Born is buried in Gottingen, where he died on January 05, 1970. His tombstone displays his fundamental equation of matrix mechanics that is $pq-qp = (h/ 2\pi)i$.

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RFID

A Marvel Technology with Bountiful Benefits and Some Concerns

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An ever-increasing number of mobile telephone users in India, during the last couple of years, have highlighted the significance of wireless communication. A moment's thought, about mobile telephones, an invincible communication tool of modern days, will help us in readily appreciating the benefits of wireless technology. When we extend these benefits to communication of data, to and from portable low cost data carriers, we come very close to appreciating the nature and potential benefits of Radio Frequency Identification, RFID for short. RFID has the power to make computing an inconspicuous, intuitive part of every day life. According to research analysts, the RFID market is estimated to be worth 3.1 billion dollars by 2008. RFID system implementation will involve IT solutions and therefore it will merit the attention of any growing economy like India, who is on the forefront of providing IT solutions worldwide.

One best way to illustrate the potential benefits of RFID technology is to simulate a futuristic shopping mall that will have the RFID system in place for the billing system. Present day shopping malls adopt a concept of enabling their customer to choose a diverse range of products from the shelves of the shopping mall. The customer can stack his chosen products haphazardly in the trolley and walk out with it after paying his bill. Unfortunately the agonizing time one has to spend at the cash counter waiting for the cashier to account for the bill scanning one item at a time and computing the total bill from the bar code tags attached to the products, as it exists in present days, is a major irritant for the customers. If RFID is in place in such shopping mall, it will let the customer to pass through the cash counter paying ones bill for all the diverse selection of products in their shopping trolley. RFID, a new technology that is knocking at our doorsteps may replace and push the, until now popularly used bar code technology in to the annals of technological history. The ability to swiftly and reliably scan a shopping cart full of jumbled, closely spaced RFID tagged items is a major aim of this technology which has already knocked our door.

Tagit Market

Modern management concepts rely heavily on processing consumer information based on information feedback, to know their customers, likes and dislikes for furthering their own cause. Knowing what toothpaste you and I may use might be worth millions of rupees to some company, and the people who are spending that much money on research and development for obtaining and documenting such information would depend on the emerging RFID technology to provide such personalised information. Notwithstanding rosy applications of RFID technology, there definitely will be a flip side to this. Privacy advocates are already alarmed that this new technology might be able to monitor even the tiniest aspects of our purely private lives. Does this technology really amount to a dangerous invasion of privacy, or is it a harmless technological tool that helps companies to monitor insignificant facts such as which razor blades we use, or what tooth paste we use, these are some of the issues which will be clear in years to come.

Benefits and concerns of RFID

RFID deals with automatic identification. It has quietly been gaining momentum in recent years and is now poised to radically enhancing data handling processes, complimentary in many ways to other data capture technologies such as bar coding. RFID technology is an innovative means of storing and retrieving data through electromagnetic transmission to an RF compatible integrated circuit. RFID uses radio frequencies to electronically read information on small tags with few problems of ambiguity or orientation, which have haunted the bar code technology. A range of RFID devices and associated systems are available to satisfy an ever-increasing range of applications. The main advantage of this technology is its ability to identify the materials without the visual contact. This determines the applications of RFID technology in every industry, commerce and service, where data needs to be collected and processed. The three main principle areas of RFID application include: Transportation and Distribution, Manufacturing and

processing and Security and Law Enforcement. The Secondary areas of RFID application, some of which are steadily growing include: Animal tagging, Waste management, Time and attendance, Postal tracking, Airline baggage reconciliation, Road toll management etc. Some of the other specific applications of RFID technology are: Electronic article surveillance, Protection of valuable equipment against theft, unauthorised removal or asset management, Controlled access to vehicles, parking areas and fuel facilities, Automated toll collection for roads and bridges, Controlled access of personnel to secure or hazardous locations, Animal husbandry - for identification in support of individualised feeding programmes, Automatic identification of tools in numerically controlled machines - to facilitate condition monitoring of tools, for use in managing tool usage and minimising waste due to excessive machine tool wear, Identification of product variants and process control in flexible manufacture systems, Sport time recording, Electronic monitoring of criminal offenders at home. RFID can also help in combating with counterfeiting. Counterfeits are a major cause for concern it is estimated that 15% of perfume worldwide is counterfeit, 10% of car and aircraft parts and 6-10% of pharmaceuticals, with a figure of 30% of pharmaceuticals in the third world are all counterfeits. The list of application of this emerging technology will be endless in foreseeable future and therefore, RFID; many feel will be the most efficient way of doing business.

RFID system components

Notwithstanding the unending benefits that this technology is likely to usher in, there seem to be equal number of ethical concerns plaguing this technology. Right now you can buy a detergent, toothpaste, shaving cream, or your favourite perfume, and what not, with total anonymity. With RFID tags, that may become a thing of the past. Products with RFID tags will reveal your identity and will enable people to track you, thus intruding into ones personal lives. Therefore RFID, some feel, will be the first step towards a nightmare of personality profiling and Big Brother-style monitoring. They also feel that privacy of people will be completely compromised with the onset of this "draconian technology". Privacy activists worry that the unchecked use of RFID could end up trampling consumer privacy by allowing retailers to gather unprecedented amount of information about their activities. Katherine Albrecht, a fierce critic of RFID technology, who heads the association of Consumers Against Supermarket Privacy invasion, says, "If you are walking around emanating an electric cloud of these devices wherever you go, you have no more privacy". She further adds, "Every doorway you walk through could be scanning you". Human rights campaigners have criticised the RFID scheme, saying that anyone with the right kind of scanning device could find out exactly what items shoppers have bought and could ultimately identify a person simply by the goods they are carrying or wearing. The latest trials of controversial electronic radio tags that allow store bosses to keep track of individual goods are currently taking place. There was controversy earlier in 2003 when the tracking system was used in the packaging of Gillette Mach3 razor blades to stop shoplifting at one of the store chain's Cambridge branches.

Despite the raging debate on the benefits and concerns of this technology, RFID applications in the industry seem poised to revolutionise the inventory system. RFID is here to stay and is also likely to push the presently omnipresent Bar code technology in to oblivion. RFID's designers - based at the Auto-ID Centre, set up by the Massachusetts Institute of Technology - say their goal is to produce an Internet database of every product in the world.

Mr Sanjay Sarma along with Mr David Brock and Mr Kevin Ashton co-founded the Auto-ID centre at MIT, which helped plant the seeds of this growing technology. Mr Sarma, professor of mechanical engineering at Massachusetts Institute of Technology (MIT) who is considered a leading authority in RFID said, "realising business processes improvements through RFID would be the key to success in its adoption". Mr Sarma also said, "the announcement of Wal-Mart and the US Department of Defence requiring its vendors to adopt RFID by 2005, has given a significant boost to this technology".

Overview of RFID

The objective of any RFID system is to carry data in suitable transponders, generally known as tags, and to retrieve data, by machine-readable means, at a suitable time and place, and to satisfy particular application needs. RFID systems have several basic components or technical characteristics that define them. These are: A reader, including an antenna (The device that is used to read and/or write data to RFID tags), A tag (A device that transmits to a reader the data), and The communication between them (RFID uses a defined radio frequency and protocol to transmit and receive data from tags). The wireless communication methods used by the RFID system are again of two different types namely Inductive coupling type and Propagation coupling type.

RFID tags form an important part of the RFID system and these tags can be segregated into two major classifications by their power source, namely, Active tags and Passive tags. Active tags contain both a radio

transceiver and battery to power the transceiver. The onboard radio of the active tag enables it to cover a wider range typically more than 300 feet in comparison with its passive counterpart. However the batteries in the active tags are required to be replaced periodically as in any other battery powered products. Passive tags on the other hand can be either battery or non-battery operated, depending on the type of application. Passive tags reflect the RF signal transmitted to them from a reader or transceiver and add information by modulating the reflected signal. A passive tag does not use a battery to boost the energy of the reflected signal. A passive tag may use a battery to maintain memory in the tag or power the electronics that enable the tag to modulate the reflected signal. Tags are further classified into two categories depending on the memory used namely Read/Write and Read only.

As the very name suggests RFID depends on the radio frequency for its operation. Today there are eight frequency bands in use around the world for RFID applications, which are identified by number and not name. These are divided into low, intermediate and high range of radio frequencies. Frequency bands in the range of 100 to 500 KHz fall under the low range, frequency bands from 10 to 15 MHz fall under the intermediate range and frequency bands from 850 to 950 MHz and 2.4 to 5.8 GHz fall under the high range of radio frequencies used by the RFID system.

How does an RFID system work?

The RFID system consists of a tag and a reader with an antenna, also known as an interrogator. The RFID reader communicates with a tag through the use of radio frequency (RF) energy. The reader sends out an RF signal and the tag then modulates the waves and sends them back to the reader. The reader converts these new waves into digital data. In addition to reading the tag, the reader can use RF energy to write new information to the tag. This enables the user to alter the information stored in the tag from a distance. The readers can be networked together so as to provide nearly unlimited coverage for a system.

RFID Versus Bar Coding

There is a big debate over the competition between bar code and RFID technology. Who will win out? Which technology is better? Generally, the consensus among RFID experts is anything but the biased answer you might expect. Rather, most experts agree that RFID and bar coding will probably work in conjunction with one another at least for another decade or so. Each application has its strong points — features that the other technology is not capable of. However as the cost of RFID tags are brought down to the presently mythical level of 5–cents a piece, the Bar Coding may well be pushed in to the annuls of history.

History of RFID

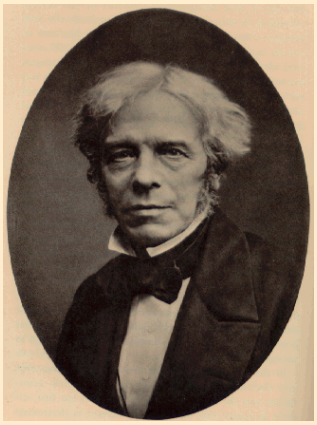
The genesis of RFID lies in the fundamental understanding of the electromagnetic energy. Michael Faraday, a noted

RFID tags

English experimentalist, proposed in 1846 that both light and radio waves are part of electromagnetic energy. In 1864, James Clerk Maxwell, a Scottish physicist, published his theory on electromagnetic fields and concluded that electric and magnetic energy travel in transverse waves that propagate at a speed equal to that of light. Soon after in 1887, Heinrich Rudolf Hertz, German physicist, confirmed Maxwell's electromagnetic theory and produced and studied electromagnetic waves (radio waves), which he showed are long transverse waves that travel at the speed of light and can be reflected, refracted, and polarized like light. Hertz is credited with the first transmission and reception of radio waves. His ideas were soon experimented and confirmed by Aleksandr Popov in Russia. In 1896, Guglielmo Marconi demonstrated the successful transmission of radiotelegraphy across the Atlantic, and the world would never be the same after that. In 1895, before Marconi's much-acclaimed feat, Jagadis Chandra Bose, gave his first public demonstration of electromagnetic waves, using them to ring a bell remotely and to explode some gunpowder. In 1896 the Daily Chronicle of England reported: "The inventor (J.C. Bose) has transmitted signals to a distance of nearly a mile and herein lies the first and obvious and exceedingly valuable application of this new theoretical marvel." The first successful wireless signalling experiment by Marconi on Salisbury Plain in England was not until May 1897. The 1895 public demonstration by Bose in Calcutta predates all these experiments. Invited by Lord Rayleigh, in 1897 Bose reported on his microwave (millimeter-wave) experiments to the Royal Institution and other societies in England. Unfortunately as history would have it, J C Bose's name some how does not find a mention in the western historical references.

Modern Radio communication began with the first demonstration of the continuous wave (CW) radio generation in 1906, by Ernst F. W. Alexanderson. This achievement signals the beginning of the modern radio communication, where all aspects of radio waves are controlled. Then came an important invention the birth of RADAR (Radio Detection and Ranging) in 1922. The work

on Radar during World War II was a significant technical development that was critical to the success of the Allies. Radar sends out radio waves for detecting and locating an object by the reflection of the radio waves. This reflection can determine the position and speed of an object. Since RFID combines radiobroadcast technology and Radar, it is not unexpected that the convergence of these two radio disciplines and the thoughts of RFID occurred on the heels of the development of Radar. One of the earliest works on the concepts, working principles and exploration of the RFID was a landmark paper published by Harry Stockman, "Communication by Means of Reflected power". Thirty years would pass before Harry's vision would begin to yield fruits. For the success of RFID, other developments and inventions were needed: the transistor, the integrated circuit, the microprocessor, development of communication networks, and changes in ways of doing business, before RFID technology could be harnessed for any fruitful applications. A lot has happened in the 53 years since Harry Stockman's work. The 1950s were an era of exploration of RFID techniques following technical developments in radio and Radar in the 1930s and 1940s. Several technologies related to RFID were being explored such as the long-range transponder systems of "identification, friend or foe" (IFF) for aircraft. Developments of the 1950s include such works as F. L. Vernon's, "Application of the microwave homodyne", and D.B. Harris', "Radio transmission systems with modulatable passive responder". The seeds of RFID development were sown during those early years.

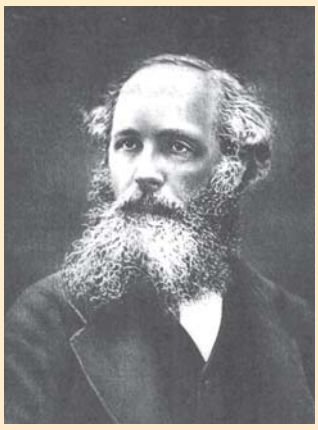


Faraday

The 1960s witnessed some exciting works in the field of RFID. Some of these works included the studies of R. F. Harrington of the electromagnetic theory related to RFID in his papers "Field measurements using active scatterers" and "Theory of loaded scatterers" in 1963-1964. The other notable works included Robert Richardson's "Remotely activated radio frequency powered devices" in 1963, Otto Rittenback's "Communication by radar beams" in 1969, J. H. Vogelman's "Passive data transmission techniques utilizing radar beams" in 1968 and J. P. Vinding's "Interrogator-responder identification system" in 1967.

Marconi

Government laboratories and academic institutions joined the race in the 1970s and started work on RFID. Research laboratories and academic institutions such as Los Alamos Scientific Laboratory, Northwestern University, and the Microwave Institute Foundation in Sweden contributed in this endeavor. Around this time some of the private companies too joined in developing RFID technology, such as Raytheon's "Raytag" in 1973. RCA developed an "Electronic identification system" in 1975 and "Electronic license plate for motor vehicles" in 1977. Thomas Meyers and Ashley Leigh of Fairchild also developed a "Passive encoding microwave transponder" in 1978. The other companies to work in this field included General Electric, Westinghouse, Philips and Glenayre. Projected applications during the 1970s were for animal tracking, vehicle tracking, and factory automation. Examples of animal tagging efforts were the microwave systems at Los Alamos and the inductive systems in Europe. Interest in animal tagging was high in Europe. By 1980s number of companies, individuals and institutions working on RFID began to multiply.



Maxwell

The main unsung hero in the invention of RFID is Charles Walton who also held the patent for RFID in 1973. He was an inventor from the Silicon Valley who worked in this field all through the 1970s and 80s. Walton showed his idea of RFID to the board of directors of General Motors, who some how were unimpressed. The prototype RFID system developed by Walton was a 36-square-inch circuit board loaded with coiled wires and other components common in the 1970s. Walton's RFID cards costed about 1.75 US dollars. Unfortunately for him, way back in the 1970s, the bar code technology, which Walton hoped to replace, was a mere 25-cent solution and therefore his idea, which was a costly affair in comparison with bar code, did not appeal to General Motors. What appeared to be a costly affair then has completely changed now. Over time, the price of RFID cards have falllen consistently from about $5 for a door lock card key in 1973 to roughly 40 cents for an RFID tag today. What was once affordable only for the highest security locations

J. C. Bose

in the 1970s is now almost a virtual throwaway technology. By 2007, analysts expect that RFID tags are expected to cost only about 5 cents.

Having received a set back and rejection from GM, Walton had to go without any salary for almost a year wanting to push through his ideas of RFID as a great invention. As luck would have it, he could sell his idea and license his RFID technique to a lock maker company, Schlage, to make electronic locks that could open by waving a key card in front of a reader. Walton made about $3 million from patenting RFID technology. But his last royalty-bearing RFID patent expired in the mid-1990s. When asked to comment on the expiry of his patent, Walton said, "I'm disappointed it ran out after 17 years", he went on to add, "It's not a bad law. I can't control it, and I'm not angry. I was never into stretching out the length of a patent because I was always more interested in inventing something new." RFID had been around in various forms for years before Walton's invention of a radio-operated door lock. Earlier inventors received patents on animal control systems, a luggage handling system and a mail-sorting system. However the design that merited the attention of the industry was that of Walton's. His design was unique and therefore has remained popular even today. He used innovative type of tags in his design in which a minute electrical current from a radio transceiver, or reader, wakes up a dormant card and gives it enough power to generate a response. This innovative approach for which he was awarded a patent in 1973, has been referred to by 48 later inventions.

Hertz

In the 1990s RFID technology was used widely in the United States for the deployment of electronic toll collections on highways. The world's first open highway electronic tolling system opened in Oklahoma in 1991, where vehicles could pass toll collection points at highway speeds, unhindered by a toll plaza or barriers and with video cameras for enforcement. The world's first combined toll collection and traffic management system was installed in the Houston area by the Harris County Toll Road Authority in 1992. Several countries like Australia, China, Hong Kong, Philippines, Argentina, Brazil, Mexico, Canada, Japan, Malaysia, Singapore, Thailand, South Korea, South Africa, Europe and India have adopted RFID technology for efficient and unhindered toll collection. With the success of toll collections, other applications have soon found their place for the RFID technology.

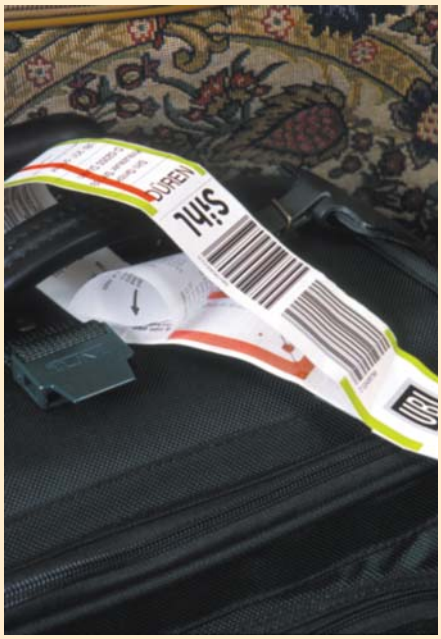
Present day RFID

Modern RFID systems are made up of readers and "smart tags"—tiny microchips each with an attached antenna. The tags can be stuck on everything from milk cartons to hospital patients. When prompted by a reader, the tag broadcasts the information on its chip. Unlike the traditional bar code, RFID chips give every tagged object a unique identification. (A bar code describes only a class of objects, such as cans of Coke.) Companies hope to use RFID to track the trillions of objects that circulate the world every year in planes, lorries and ships, through ports and warehouses, on to shop shelves, through tills and into homes and offices. Accurate tracking should eventually save hundreds of billions of dollars a year for industry as it improves distribution, reduces theft, cuts labour costs and shrinks inventory. Governments also want to use RFID to reduce drug counterfeiting and improve military logistics, among other things.

Radar

In 2002, the Auto-ID centre, a partnership between academic researchers and business based in Cambridge, Massachusetts, came up with a standard for a new, stripped-down RFID chip that stores just 96 bits of information—enough to give every object in the world a unique number. With tag readers plugged into a computer network, this number can be used to look up detailed information about the object, such as its origin, age and expiry date. At the same time, the Auto-ID centre also challenged manufacturers to produce a five-cent tag. Several start-ups, including Alien Technology and Matrics, said they could do so. Suddenly, there was huge interest and talk of a potential mass market. Wal-Mart, the world's biggest retailer, has said that it would require its 100 top suppliers to put tags on pallets and cases of products for shipment to a cluster of its super centres in northern Texas. Tesco, Britain's biggest retailer has also decided to introduce RFID technology. The American government is also becoming a big user of the new tags. The Pentagon has said that it would require its suppliers to put tags on cases and pallets shipped to its warehouses. The Food and Drug Administration has also

insisted that the drug manufacturers, distributors and retailers have to adopt the new RFID technology to combat counterfeiting. At the current rate of demand for RFID technology and as prices continue to fall; demand will continue to grow, from expected tens of billions of tags in 2006, to hundreds of billions by 2009, to perhaps trillions a few years later. As prices fall, most organisations dealing with physical and logistical challenges should find valuable uses for the new tags.



British airways baggage RFID tags

Indian Scenario

The emerging market of an unprecedented growth in RFID technology is likely to provide a fillip to the Indian IT industry. During the launching of the RFID solutions on 31st December 2003, Mr Nandan M. Nilekani, President and CEO, Infosys said, "Enterprises across verticals face many challenges in real-time visibility and tracking of physical movement of goods, assets and personnel. Our customers can now look to us to provide the cost reduction, improved customer service and streamlined operations with the launch of our RFID solution and expertise. The range of Infosys services, he said, will range from analyzing the potential consequences and payback of an RFID deployment to overseeing initial pilots and final deployment. The company will also provide low-cost services to develop the custom software, its clients will need to link their RFID networks to existing enterprise systems. Through consultation with RFID vendors and potential retail customers, Infosys, has developed a framework to help its clients quickly examine the potential impact and business value of RIFD investments. According to Infosys, its framework will provide the basis for RFID deployments across a wide range of industry verticals. "Our seven-layer reference architecture provides a hierarchical methodology for implementing RFID within an enterprise independent of whatever industry vertical that enterprise may be in," says Shashi Shekahar, principle architect of RFID at Infosys. Because the amount of software development required to link RFID networks to enterprise systems is significant, India will be immensely benefited from these new opportunities of RFID.

Wipro Technologies is launching an RFID concept store at its corporate campus in Bangalore in hopes of building expertise in the hot supply-chain technology. The store will be equipped with RFID technology, including tags, readers, and related software, according to a statement issued by the company during the launching of a radio-frequency ID concept store at its corporate campus in Bangalore in July 2004. Wipro technicians will test a number of RFID scenarios at the store, including item-level tagging, stock maintenance, apparel tracking, and inventory tracing. Most of the Indian IT companies are likely to harness potential economic benefits from this new technology.

The Future of RFID

In spite of all the hype associated with RFID, many regard RFID, even today, as a technology in its infancy with as yet untapped potential. This assessment seems true. The technology has many benefits to offer. Its stumbling point seems only to be a variety of issues outside the technology itself: marketing problems, false promises, and a lack of standards. Industry members, however, have become painfully aware of these problems and are trying to do something to remedy the mistakes of the past. If they are able to successfully unify the industry with standards, deliver on future promises, and convince end users of the technology's benefits, then RFID's future looks favorable.

RFID has climbed from relative obscurity to become one of todays most discussed retail technologies, spurred by industry speculation that a 5-cent RFID tag will be available in the near future. Will the speculation of a 5-cent RFID tag be a reality or just a myth, is a subject matter that will only unfold in time to come.

Gartner Symposium/ITxpo is the IT industry's largest and most strategic conference, providing business leaders with a look at the future of IT. For more than 10,000 IT professionals from the world's leading enterprises, Gartner's annual Symposium/ITxpo events are key components of their annual planning efforts. Attendees rely on Gartner Symposium/ITxpo to gain insight into how their organizations can use modern technology to address business challenges and improve operational efficiency. During the six-day conference at the Gartner Symposium/ ITxpo 2004, Future trends for RFID in retailing were presented at the symposium. "RFID technology holds exciting opportunities for almost every business," said Stephen Smith, research vice president at Gartner. The use of RFID to capitalize on data flow in global supply chains could be one of the most significant developments in business strategy since companies first recognized the importance of information flow. This means we can expect tremendous change ahead for product-centric organizations. RFID technology and the business benefits it promises may not arrive with a big bang. High capital costs, imperfect read-rates, unproven systems and uncertainty around standards will all need to be addressed before retailers can adopt and benefit from the technology. This means that over the next 10 years, retailers will continue to use barcodes and gradually introduce RFID tagging, creating an environment of co-existence.

As for the 5-cent RFID tag myth, Mr. Smith said, "There are conflicting problems with assembling low-cost tags. One of the primary things vendors must do to reduce tag cost is reduce the size of the chip. However, reductions in the size of the chip make assembly more expensive. Currently, no vendor has been able to come out of this paradox." Passive tags today cost from 40 cents to $10. Active tags usually start at $4 to $5, increasing to hundreds of dollars. By 2009, the most competitive RFID tags will cost 20 cents. As it stands now there are many hurdles to be crossed before the RFID is accepted as a business standards.

Due to new emerging possibilities that come with RFID and Internet connectivity, RFID has witnessed renewed interest and resurgence in the market. RFID has moved past the limited market of manufacturing logistics and security access, and gained acceptance in the consumer market with such applications as automatic toll payments and fueling applications. Research into future visions for RFID technology; have showed however, that although the market is rapidly growing, there is a limited number of compelling future visions for RFID systems. In fact, based on a study conducted by Venture Development Corporation (VDC), it is agreed among many industry players that a killer application has yet to be defined for RFID. With the exception of the extension of current applications such as e-commerce and tracking, there is little other thinking going on in the field of RFID implementation. The most interesting and visionary thinking of RFID implementation is currently being conducted by Xerox PARC, some telecommunications companies such as Nokia, and MIT's Auto ID Group which is currently funded by a number of large companies such as Coca Cola, Johnson & Johnson, Pfizer, UPS, Wal-Mart, Intel, NCR Corporation, and Philips Semiconductors. This involvement of large corporations and key players indicates that there is an agreement that RFID technology does have the potential of becoming a very prominent technology with some strategic thinking and innovative applications.

Conclusion

Just because the interest is there, it does not guarantee the success of RFID. The biggest challenge facing RFID are the people and time. History has showed that people were always the biggest barriers to progress. The rift among the businesses that were embracing RFID — between those that had a short-term outlook and those that were more visionary about it will ultimately be the benefactors or destroyers of this technology. The latter group sees RFID as a way to cut costs; the former sees it as the bedrock of future business relationships. Which group will ultimately be the winner will decide the fate of this so-called future ubiquitous technology in years to come.

Shivaprasad M Khened, Curator, Nehru Science Centre, Mumbai

WYP 2005: Master.... (Contd. from page 32)

The third training programme for the Western Zone was organised at Mumbai during period 29 June – 01 July 2005. S & T Cell, Government of Maharashtra and Nehru Science Centre, NCSM, were the co-hosts. 35 participants representing 5 States and 2 UTs participated in the programme. Dr. A. V. Sapre, Senior Scientific Officer, S&T Cell welcomed the participants. Renowned Physicist Professor Virendra Singh inaugurated the training programme and also spoke on the Rise of the Quantum Theory. Dr. A. B. Pandey, Secretary, IT and S&T, Government of Maharashtra, presided over the inaugural session. Shri G. S. Rautela, Director, NSC proposed the vote of thanks. Professor A. A. Rangwala spoke on the Discovery of the electron, while Dr. M. B. Hosur spoke on X-rays. The other topics and the speakers were the same as in the training programme for the North-Eastern Zone at Guwahati. As part of the training programme, the participants visited various labs of Tata Institute of Fundamental Research.

Feedback from the participants revealed the efficacy of the training programme. The resource material and the software – articles on discoveries made during the golden decade 1895-1905 and the biographies of the makers of these discoveries, power point presentations on 9 topics, astronomy kit, and VP's publications have been receiving tremendous appreciation. The resource material was distributed to the participants of the MRP training programmes.

The Call of the Wild (Contd. from page 31)

terrain. A number of sanctuaries have villages still located inside them – as is the case with Sariska and Ranthambore. There is no gainsaying the fact that for the protected areas to survive, the support of the local people must be ensured. There has to be communication between the villagers and the forest guards. Further, we must seriously involve local people in protected area management. Efforts need to be put in to undertake eco-development activities around the protected areas to provide for the basic needs of people there. The help of reputed NGOs could be taken to mould the local opinion in favour of scientific wildlife management of our sanctuaries, while special education programmes could help in inspiring, informing and empowering local communities to participate in the protection of the wildlife.

The disappearance of the tiger from Sariska is a major setback to our wildlife management. May be, we could re-introduce tigers in Sariska. The prey base and habitat of Sariska are still capable of supporting a number of tigers.

Soon after reading the Sariska reports in the newspapers, I dug out my childhood treasure of Jim Corbett's - The Temple Tiger, the Man Eaters of Kumaon and so on. In those stories, it was the human beings who constantly lived in mortal fear of falling prey to tigers. Today the roles seem to have reversed! Today it is the call of the wild; tomorrow it may just be the wilderness. We have to act fast.

❐ **V. B. Kamble**

Infective Diarrhoea

Remedies and Prevention

❑ Dr. Yatish Agarwal
e-mail: dryatish@yahoo.com

With most eating places—restaurants, confectioners, halwais, chaatwallahs and food vendors—a suspect, poor quality of potable water, filthy choked drains and cesspools harvesting flies and other crawlies, it's your guts that bear the crunch. Bugs of all kinds—viruses, bacteria and protozoa—can ambush you any time. You come to know of it only when these little thugs begin to show effects. You start feeling queasy. Your insides rumble. The gut smarts in pain. You rush to the loo. You want to rest, but your inflamed bowel will not let up.

Your body fights back. Mostly it wins. The little thugs are eliminated. But before they quit, some damage is already done. Your body loses valuable fluids and electrolytes, and there is a need to replenish the loss, to pull it out of distress. Simple measures can avert a crisis.

Replenish body water and electrolytes : Just the most important thing in management of acute diarrhoea is to replenish the lost body water and electrolytes, and not allow yourself to get dehydrated.

You have many options. The easiest, of course, is to buy a commercially available sachet of oral rehydration salts (ORS). Mix, as per instructions, in clean drinking water and sip a sufficient amount of it to maintain your hydration level. Make sure that you mix just the right amount and not be miserly or overzealous. Too less or too much of the salts may disturb the delicate electrolyte equilibrium.

You can buy any of the commercial ORS sachets—Punarjal granules, Prolyte, Electral, Ricetral or Cerelyte. All are good and available at all chemists'.

Making a mix of ORS at home is not difficult either. Just take a litre of clean water. In case the water quality is doubtful, boil it for two minutes to make it safe. Allow it to cool and then use. Add half a level teaspoon of salt and eight level teaspoons of sugar. Stir well to mix and the ORS is ready.

Another method to make a rehydration drink is to add half a level teaspoon of salt and eight heaped teaspoons of powdered rice to one litre of water and boil it for five to seven minutes. The liquid gruel is an excellent replenisher.

You can also add half a cup of fruit juice, coconut water or mashed ripe banana to the mix. This will make it richer in potassium and improve its taste.

Always be very careful about not sipping the mix if it goes bad. It is best to prepare it fresh and use over an hour. If left at room temperature, the drink gets spoiled very quickly because it allows bacteria to flourish.

Sip to a good measure : Most of the times vomiting accompanies diarrhoea and is an equally big problem. If not severe, it can be tackled at home. To get around it, you should sip the rehydration drink in small amounts at frequent intervals, say every five minutes. Sip slowly. Trying to gulp down too much at once may trigger more vomiting and worsen the condition. In case you take a tablet which stops vomiting, wait for half an hour before you sip liquids and test the tablet's effectiveness.

The healthy mark : There are many ways to determine how much rehydration liquid is required in a particular case to make up for the loss.

The simplest gauge is the output of urine. If the sick person is urinating three or four times a day, it indicates that the fluid balance is adequately maintained. However, if urination is weak or absent, the mouth and tongue go dry, the skin loses its turgor and mental alertness takes a dip, it is a clear indication that the fluid replacement is insufficient and immediate medical attention is needed. Intravenous fluids, given quickly, help a person to pull out of such a delicate situation.

Just take clear liquids : For the first twenty-four hours, it is best to restrict yourself to clear liquids only. You may take chhach, neembu pani, sherbat, tea (minus the milk), daal ka pani, chawal ka maand, green coconut water and similar other homely fluids. Do not force your system to handle more than it can take, nor let it starve.

Fasting is not the remedy : It is never a good idea to starve while you have diarrhoea. Some people do this under the wrong impression that this may help them overcome the condition. But this can be very dangerous, particularly in children and the elderly. Dehydration is a ruthless killer.

Add small feedings of soft foods : Soon as the diarrhoea begins to settle, you suddenly feel hungry and are ready for some 'palate-tickling' food. But never be in a hurry. Try khichdi, daal-chawal, mashed potatoes, bananas, poha and yoghurt. Carry on with these soft foods for a day or two, allowing your intestines to recover.

Avoid raw fruits and vegetables : In the convalescence stage, raw fruits and vegetables and whole grain cereals should be avoided as these foods tend to add more bulk to the intestinal contents.

Stay off milk : It is always a good idea to stay off milk and milk products for a few days after an attack of diarrhoea. Milk can prolong the illness and make the diarrhoea worse because all acute diarrhoeas knock out the intestinal enzyme—lactase. Made in the intestinal wall, this enzyme is absolutely vital for digestion of milk sugar. Deprived of lactase, the intestines cannot tolerate milk. But once the diarrhoea settles, normalcy is restored after a few days. Milk can then be resumed.

Medicines have little role : Never take anti-diarrhoeal products like Lomotil or Pectokab on your own initiative. Such drugs slow down the gut movements and appear to provide relief, but that's no good. Your body fights hard to expel the toxic, diarrhoea-causing organisms. It simply purges them out. Do not interfere with this natural healing mechanism.

Some infective diarrhoeas do, however, need antibiotics. Consult your doctor on this as he would know best.

When to call the doctor : Fortunately, in most acute diarrhoeas the illness is brief and, at most, an inconvenience. It can often be managed with simple home measures. However, it is best to consult your doctor if:

- the diarrhoea is severe and is not getting better
- there is fever
- signs of dehydration appear, or
- the patient is an infant, elderly or a debilitated person.

In such situations, intravenous fluids and antibiotics may be necessary.

Prevention is best : Many cases of infective diarrhoeas occur due to plain carelessness. A few simple rules are effective and reduce your chances of getting acute gastroenteritis. Read on.

- Wash your hands with soap and water before preparing food. This little measure helps avoid the transfer of bacteria from your hands to the food.

- Always wash and clean thoroughly and, preferably, peel raw fruits and vegetables before you eat them.
- Never eat cracked eggs or raw animal protein food. These could very easily be harbouring toxic organisms.
- Do not leave food at room temperature for more than two hours. Avoid eating anything that is suspect. Do not taste it to check if it is still good, just throw it away.
- Toxic organisms and dangerous toxins can easily contaminate home-canned foods. If there is even the slightest suspicion, or any signs of gas production, just do not 'try'.
- Avoid cracked jars, clear liquids that have turned milky, or cans and jars that spurt or have an 'off' odour when opened.
- Avoid food that may have been exposed to flies, rats, mice or dust.
- Stay out of the kitchen in case you are suffering from boils, infected wounds, or throat infection. You can contaminate the food with dangerous staph bacteria.
- Always maintain the cleanliness of utensils you cook in and the cutlery and the crockery you use. Replace sponges often and wash and wipe clean crockery before use.

Recent Developments in Science & Technology

A Washing Machine for Blood:

Scientist in Germany have developed a device that could quickly and effectively retrieve toxic substances from the vital fluid without altering the blood count. This could help by efficient blood cleansing save same many a lives as blood poisoning is fatal.

The unique feature of the technique developed by the researcher at the Franunhofer Institute for Interfacial Engineering and Biotechnology in Collaboration with scientists at University of Stuttgart and Gambro Dialysatoren GmbH is that blood cell separation and plasma cleaning are carried out in a single step.

During the complex process, a doctor extracts some of the patient's blood with a hydrodamic needle. A plasma filter separates the cell from the plasma and in second step, the plasma is percolated through microbed columns containing absorbers that filters out specific toxic substance. The cleansed plasma is then reunited with the blood cells and returned to the body. The blood cells are not be permitted to touch the absorber suffers as otherwise the blood may clot.

The new technique enables the amount of blood that is outside the body to be reduced by more than half. In addition, the hollow fiber material does not activate the blood cell in other words, it does not blood clotting. In this new technique blood flows through the porous hollow fibers. Only the plasma passes through the fine pores. The sensitive blood cells are too big and stay on the inside. In this way the blood is automatically separated into cells and plasma. This new method has already passed all its laboratory test and scientists are now preparing for the first clinical trial in aphaeresis therapy.

Source: PTI News, June (II) 2005.

Killar Fungi could cut malaria deaths:

Mosquito staying fungi could help cut malaria's toll of misery and death. Studies have shown that impregnating household surface with fungal spares can slash the number of mosquitoes capable of transmitting the parasite.

To find out if fungi could be effective a British team at Imperial College, London and the University of Edinburgs fed one mosquito species blood infeded with malaria parasite. After two weeks, nearly a third of the insects carried sporozoites the infections from parasite. But when the mosquitoes were kept in boxes sprayed with an oil containing fungal spores, 90 percent died after two weeks and only 0.4 per cent of the surviors carried sporozoites.

One reason the method works so well is that malaria infection approve to make mosquitoes far more vulnerable to fungal infections which enter the insects bodies through their feet. The team found only 6 days to expose to a sprayed surface was needed and fungus was effective for at least 12 days after spraying. The fungus used was Beauveria bassiania chosen because it has already been approved for use as a biopesticide.com

Source: New Scientist.

Super Computer to copy human brain:

The first attempt to build a complete simulation of the human brain has begun.

IBM and the Swiss Federal Institute of Technology in Lausanne announced the launch of the Blue Brain Project, an attempt to model the entire electrical circuiting of the brain using a supercomputer based on IBM's Blue Gene design.

Drawing on more than 10 years worth of biological observations of how the brain's 10 billion neurons behave individually and how they are wired together, the simulation will give scientist an opportunity to study how part of brain respond to different stimulation. The hope is that the virtual brain will help our understanding of aspects of human cognition such as perception and memory as well as how malfunction neurons can cause psychiatric disorder such as autism and schizophrenia.

Source: New Scientist, June 2005.

NASA probe collided with the Comet:

To learn about the formation of solar system, NASA scientists used a space probe to chase down a speeding comet 134 million km away and slammed it into the frozen ball of ice and debris.

The unmanned probe of the Deep Impact mission collided with Temple 1, a comet half the size of Manhattan on 4 July 2005. Comet are frozen ball of ice rock and dust that orbit the sun. A giant cloud of gas and dust collapsed to create the sun and planets about 4.5 billion years ago and comets formed from the leftover building blocks of solar system.

The energy produced from the impact was equivalent to exploding five tones of dynamite and it caused the comet to shine six times brighter than normal. Soon after the crash on the comet sunlit side the mother ship prepared to approach Temple 1 to peer into the crater site and send more data back to Earth. When the dust settles, scientists hope to peek inside the comet's frozen core- a composite of ice and rock left over from early solar system.

NASA fleet of space telescopes including the Hubble Space Telescope, Chandra X-rays Observatory and Spitzer Space Telescope and dozens of ground observatories recorded the impact.

It was a milestone for the U.S. space agency because no other space mission has flown this close to comet.

Compiled by Kapil Tripathi

Vigyan Prasar's Radio Science Serial in Gondi

In addition to the well known languages like Tamil, Telugu and so on a number of minority languages of hill and forest dwelling Tribal scattered over much of the subcontinent also belong to Dravidian language family. Gondi, a principal Dravidian language of Northern India, is one of the 17 Dravidian languages spoken in India Gondi is the most important of the Central Dravidian group, which must have separated from southern languages such as Kannada and Tamil well over two thousand years ago. In order of speakers it is 15th most spoken language with about 21,24,852 returning Gondi as their mother tongue. As per the 1991 census about 0.25 % of Indian population return it as their mother tongue.

The word Gond occurs in the works of Sanskrit lexicographers like Hemachandra. The Gonds have given their name to the tract of Gondwana, which corresponds to the greater part of what is now the Central Provinces. Gondwana or "land of the Gonds", is a loosely-defined area of southeastern Madhya Pradesh, eastern Maharashtra, and parts of Chhattisgarh, Orissa, and northern Andhra Pradesh. Their home has long been the plateau between the Narwada valley on the north and the Nagpur plains on the south. Gondi thus simultaneously refers to a people and their language in central India. The Gondi, or Gond people are spread over the states of Madhya Pradesh, eastern Maharashtra, Chhattisgarh, northern Andhra Pradesh, and western Orissa. With over four million people, they are the largest tribe in Central India.

Gondi is not a literary language. There are, however, several Gondi songs current, and some of them have been printed in the work by the Rev. S. Hislop. Except such efforts there are hardly any written literature in Gondi. The language is spoken in several large enclaves of forest tracts of central India, separated from one another by settled lands where Marathi, Chhattisgarhi and Telugu are spoken. Such interactions have resulted in emergence of dialects such as Bhatri (amalgam of Gondi with Oriya) and Halbi dialect of Marathi and Gondi.

The Gonds are traditionally agriculturalists; some practice shifting cultivation, while others raise cereals or herd cattle. Traditional Gond religion involves a distinct pantheon of gods and spirits. Gond society is highly stratified and belong to a category of very large tribes that have traditionally dominated the regions in which they have lived. The central region of India was home to several Gond kingdoms from the 15th century to the mid-18th century, when the Marathas expanded into the region from the west.

Since Independence there were attempts to spread literacy amongst the population. The government selected a group of Gonds who were semiliterate in Telugu or such major languages and taught them the basics of written script. These individuals became teachers who taught in Gondi, and their efforts enjoyed a measure of success. However still illiteracy is rampant.

The innovative and unique effort of Vigyan Prasar is aimed at production of a 13 part radio science serial in Gondi for the benefit of this large tribal population of India. The programme is being developed and produced jointly with State Health Resource Center, Raipur and Vanvasi Chetna Ashram, Dantewada. Topics such as ' Science- a everlasting journey of search; Bastar to Brahmand; natural phenomena; myths and science; superstitions and rational outlook; Why we fall sick; major diseases afflicting Bastar region; Agricultrue, food preservation are to be addressed in the radio science serial. The audio scripts are being prepared with inputs from the elders from the tribal hamlets, native Gondi speakers as well experts working in that region.

Workshop Participants at Dantewada

Would you like to write or translate articles for **DREAM 2047?**

Vigyan Prasar invites individuals to contribute articles (including interviews with eminent scientists and profiles of Indian scientific institutions) for publication in DREAM-2047. The articles may be accompanied by sufficient number of illustrations. The articles should be written in a language that can be understood by lay-readers. The article (both in hardcopy and electronic version) should accompany a brief write-up about the author with mailing address, phone number and e-mail ID. The articles also could be e-mailed in the MS word format. Vigyan Prasar will not be responsible for the statements and opinions expressed by the authors in their articles/write-ups published in Dream-2047. **The author will ensure that there is no copyright violation**. Unsolicited articles will not automatically ensure publication in Dream-2047. The articles will be accepted for publication based only on their merits. Vigyan Prasar's decision will be final in this regrrd.

Vigyan Prasar also invites translators for translating English articles into Hindi and vice versa. Kindly send your resume along with samples of your recent translation works.

Editor